



JURISDICTIONAL WATERS DELINEATION REPORT
AMERICAN ELECTRIC POWER CO., INC.
PROPOSED MITCHELL LANDFILL PROJECT
CRESAP, MARSHALL COUNTY, WEST VIRGINIA

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1.0 INTRODUCTION

1.1 GENERAL INFORMATION

This report presents the findings of a wetland and stream delineation conducted at the American Electric Power Company, Inc. (AEP) proposed Mitchell Landfill Project Area (the Project Area) located in Cresap, Marshall County, West Virginia. The Project Area is located on Gatts Ridge Road west of its intersection with Taylors Ridge Road (Figure 1) and consists of a proposed coal combustion byproducts landfill and adjacent areas that may be impacted by soil borrow and other construction and operation activities. The Project Area includes two possible configurations for the proposed landfill, Option 1 that encompasses one valley and has limits of disturbance that are approximately 131 acres in size, and Option 2 that encompasses the Option 1 valley and a second valley for limits of disturbance that are approximately 216 acres in size.

Civil & Environmental Consultants, Inc. (CEC) conducted the field reconnaissance portion of the wetland and stream delineation on August 11 through 15 and on September 27 and 28, 2011.

1.2 METHODOLOGY

This report identifies delineated wetlands, streams (ephemeral, intermittent, and perennial), and other waters within the Project Area. The methodology for conducting the wetland and stream delineation is presented below.

1.2.1 Wetlands

The delineation was based on CEC's professional judgment and interpretation of the technical criteria presented in the 1987 *Corps of Engineers Wetlands Delineation Manual* (USACE Manual) and the 2008 *Corps of Engineers Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont* (Eastern Mountain and Piedmont Supplement). The wetland boundaries, where present, were delineated using the routine onsite determination method described in the USACE Manual and Eastern Mountains



and Piedmont Supplement, supplemented by the *National List of Plant Species That Occur in Wetlands: Northeast (Region 1)* (Reed 1988) and *Hydric Soils of the United States* (USDA 1991). CEC completed the following scope of services to identify and delineate wetland boundaries within the Project Area:

1. Office Data Review: CEC personnel reviewed the U.S. Geological Survey (USGS) topographic map (Figure 1), U.S. Department of Agriculture (USDA) Soil Survey of Marshall County, West Virginia (Figure 2), U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) map (Figure 3), and the corresponding county hydric soils list. These resources were used to identify potential wetland areas prior to conducting the site reconnaissance.
2. Site Reconnaissance: CEC performed the field reconnaissance portion of the wetland and stream delineation on August 11 through August 15 and on September 27 and 28, 2011. First, plant communities present within the Project Area were identified. The dominant plant species within each community were identified and a determination was made on whether the plant community was dominated by hydrophytic (wetland) plants. If areas that appeared to be dominated by hydrophytic plants were identified within the Project Area, a representative test site was located within the plant community and soils were sampled using a spade shovel to determine if hydric soil indicators were present. Lastly, the test site was inspected to determine if indicators of wetland hydrology (ponding, soil saturation, etc.) were present. If a test site was determined to be within a wetland, further testing was performed to locate the wetland/non-wetland boundary and a second test site was established outside the wetland boundary to document conditions in the non-wetland area. If found, the boundaries of areas having the three necessary criteria were marked in the field with consecutively numbered plastic flagging tape and subsequently located using a sub-meter accuracy Trimble Geo-XT Global Positioning System (GPS) unit.
3. Data Collection: Eastern Mountain and Piedmont Supplement wetland determination data forms for the routine onsite determination method were completed for four representative locations within the site boundaries (see Figure 4 for test site locations and Appendix A for the wetland determination data forms). The wetland determination data forms provide a record of the vegetation, soils, and hydrology observations used in making the wetland determinations.

CEC photographed the test site locations and wetland areas located within the Project Area; representative photographs are included in Appendix B.

1.2.2 Streams

In addition to the identification of wetlands, CEC identified streams within the Project Area that would likely be considered jurisdictional by the USACE and the West Virginia Department of Environmental Protection (WVDEP). Using professional judgment and field indicators such as

flow, substrate composition, embeddedness, defined bed and bank, vegetation, and benthic macroinvertebrates, CEC classified on-site stream segments into one of three stream types: ephemeral, intermittent, and perennial. The following descriptions are provided to clarify the different stream classifications.

- Ephemeral Stream – An ephemeral stream has flowing water only during, and for a short duration after, precipitation events in a typical year. Ephemeral stream beds are located above the water table year-round. Groundwater is not a source of water for the stream. Runoff from rainfall is the primary source of water for stream flow.
- Intermittent Stream – An intermittent stream has flowing water during certain times of the year, when groundwater provides water for stream flow. During dry periods, intermittent streams may not have flowing water. Runoff from rainfall is a supplemental source of water for stream flow. Intermittent streams have also been defined as those streams which have no flow during sustained periods of no precipitation and which do not support life whose life history requires residence in flowing waters for a continuous period of at least 6 months.
- Perennial Stream – A perennial stream has flowing water year-round during a typical year. The water table is located above the stream bed for most of the year. Groundwater is the primary source of water for stream flow. Runoff from rainfall is a supplemental source of water for stream flow.

The uppermost limit of an ephemeral stream is determined at the point where the stream loses its defined "bed and bank" or ordinary high water mark (OHWM) and a predominance of upland vegetation occurs in the channel. Under natural, undisturbed conditions, streams generally originate as headwater ephemeral drainages along the tops of ridges, transition into intermittent stream systems, and eventually transition into perennial stream systems. CEC placed blue flagging tape with the words "Beginning of Stream X" at the locations where a defined bed and bank/OHWM began within streams within the Project Area. In order to determine the locations where ephemeral streams transitioned to intermittent streams, where applicable, CEC walked downstream until pooled or flowing water was observed in the stream channel. At the point where flowing water or a pool was observed, CEC excavated a test pit approximately 12 to 16 inches deep in the streambed outside of the area of the pool or flowing water in order to determine if groundwater was present. If groundwater was present within the test pit, CEC recorded the location of the test pit with the Trimble Geo-XT GPS unit and placed blue flagging tape with the words "Stream X Ephemeral/Intermittent Break Point" at this location.

Following the methodology outlined in the U.S. Environmental Protection Agency's (USEPA) *Rapid Bioassessment Protocols for Use in Streams and Wadeable Rivers: Periphyton, Benthic Macroinvertebrates, and Fish, Second Edition* (Barbour et al. 1999), CEC completed the following forms for each intermittent stream identified within the Project Area (see Appendix C):

- Habitat Assessment Field Data Sheet – High Gradient Streams
- Physical Characterization/Water Quality Field Data Sheet
- Benthic Macroinvertebrate Field Data Sheet

Within the intermittent streams identified within the Project Area, CEC also used a Horiba U-52 multiparameter water quality meter to measure temperature, specific conductivity, dissolved oxygen, pH, and turbidity.

In addition to the above outlined forms, CEC also completed field data sheets for intermittent streams following the methodology outlined in the USACE's *Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky*. These forms are provided in Appendix D.

For each ephemeral stream identified within the Project Area, CEC completed the USEPA's Habitat Assessment Field Data Sheet – High Gradient Streams. In addition to these forms, CEC documented the average OHWM width, average bankfull width, average depth of flowing water and/or pools (if present), and dominant substrates for each stream. CEC also evaluated the ephemeral streams that are located within the minimum degradation alternative limits of disturbance using the USACE's *Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky* (Appendix D).

The limit of each distinct stream segment was located in the field using a Trimble GeoXT GPS unit. The total stream segment lengths and stream designations are summarized in Section 2.6



and Table 3 of this report. Representative photographs of the streams are included in Appendix B. Additionally, scores assigned to each stream segment sampled following the USEPA and/or USACE high gradient stream sampling methodology are provided in Table 3.

2.0 FINDINGS

2.1 NATIONAL WETLANDS INVENTORY MAPS

NWI maps have been prepared by the USFWS based on high altitude infrared aerial photography and limited ground truthing. Wetlands and deep water habitats are identified on these maps and classified according to the system developed by Cowardin and co-workers (1979). The aerial photographs reflect conditions during the specific year and season the data were acquired and all wetlands may not be indicated.

The NWI maps for the Glen Easton, WV and the Powhatan Point, WV topographic quadrangles (Figure 3) do not identify waterbodies within the Project Area. One NWI mapped waterbody is shown as being present just south of the Project Area. The NWI maps identify this waterbody as a palustrine, unconsolidated bottom, semi-permanently flooded, diked/impounded wetland (PUBFh). CEC investigated this mapped NWI wetland during the field surveys in order to determine if it was a potential wetland and in order to verify that it is not within the boundary of the Project Area. The waterbody appears to be an old farm pond that has become silted in. Its location on the NWI map is accurate and it is located outside of the limits of the Project Area. CEC did not excavate test pits within this waterbody, but it had wetland delineation flags around its perimeter from what is assumed to be a previous wetland delineation study by others. The pond was dominated by cattails (*Typha* spp.) and other hydrophytic vegetation and appears to be a palustrine emergent wetland. Representative photographs of this waterbody are provided in Appendix B.

As noted in the following sections of this report, the NWI map does not accurately depict the current wetland conditions observed by CEC within the Project Area.

2.2 SITE SOILS

Soils information for Marshall County, WV is available online via the Web Soil Survey through the USDA Natural Resources Conservation Service (NRCS). The NRCS (USDA 2010)

identifies six soil types within the Project Area (Table 1, Figure 2). The NRCS does not list the six soil types as having hydric components.

TABLE 1 SOILS INFORMATION			
Soil Mapping Unit Symbol	Soil Mapping Unit Name	Drainage Class	Hydric Component
CmC	Culleoka-Dormont complex, 8 to 15 percent slopes	Well drained	Not hydric
CmD	Culleoka-Dormont complex, 15 to 25 percent slopes	Well drained	Not hydric
CpE	Culleoka-Dormont-Peabody complex, 25 to 35 percent slopes	Well drained	Not Hydric
CrF	Culleoka-Dormont-Peabody complex, 35 to 65 percent slopes, very stony	Well drained	Not hydric
DoD	Dormont silt loam, 15 to 25 percent slopes	Moderately well drained	Not Hydric
DrE	Dormont-Culleoka complex, 25 to 35 percent slopes	Moderately well drained	Not Hydric

The Project Area is mapped to consist of well drained to moderately well drained soils. Some of the soils within the Project Area have been disturbed by agricultural activities. Therefore, some of the soils within the Project Area may no longer reflect the characteristics of the soil mapping units in the NRCS Web Soil Survey.

2.3 PLANT COMMUNITIES

The plant communities present within the Project Area consist of mixed second growth/early successional forest, second growth forest, old field habitat, mixed old field/early successional forest, riparian forest, agricultural row crop fields, palustrine emergent wetland, and hay fields. Additionally, areas of residential lawn habitats with scattered trees were also identified within the Project Area. Riparian forest was present in limited areas along the bottom of slopes adjacent to intermittent streams. Dominant plant species comprising these plant communities were identified and the USFWS wetland plant indicator status was determined according to Reed (1988). The USFWS has defined five wetland plant indicator categories, which include:



- Obligate Wetland (OBL – has >99% probability of occurring in wetlands);
- Facultative Wetland (FACW – has 66% to 99% chance of occurring in wetlands);
- Facultative (FAC – has 33% to 66% chance of occurring in wetlands);
- Facultative Upland (FACU – has 1 to 33% chance of occurring in wetlands); and
- Upland (UPL – has <1% chance of occurring in wetlands).

Plants classified as OBL, FACW, or FAC are considered to be wetland plants (hydrophytes) by the USFWS and USACE.

Agricultural fields were present in the vicinity of the Gatts farmstead and, at the time of the site visits, consisted of either soybean (*Glycine max*) or corn (*Zea mays*).

Old field vegetation was located primarily within an existing natural gas pipeline right-of-way, electric transmission powerline rights-of-way, and pastures. Dominant species included the following: Allegheny blackberry (*Rubus allegheniensis*), deertongue (*Dichanthelium clandestinum*), giant ironweed (*Vernonia gigantea*), spotted trumpetweed (*Eupatoriadelphus maculatus*), indianhemp (*Apocynum cannabinum*), hedge false bindweed (*Calystegia sepium*), flattop goldentop (*Euthamia graminifolia*), Queen Anne's lace (*Daucus carota*), common yarrow (*Achillea millefolium*), wildgrape (*Vitis* sp.), white ash (*Fraxinus americana*) saplings, multiflora rose (*Rosa multiflora*), wingstem (*Verbesina alternifolia*), Nepalese browntop (*Microstegium vimineum*), poison ivy (*Toxicodendron radicans*), tall goldenrod (*Solidago altissima*), black raspberry (*Rubus occidentalis*), Canadian horsetweed (*Conyza canadensis*), red maple (*Acer rubrum*) saplings, Canadian blacksnakeroot (*Sanicula canadensis*), Christmas fern (*Polystichum acrostichoides*), ticktrefoil (*Desmodium* sp.), orchardgrass (*Dactylis glomerata*), eastern hayscented fern (*Dennstaedtia punctiloba*), and tulip poplar (*Liriodendron tulipifera*) saplings.

Second growth forest is present within the central portions of both the Option 1 and Option 2 limits of disturbance. These areas are located primarily on the steeper slopes and do not appear to have been logged recently. Dominant canopy species included the following: sugar maple (*Acer saccharum*), red maple, hickory (*Carya* spp.), white ash, American beech (*Fagus grandifolia*), northern red oak (*Quercus rubra*), tulip poplar, American elm (*Ulmus americana*),

American basswood (*Tilia americana*), white oak (*Quercus alba*), black cherry (*Prunus serotina*), and hophornbeam (*Ostrya virginiana*). Dominant shrub and herbaceous species included pawpaw (*Asimina triloba*), American hornbeam (*Carpinus caroliniana*), American witchhazel (*Hamamelis virginiana*), hawthorn (*Crataegus* sp.), spicebush (*Lindera benzoin*), multiflora rose, Christmas fern, white snakeroot (*Ageratina altissima*), Canadian woodnettle (*Laportea canadensis*), jumpseed (*Polygonum virginianum*), Nepalese browntop, Virginia creeper (*Parthenocissus quinquefolia*), mayapple (*Podophyllum peltatum*), Canadian clearweed (*Pilea pumila*), jewelweed (*Impatiens capensis*), and common blue wood aster (*Symphyotrichum cordifolium*).

Mixed second growth/early successional forest is present throughout much of the Project Area, within areas that have been logged or selectively logged relatively recently. Dominant plant species within these habitats were similar to those found within the second growth forest habitats within the Project Area. However, the understory was significantly more dense with multiflora rose and Allegheny blackberry.

Riparian forest was located along the base of slopes adjacent to portions of the intermittent streams present within the Project Area. Dominant canopy species in the riparian forest included the following: American elm, American sycamore (*Platanus occidentalis*), boxelder, sugar maple, American basswood, and American beech. The understory included species found in the canopy as well as American hornbeam, spicebush, and multiflora rose. Herbaceous species and vines common in these areas consisted of wingstem, Virginia creeper, Canadian woodnettle, jewelweed, pale touch-me-not (*Impatiens pallida*), and smartweed (*Polygonum* sp.).

Hay field habitats were present near Gatts Ridge Road and in a portion of the Gatts Farmstead. Dominant species in the hay fields included yellow foxtail (*Setaria glauca*), red clover (*Trifolium pratense*), tall fescue (*Schedonorus phoenix*), narrowleaf plantain (*Plantago lanceolata*), common yarrow, white clover (*Trifolium repens*), Queen Anne's lace, giant ironweed, purpletop tridens (*Tridens flavus*), common dandelion (*Taraxacum officinale*), horsenettle (*Solanum carolinense*), barnyardgrass (*Echinochloa crus-galli*), orchardgrass, yellow nutsedge (*Cyperus esculentus*), curly dock (*Rumex crispus*), and common milkweed (*Asclepias syriaca*),

Two small palustrine emergent wetlands were identified within the Project Area. Dominant species in these areas included the following: rice cutgrass (*Leersia oryzoides*), fowl mannagrass (*Glyceria striata*), Frank's sedge (*Carex frankii*), jewelweed (*Impatiens capensis*), clearweed, swamp milkweed, smartweed, purplestem aster (*Symphotrichum puniceum*), broadleaf cattail (*Typha latifolia*), swamp dock (*Rumex verticillatus*), and field horsetail (*Equisetum arvense*).

The locations of plant communities identified within the Project Area are shown on Figure 5. Individual wetland areas and their characteristics are listed in Table 2 in Section 2.5 of this report. In addition, dominant plant species observed in the wetlands and their indicator status are recorded on the wetland determination data forms included in Appendix A.

2.4 HYDROLOGY

The Glen Easton, WV and the Powhatan Point, WV topographic quadrangle maps (1978) indicate that the majority of the Project Area is located within relatively steep terrain. Portions of the Project Area are located along ridgetops and consist of gently rolling and/or relatively flat areas. Ground surface elevations within the Project Area are mapped to range from approximately 800 feet to 1,300 feet above mean sea level (AMSL). CEC assumes groundwater flow in the vicinity western portion of the Project Area follows regional topography and generally flows south towards Fish Creek. CEC also assumes groundwater flow within the eastern portion of the Project Area follows regional topography and generally flows southeast towards Little Tribble Creek.

It is of note that the hydrology of the streams within the Project Area was likely affected by the increased amount of rainfall that has occurred in Marshall County, West Virginia during 2011, as compared to the 30-year average. According to the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center, the average precipitation for Moundsville, West Virginia, for the period from January 1 through July 31 is 24.84 inches (NOAA 2011). According to NOAA (2011), Moundsville received 30.23 inches of precipitation during that time period in 2011, an increase of 5.39 inches compared to normal years. The

Weather Channel (TWC 2011) lists the amount of rainfall that fell in Moundsville from August 1 through August 10, 2011, as 0.74 inches. Additionally, precipitation occurred in Moundsville during the days the site visits were conducted for the delineation, as follows: August 13 – 0.34 inches; August 14 – 0.12 inches; and August 15 – 0.12 inches (TWC 2011).

2.5 WETLANDS

Two wetlands (Wetlands A and B) were identified in the Project Area (Figure 4). Eastern Mountains and Piedmont Supplement Wetland Determination Data Forms are provided in Appendix A and photographs of the wetlands are provided in Appendix B. Photograph locations are depicted on Figure 5. A field survey of the delineated wetland boundaries (Figure 4) was completed by CEC using a Trimble Geo-XT GPS unit. The wetland identifier, acreage, CEC's interpretation of the USFWS classification, and hydrological characteristics are summarized for each wetland in Table 2.

TABLE 2 WETLAND CHARACTERISTICS			
Wetland Identifier	Acreage	USFWS Classification	Hydrological Status¹
A	0.01	Palustrine Emergent Wetland	Connected/Adjacent
B	0.01	Palustrine Emergent Wetland	Connected/Adjacent
Total	0.02	--	--

¹ The determinations of hydrologically connected/adjacent and isolated wetlands outlined in this report are preliminary, based on the boundary delineations and have not been formally approved by the USACE.

The hydrological status of each wetland relates to the possible jurisdictional authority by the USACE and WVDEP (Table 2). Wetlands that are hydrologically connected or adjacent to a stream are likely to be classified by the USACE as waters of the United States and, thus, regulated by both the USACE and WVDEP under the Clean Water Act (CWA). Wetlands that are hydrologically isolated and not adjacent to a stream are likely to be classified as isolated waters and not regulated by the USACE or WVDEP.

Wetland A is located in the northwestern portion of the Project Area (Figure 4). CEC classified this approximately 0.01-acre wetland as a palustrine, emergent, seasonally flooded/saturated (PEM1E) wetland (Cowardin 1979). Dominant species included the following: rice cutgrass, fowl mannagrass, Frank's sedge, clearweed, swamp milkweed, and dotted smartweed (*Polygonum punctatum*). No surface water or saturated soils were present within Wetland A during the site visit. Wetland A is located within an existing natural gas pipeline right-of-way. It is located adjacent to Streams 10 and 10a and is therefore likely to be classified by the USACE as a water of the United States.

Wetland B is located in the southeastern portion of the Option 1 Limits of Disturbance, southeast of the Gatts Farmstead (Figure 4). CEC classified this approximately 0.01-acre wetland as a palustrine, emergent, seasonally flooded/saturated (PEM1E) wetland (Cowardin 1979). Dominant species included the following: jewelweed, clearweed, Pennsylvania smartweed (*Polygonum pensylvanicum*), purplestem aster, swamp dock, broadleaf cattail, and field horsetail. A spring was observed on the north side of Wetland B and was flowing at the time of the site visit. Stream 16 begins at the downstream end of Wetland B and is hydrologically connected to it. Therefore, this wetland is likely to be classified by the USACE as a water of the United States.

2.6 OTHER WATERS

In addition to the aforementioned wetland areas, 30 interpreted ephemeral and intermittent streams were identified within the Project Area (Figure 4). The entire reach of some streams identified within the Project Area were interpreted as being ephemeral, while the upper reaches of some streams were interpreted as being ephemeral and the lower reaches were interpreted as being intermittent. Table 3 contains information on each stream documented within the Project Area. Following Table 3 are narrative summaries of each stream. Representative photographs of each of the streams can be found in Appendix B, with photograph locations depicted on Figure 5. USEPA Rapid Bioassessment Protocol stream forms are provided in Appendix C, while USACE High-gradient Headwater Stream forms are provided in Appendix D.

**TABLE 3
STREAM CHARACTERISTICS**

Stream Segment Identifier	Classification	Approximate Length Within Project Area	USEPA High Gradient Stream Score	USACE Functional Capacity Units (FCU)		
				Hydrology	Biogeochemical Cycling	Habitat
Stream 1	Intermittent	3,465	131	97	93	88
Stream 1	Intermittent		146	95	90	89
Stream 1	Intermittent		154	98	93	94
Stream 1	Ephemeral	78	96	93	85	74
Stream 1a	Ephemeral	327	103	98	96	97
Stream 1b	Ephemeral	70	75	94	85	61
Stream 1c	Ephemeral	79	73	67	48	42
Stream 1d	Ephemeral	151	102	93	92	73
Stream 2	Intermittent	372	130	98	94	89
Stream 2a	Ephemeral	70	92	92	88	71
Stream 2a	Intermittent	413	82	93	80	61
Stream 2a-1	Ephemeral	298	82	98	91	74
Stream 2a-2	Ephemeral	51	89	66	63	63
Stream 2a-3	Ephemeral	92	86	74	84	81
Stream 2b	Ephemeral	550	109	94	85	75
Stream 3	Ephemeral	375	103	94	85	84
Stream 3	Intermittent	216	118	100	94	82
Stream 3a	Ephemeral	178	109	89	85	77
Stream 3b	Ephemeral	119	103	93	81	79
Stream 4	Ephemeral	495	111	91	78	85
Stream 5	Ephemeral	383	110	87	89	78
Stream 6	Ephemeral	51	77	79	89	92
Stream 6	Intermittent	292	116	92	90	87
Stream 7	Ephemeral	394	107	94	84	72
Stream 8	Ephemeral	82	97	--	--	--
Stream 8	Intermittent	2744	138	97	94	96
Stream 8	Intermittent		153	91	75	79
Stream 8a	Ephemeral	181	101	--	--	--
Stream 8a	Intermittent	95	127	65	58	62
Stream 8b	Ephemeral	201	113	--	--	--
Stream 9	Ephemeral	89	107	--	--	--
Stream 9	Intermittent	210	125	96	88	86
Stream 10	Ephemeral	199	92	--	--	--
Stream 10	Intermittent	395	137	96	92	86
Stream 10a	Ephemeral	160	103	--	--	--
Stream 11	Ephemeral	289	124	--	--	--

**TABLE 3
STREAM CHARACTERISTICS**

Stream Segment Identifier	Classification	Approximate Length Within Project Area	USEPA High Gradient Stream Score	USACE Functional Capacity Units (FCU)		
				Hydrology	Biogeochemical Cycling	Habitat
Stream 12	Ephemeral	439	111	--	--	--
Stream 13	Ephemeral	202	129	--	--	--
Stream 13	Intermittent	333	125	94	82	79
Stream 14	Ephemeral	194	109	--	--	--
Stream 14	Intermittent	179	140	78	76	62
Stream 15	Ephemeral	290	112	--	--	--
Stream 16	Intermittent	39	91	59	72	55
Stream 16	Intermittent	152				
Total	--	14,992	--	--	--	--

Stream 1 consists of an unnamed intermittent stream, which originates as an ephemeral stream in the western (Option 1) portion of the Project Area, as shown on Figure 4. Stream 1 flows south within the Project Area. Approximately 78 linear feet of Stream 1 were interpreted as being ephemeral, while approximately 3,465 linear feet of Stream 1 were interpreted as being intermittent. During the site visits, CEC sampled one reach within the ephemeral portion of Stream 1 and three reaches within the intermittent portion of Stream 1.

The ephemeral portion of Stream 1 did not have pools or flowing water during the site visit and was characterized by an average OHWM width of approximately 4 feet and an average bankfull width of 6 to 8 feet. Substrates within the ephemeral portion of Stream 1 consisted of flat boulders, cobble, gravel, and clay. The USEPA High Gradient Stream score for the Stream 1 ephemeral sample reach was 96 (see Appendix C). A representative photograph of the ephemeral portion of Stream 1 is provided in Appendix B.

The upper/upstream sample reach of the intermittent portion of Stream 1 was located upstream of its confluence with Stream 2. CEC observed the upstream sample reach of Stream 1 as characterized by an average OHWM width of approximately 6 feet and an average bankfull width of approximately 8 to 10 feet. Flowing water was observed within this sample reach,

within an average depth of approximately 1 inch, and pools of water up to 6 inches deep were also present. The substrates of the upstream sample reach of Stream 1 consisted of cobble, flat boulders, bedrock, silt, and gravel. The USEPA High Gradient Stream score for this representative reach of Stream 1 was 131. Northern dusky salamander (*Desmognathus fuscus*) larvae were observed within this sample reach, but no fish were observed. Overall, benthic macroinvertebrates were rare within this sample reach, with taxa observed including Decapoda (crayfish), Coleoptera (aquatic beetles), Corydalidae (dobsonfly larvae), Tipulidae (crane fly larvae) and Ephemeroptera (mayfly larvae).

The second/middle sample reach of the intermittent portion of Stream 1 was located at the confluence of Stream 1 and Stream 4. CEC observed Stream 1 within this sample reach as characterized by a width at the OWHM of approximately 10 feet and an average bankfull width of approximately 12 to 14 feet. Flowing water was present, with an average depth of approximately 1 to 2 inches deep. Bedrock pools up to 16 inches deep were also present within this sample reach. The substrates of the middle sample reach of Stream 1 consisted of cobble, bedrock, boulders, and gravel. The USEPA High Gradient Stream score for this representative reach of Stream 1 was 146. Benthic macroinvertebrate taxa were common within this sample reach but diversity was limited, with only crayfish and mayfly larvae being abundant. Other macroinvertebrate taxa were rare in the sample reach and included Hemiptera (water striders), aquatic beetles, and Trichoptera (caddisfly larvae). Adult northern dusky salamanders and green frogs (*Rana clamitans*) were observed, but no fish were present within this sample reach.

The third/lower sample reach of the intermittent portion of Stream 1 was located directly upstream from the southern edge of the Project Area boundary in the Option 1 limits of disturbance. CEC observed Stream 1 within the lower sample reach as characterized by an OWHM width of approximately 10 to 12 feet and an average bankfull width of approximately 15 to 20 feet. Flowing water was present within the sample reach, with an average depth of approximately 1 to 3 inches. Pools up to 12 inches deep were also present within this sample reach. Substrates present within the lower sample reach of Stream 1 consisted of small flat boulders, large boulders, gravel, and cobble. The USEPA High Gradient Stream score for this representative reach of Stream 1 was 154. Benthic macroinvertebrates were rare overall within

this sample reach and diversity was limited, with only crayfish and mayfly larvae being observed. Adult and larval northern dusky salamanders and green frogs (*Rana clamitans*) were observed, but no fish were present within this sample reach.

No fish or species of salamanders dependent upon a perennial source of water were observed within the three reaches sampled within Stream 1. Additionally, benthic macroinvertebrates were rare overall and of limited diversity. Benthic macroinvertebrate taxa observed within the Stream 1 sample reaches also are not dependent upon a perennial source of water, other than dobsonfly larvae, which are sometimes dependent upon water being available for a year or more. Dobsonfly larvae were rare within Stream 1 and can be assumed to be present due to the availability of water for longer periods of time within the deeper pools in Stream 1. Representative photographs of Stream 1 can be found in Appendix B, with photograph locations depicted on Figure 5. The USEPA Rapid Bioassessment Protocol High Gradient Stream forms for Stream 1 are provided in Appendix C and the USACE High-gradient Stream forms are provided in Appendix D.

Stream 1a consists of an unnamed ephemeral stream that originates in the northeastern portion the Option 1 Project Area. Stream 1a flows southwest to Stream 1. Approximately 327 linear feet of Stream 1a were identified within the Project Area. During the August 12, 2011, site visit, Stream 1a was characterized by an OHWM width of approximately 2 to 3 feet and an average bankfull width of approximately 5 to 6 feet. No flowing water or pools were observed within Stream 1a during the site visit. The substrates of Stream 1a consisted primarily of cobble, gravel, and flat boulders, with clay, silt and leaf pack/woody debris also being present to a lesser extent. No fish or amphibians were observed within Stream 1a during the field survey. The USEPA High Gradient Stream score for this representative reach sampled within Stream 1a was 103. A representative photograph of Stream 1a can be found in Appendix B, with the photograph location depicted on Figure 5. USEPA High Gradient Stream forms for Stream 1a are provided in Appendix C.

Stream 1b consists of an unnamed ephemeral stream that originates within a powerline right-of-way in the northeastern portion the Option 1 Project Area. Stream 1b flows south to Stream 1.

Approximately 70 linear feet of Stream 1b were identified within the Project Area. Stream 1b was characterized by a width at the OWHM of approximately 1.5 to 2 feet and an average bankfull width of approximately 4 feet. No flowing water was observed during the site visit, but a few shallow pools were present. The substrates of Stream 1b consisted of silt, clay, cobble and gravel. No fish or amphibians were observed within Stream 1b during the field survey. The USEPA High Gradient Stream score for Stream 1b was 75. A representative photograph of Stream 1b channel can be found in Appendix B, with the photograph location depicted on Figure 5. USEPA High Gradient Stream forms for Stream 1b are provided in Appendix C.

Stream 1c consists of an unnamed ephemeral stream that originates within a powerline right-of-way in the northern portion the Option 1 Project Area. Stream 1c flows southeast to Stream 1. Approximately 79 linear feet of Stream 1c were identified within the Project Area. During the site visit, Stream 1c was characterized by an OHWM width of approximately 1 foot and an average bankfull width of approximately 2 to 3 feet. No flowing water or pools were observed within Stream 1c during the site visit. The substrates of Stream 1c consisted of silt, clay, cobble and gravel. The USEPA High Gradient Stream score for this representative reach of Stream 1b was 73. A representative photograph Stream 1c can be found in Appendix B, with photograph locations depicted on Figure 5. USEPA High Gradient Stream forms for Stream 1c are provided in Appendix C.

Stream 1d consists of an unnamed ephemeral stream that originates in the northern portion of the Option 1 Project Area. Stream 1d flows southeast to Stream 1. Approximately 151 linear feet of Stream 1d were identified within the Project Area. During the site visit, Stream 1d was characterized by a width at the OWHM of approximately 3 feet and an average bankfull width of approximately 5 to 6 feet. No flowing water or pools were observed during the site visit. The substrates of Stream 1d consisted of flat boulders, cobble, gravel, clay, and leaf pack/woody debris. No fish or amphibians were observed within Stream 1d during the field survey. The USEPA High Gradient Stream score for this representative reach of Stream 1d was 102. A representative photograph of Stream 1d can be found in Appendix B, with the photograph location depicted on Figure 5. USEPA High Gradient Stream forms for Stream 1d are provided in Appendix C.

Stream 2 consists of an unnamed intermittent stream, which originates at the confluence of an ephemeral stream (Stream 2b) and intermittent stream (Stream 2a) in the western (Option 1) portion of the Project Area, as shown on Figure 4. Stream 2 flows southwest within Project Area to Stream 1. Approximately 372 linear feet of Stream 2 were identified within the Project Area. Stream 2 was characterized by an average OHWM width of approximately 5 to 6 feet and an average bankfull width of approximately 8 to 10 feet. Slowly flowing water was observed within Stream 2, within an average depth of approximately 1 inch, and pools of water up to 4 inches deep were also present. Portions of Stream 2 were observed to be without flowing water at the surface during the site visit. The substrates of Stream 2 primarily consisted of cobble, gravel, flat boulders, and silt, with small areas of bedrock also being present. The USEPA High Gradient Stream score for this representative reach of Stream 2 was 130 (see Appendix C). No stream salamanders, frogs, or fish were observed within this sample reach. Overall, benthic macroinvertebrates were common within this sample reach. However, the diversity was very low, with only one species of mayfly larvae and crayfish observed within the sample reach. Benthic macroinvertebrate taxa observed within the Stream 2 sample reach also are not dependent upon a perennial source of water. The USEPA High Gradient Stream forms and the USACE High-gradient Stream Forms for Stream 2 are provided in Appendix C and Appendix D, respectively. Representative photographs of the intermittent portion of Stream 2 are provided in Appendix B.

Stream 2a consists of an unnamed intermittent stream, which originates as an ephemeral stream in the western (Option 1) portion of the Project Area, as shown on Figure 4. Stream 2a flows southwest within the Project Area to Stream 2. Approximately 70 linear feet of Stream 2a were interpreted as being ephemeral, while approximately 413 linear feet of Stream 2a were interpreted as being intermittent. During the site visits, CEC sampled one reach within the ephemeral portion of Stream 2a and one reach within the intermittent portion of Stream 2a.

The ephemeral portion of Stream 2a did not have flowing water during the site visit, but one small pool was present. The average OHWM width of this portion of Stream 2a was approximately 1.5 feet and the average bankfull width was approximately 3 feet. Substrates



within the ephemeral portion of Stream 2a consisted of silt, clay, gravel, and cobble, with a few flat boulders and areas of woody debris also present. The USEPA High Gradient Stream score for the Stream 2a ephemeral sample reach was 92 (see Appendix C). A representative photograph of the ephemeral portion of Stream 2a is provided in Appendix B.

The intermittent portion of Stream 2a was characterized by an average OHWM width of approximately 3 feet and an average bankfull width of approximately 7 feet. Slowly flowing water was observed within Stream 2a, within an average depth of approximately 1 inch, and pools of water up to 6 inches deep were also present. The substrates of Stream 2a primarily consisted of clay, silt, gravel, and cobble, with small areas of leaf pack and woody debris also being present. The USEPA High Gradient Stream score for this representative reach of the intermittent portion of Stream 2a was 82. No stream salamanders, frogs, or fish were observed within this sample reach. Overall, benthic macroinvertebrates were rare and diversity was very low, with only one species of mayfly larvae and one species of aquatic beetles observed within the sample reach. Benthic macroinvertebrate taxa observed within the Stream 2a sample reach also are not dependent upon a perennial source of water. The USEPA High Gradient Stream forms and the USACE High-gradient Stream Forms are provided in Appendix C and Appendix D, respectively. Representative photographs of the intermittent portion of Stream 2a are provided in Appendix B.

Stream 2a-1 consists of an unnamed ephemeral stream that originates in the northeastern portion the Option 1 Limits of Disturbance portion of the Project Area. Stream 2a-1 flows south/southwest to Stream 2a. Approximately 298 linear feet of Stream 2a-1 were identified within the Project Area. During the site visit, Stream 2a-1 was characterized by a width at the OHWM of approximately 2.5 feet and an average bankfull width of approximately 5 feet. No flowing water or pools were observed with this stream during the site visit. The substrates of Stream 2a-1 consisted primarily of silt, with some gravel, cobble, and leaf pack/woody debris also present. No fish or amphibians were observed within Stream 2a-1 during the field survey. The USEPA High Gradient Stream score for this representative reach of Stream 2a-1 was 82. Representative photographs of Stream 2a-1 can be found in Appendix B, with photograph



locations depicted on Figure 5. USEPA High Gradient Stream forms for Stream 2a-1 are provided in Appendix C.

Stream 2a-2 consists of an unnamed ephemeral stream that originates in the northeastern portion the Option 1 Limits of Disturbance portion of the Project Area. Stream 2a-2 flows west/southwest to Stream 2a. Approximately 51 linear feet of Stream 2a-2 were identified within the Project Area. During the site visit, Stream 2a-2 was characterized by an average OHWM width of approximately 1.5 feet and an average bankfull width of approximately 2.5 feet. No flowing water or pools were observed during the site visit. The substrates of Stream 2a-2 consisted primarily of silt and clay, with some gravel, cobble, and a few flat boulders also present. No fish or amphibians were observed within Stream 2a-2 during the field survey. The USEPA High Gradient Stream score for Stream 2a-2 was 89. A representative photograph of Stream 2a-2 can be found in Appendix B, with the photograph location depicted on Figure 5. USEPA High Gradient Stream forms for Stream 2a-2 are provided in Appendix C.

Stream 2a-3 consists of an unnamed ephemeral stream that originates in the northeastern portion the Option 1 Project Area. Stream 2a-3 flows southwest to Stream 2a. Approximately 92 linear feet of Stream 2a-3 were identified within the Project Area. During the site visit, Stream 2a-3 was characterized by an average width at the OHWM of approximately 2 feet and an average bankfull width of approximately 5 feet. No flowing water or pools were observed during the site visit. The substrates of Stream 2a-3 consisted primarily of silt and clay, with some gravel, cobble, and a leaf pack/woody debris also present. No fish or amphibians were observed within Stream 2a-3 during the field survey. The USEPA High Gradient Stream score for Stream 2a-3 was 86. A representative photograph of Stream 2a-3 can be found in Appendix B, with the photograph location depicted on Figure 5. USEPA High Gradient Stream forms for Stream 2a-3 are provided in Appendix C.

Stream 2b consists of an unnamed ephemeral stream that originates in the eastern portion the Option 1 Limits of Disturbance portion of the Project Area. Stream 2b flows generally west to Stream 2. Approximately 550 linear feet of Stream 2b were identified within the Project Area. During the site visit, Stream 2b was characterized by an average OHWM width of approximately

3 feet and an average bankfull width of approximately 6 feet. No flowing water was observed during the site visit; however, a few small pools were present. The substrates of Stream 2b consisted of cobble, gravel, silt, flat boulders, and some leaf pack/woody debris. No fish or amphibians were observed within Stream 2b during the field survey. The USEPA High Gradient Stream score for this representative reach of Stream 2b was 109. Representative photographs of Stream 2b can be found in Appendix B, with photograph locations depicted on Figure 5. USEPA High Gradient Stream forms for Stream 2b are provided in Appendix C.

Stream 3 consists of an unnamed intermittent stream, which originates as an ephemeral stream in the northwestern (Option 1) portion of the Project Area, as shown on Figure 4. Stream 3 flows southeast within the Project Area to Stream 1. Approximately 375 linear feet of Stream 3 were interpreted as being ephemeral, while approximately 216 linear feet of Stream 3 were interpreted as being intermittent. During the site visits, CEC sampled one reach within the ephemeral portion of Stream 3 and one reach within the intermittent portion of Stream 3.

The ephemeral portion of Stream 3 did not have flowing water or pools present during the site visit. The average OHWM width of this portion of Stream 3 was approximately 4 to 5 feet and the average bankfull width was approximately 8 to 10 feet. Substrates within the ephemeral portion of Stream 3 consisted primarily of flat boulders, cobble, and gravel, with a few areas of silt, clay, bedrock, and leaf pack/woody debris also present. The USEPA High Gradient Stream score for the Stream 3 ephemeral sample reach was 103 (see Appendix C). Representative photographs of the ephemeral portion of Stream 3 are provided in Appendix B and the photograph locations are shown on Figure 5.

The intermittent portion of Stream 3 was characterized by an average OHWM width of approximately 5 to 6 feet and an average bankfull width of approximately 8 to 10 feet. Slowly flowing water was observed within Stream 3, within an average depth of approximately 1 inch, and pools of water up to 3 to 4 inches deep were also present but uncommon. The substrates of Stream 3 primarily consisted of flat boulders, cobble, and gravel, with small areas of bedrock, clay, and silt also being present. The USEPA High Gradient Stream score for this representative reach of the intermittent portion of Stream 3 was 118. One adult northern dusky salamander was

observed, but no frogs or fish were observed, within this sample reach. Overall, benthic macroinvertebrates were rare and diversity was very low within this sample reach. Benthic macroinvertebrate taxa observed within the sample reach included Hirundinea (leeches), Amphipoda (scuds), crayfish, mayfly larvae, and caddisfly larvae. Benthic macroinvertebrate taxa observed within the Stream 3 sample reach also are not dependent upon a perennial source of water for completion of their life cycles. The USEPA High Gradient Stream forms and the USACE High-gradient Stream Forms are provided in Appendix C and Appendix D, respectively. Representative photographs of the intermittent portion of Stream 3 are provided in Appendix B.

Stream 3a consists of an unnamed ephemeral stream that originates in the western portion the Option 1 Project Area. Stream 3a flows generally northeast to Stream 3. Approximately 178 linear feet of Stream 3a were identified within the Project Area. During the site visit, Stream 3a was characterized by an average OHWM width of approximately 3 feet and an average bankfull width of approximately 6 to 8 feet. No flowing water was observed during the site visit; however, a couple small shallow pools were present in the channel. The substrates of Stream 3a primarily consisted of clay, cobble, gravel, and flat boulders, with some leaf pack/woody debris and bedrock also present to a lesser degree. No fish or amphibians were observed within Stream 3a during the site visit. The USEPA High Gradient Stream score for this representative reach of Stream 3a was 109. A representative photograph of Stream 3a can be found in Appendix B, with the photograph location depicted on Figure 5. USEPA High Gradient Stream forms for Stream 3a are provided in Appendix C.

Stream 3b consists of an unnamed ephemeral stream that originates in the western portion of the Option 1 Limits of disturbance within the Project Area. Stream 3b flows generally south to Stream 3. Approximately 119 linear feet of Stream 3b were identified within the Project Area. During the site visit, Stream 3b was characterized by an average OHWM width of approximately 2 to 3 feet and an average bankfull width of approximately 5 to 6 feet. No flowing water or pools were observed within Stream 3b during the site visit. The substrates of Stream 3b consisted primarily of gravel, cobble, and flat boulders, with some clay, silt and leaf pack/woody debris also present. No fish or amphibians were observed within Stream 3b during the field survey. The USEPA High Gradient Stream score for this representative reach of Stream 3b was

103. A representative photograph of Stream 3b can be found in Appendix B, with the photograph location depicted on Figure 5. USEPA High Gradient Stream forms for Stream 3b are provided in Appendix C.

Stream 4 consists of an unnamed ephemeral stream that originates in the eastern portion the Option 1 Limits of Disturbance within the Project Area. Stream 4 flows generally west to Stream 1. Approximately 495 linear feet of Stream 4 were identified within the Project Area. During the site visit, Stream 4 was characterized by an average OHWM width of approximately 4 to 5 feet and an average bankfull width of approximately 6 to 8 feet. No flowing water or pools were observed within Stream 4 during the site visit. The substrates of Stream 4 consisted primarily of gravel, cobble, and flat boulders. Some clay and bedrock substrates were also present within Stream 4. No fish or amphibians were observed within Stream 4 during the site visit. The USEPA High Gradient Stream score for this representative reach of Stream 4 was 111. Representative photographs of Stream 4 can be found in Appendix B, with photograph locations depicted on Figure 5. USEPA High Gradient Stream forms for Stream 4 are provided in Appendix C.

Stream 5 consists of an unnamed ephemeral stream that originates in the southwestern portion of the Option 1 Limits of Disturbance within the Project Area. Stream 5 flows generally east to Stream 1. Approximately 383 linear feet of Stream 5 were identified within the Project Area. During the site visit, Stream 5 was characterized by an average OHWM width of approximately 2 to 3 feet and an average bankfull width of approximately 6 feet. No flowing water or pools were observed with this stream during the site visit. The substrates of Stream 5 consisted primarily of gravel, cobble, and flat boulders, with clay and leaf pack/woody debris substrates also present to a lesser degree. No fish or amphibians were observed within Stream 5 during the field survey. The USEPA High Gradient Stream score for the representative sample reach within Stream 5 was 110. A representative photograph of Stream 5 can be found in Appendix B, with photograph locations depicted on Figure 5. USEPA High Gradient Stream forms for Stream 5 are provided in Appendix C.

Stream 6 consists of an unnamed intermittent stream, which originates as an ephemeral stream in the southwestern (Option 1) portion of the Project Area, as shown on Figure 4. Stream 6 flows east/southeast within the Project Area to Stream 1. Approximately 51 linear feet of Stream 6 were interpreted as being ephemeral, while approximately 292 linear feet of Stream 6 were interpreted as being intermittent. During the site visits, CEC sampled one reach within the ephemeral portion of Stream 6 and one reach within the intermittent portion of Stream 6.

The ephemeral portion of Stream 6 did not have flowing water or pools present during the site visit. The average OHWM width of this portion of Stream 6 was approximately 1 foot and the average bankfull width was approximately 1.5 to 2 feet. Substrates within the ephemeral portion of Stream 6 consisted primarily of cobble and clay, with a few flat boulders also present. The USEPA High Gradient Stream score for the Stream 6 ephemeral sample reach was 77 (see Appendix C). A representative photograph of the ephemeral portion of Stream 6 is provided in Appendix B and the photograph location is shown on Figure 5.

The intermittent portion of Stream 6 was very steep overall and was characterized by an average OHWM width of approximately 3 feet and an average bankfull width of approximately 5 to 6 feet. Slowly flowing water was observed within Stream 6, within an average depth of approximately 0.5 to 1 inch, and pools of water up to 3 inches deep were also present. The substrates of Stream 6 primarily consisted of flat boulders, bedrock, cobble, gravel, clay and silt, with small areas of leaf pack/woody debris also being present. The USEPA High Gradient Stream score for this representative reach of the intermittent portion of Stream 6 was 116. One adult northern dusky salamander was observed, but no frogs or fish were observed, within this sample reach. Overall, benthic macroinvertebrates were rare and diversity was very low within this sample reach, as larvae of one species of mayfly was the only benthic macroinvertebrate taxa observed within the sample reach. Mayfly taxa are not dependent upon a perennial source of water for completion of their life cycle. The USEPA High Gradient Stream forms and the USACE High-gradient Stream Forms are provided in Appendix C and Appendix D, respectively. Representative photographs of the intermittent portion of Stream 6 are provided in Appendix B.

Stream 7 consists of an unnamed ephemeral stream that originates in the western (Option 1) portion of the Project Area. Stream 7 flows generally northeast to Stream 1. Approximately 394 linear feet of Stream 7 were identified within the Project Area. During the site visit, Stream 7 was characterized by an average width at the OWHM of approximately 3 to 4 feet and an average bankfull width of approximately 6 to 7 feet. No flowing water or pools were observed within Stream 7 during the site visit. The substrates of Stream 7 consisted primarily of flat boulders, cobble, gravel, and clay. Heavy growth of clearweed, jewelweed, and pale touch-me-not was present within portions of the stream channel. No fish or amphibians were observed within Stream 7 during the field survey. The USEPA High Gradient Stream score for the representative sample reach of Stream 7 was 107. Representative photographs of Stream 7 can be found in Appendix B, with photograph locations depicted on Figure 5. USEPA High Gradient Stream forms for Stream 7 are provided in Appendix C.

Stream 8 consists of an unnamed intermittent stream, which originates as an ephemeral stream in the eastern (Option 2) portion of the Project Area, as shown on Figure 4. Stream 8 flows south and southeast within the Project Area. Approximately 82 linear feet of Stream 1 were interpreted as being ephemeral, while approximately 2,744 linear feet of Stream 8 were interpreted as being intermittent. During the site visits, CEC sampled one reach within the ephemeral portion of Stream 8 and two reaches within the intermittent portion of Stream 8.

The ephemeral portion of Stream 8 did not have pools or flowing water during the site visit and was characterized by an average OHWM width of approximately 1 foot and an average bankfull width of 2 to 3 feet. Substrates within the ephemeral portion of Stream 8 primarily consisted of clay and cobble, with some flat boulders present to a lesser degree. The USEPA High Gradient Stream score for the Stream 8 ephemeral sample reach was 97 (see Appendix C). A representative photograph of the ephemeral portion of Stream 8 is provided in Appendix B.

The upper/upstream sample reach of the intermittent portion of Stream 8 was located upstream of its confluence with Stream 10. CEC observed the upstream sample reach of Stream 8 as characterized by an average OHWM width of approximately 6 feet and an average bankfull width of approximately 8 to 10 feet. Flowing water was observed within this sample reach,

within average depths of approximately 0.5 to 3 inches, and pools of water up to 6 inches deep were also present. The substrates of the upstream sample reach of Stream 8 primarily consisted of cobble, flat boulders, and gravel, with some large boulders and silt present to a lesser degree. The USEPA High Gradient Stream score for this representative reach of Stream 8 was 138. Northern dusky salamander adults were observed within this sample reach, but no fish or other amphibians were observed. Overall, benthic macroinvertebrates were relatively abundant within this sample reach, but the diversity of taxa observed was very low and included only larvae of one species of mayfly and larvae of one species of caddisfly.

The second/lower sample reach of the intermittent portion of Stream 8 was located approximately halfway between the confluence with Stream 14 and the southern edge of the Project Area boundary in the Option 2 limits of disturbance. CEC observed Stream 8 within the lower sample reach as characterized by an OHWM width of approximately 10 to 15 feet and an average bankfull width of approximately 15 to 20 feet. Flowing water was present within the sample reach, with an average depth of approximately 1 to 4 inches. Pools up to 16 inches deep were also present within this sample reach. Substrates present within the lower sample reach of Stream 8 consisted of small flat boulders, large boulders, gravel, and cobble. The USEPA High Gradient Stream score for this representative reach of Stream 1 was 153. Benthic macroinvertebrates were abundant overall within this sample reach but diversity was limited, with only one species of crayfish and larvae of one species of mayfly being observed as abundant. Dobsonfly larvae and caddisfly larvae were the only other taxa observed within the sample reach. The vast majority of benthic macroinvertebrates observed within the sample reach were present in the areas of deeper pools. Adult northern dusky salamanders and green frogs were observed, but no fish were present within this sample reach.

No fish or species of salamanders dependent upon a perennial source of water were observed within either of the two reaches sampled within Stream 8. Additionally, benthic macroinvertebrates were rare overall and of limited diversity. Benthic macroinvertebrate taxa observed within the Stream 8 sample reaches also are not dependent upon a perennial source of water, other than dobsonfly larvae, which are sometimes dependent upon water being available for a year or more. Dobsonfly larvae were rare within Stream 8 and can be assumed to be

present due to the availability of water for longer periods of time within the deeper pools in Stream 8. Representative photographs of Stream 8 can be found in Appendix B, with photograph locations depicted on Figure 5. The USEPA Rapid Bioassessment Protocol High Gradient Stream forms for Stream 8 are provided in Appendix C and the USACE High-gradient Stream forms are provided in Appendix D.

Stream 8a consists of an unnamed intermittent stream, which originates as an ephemeral stream in the northeastern (Option 2) portion of the Project Area, as shown on Figure 4. Stream 8a flows generally south/southeast within the Project Area to Stream 8. Approximately 181 linear feet of Stream 8a were interpreted as being ephemeral, while approximately 95 linear feet of Stream 8a was interpreted as being intermittent. During the site visits, CEC sampled one reach within the ephemeral portion of Stream 8a and one reach within the intermittent portion of Stream 8a.

The ephemeral portion of Stream 8a did not have flowing water or pools present during the site visit. The average OHWM width of this portion of Stream 8a was approximately 3 feet and the average bankfull width was approximately 5 to 6 feet. Substrates within the ephemeral portion of Stream 8a consisted primarily of clay and cobble, with flat boulders and gravel also present to a lesser extent. The USEPA High Gradient Stream score for the Stream 8a ephemeral sample reach was 101 (see Appendix C). A representative photograph of the ephemeral portion of Stream 8a is provided in Appendix B and the photograph location is shown on Figure 5.

The intermittent portion of Stream 8a was characterized by an average OHWM width of approximately 4 to 5 feet and an average bankfull width of approximately 6 to 8 feet. Slowly flowing water was observed within Stream 8a, with an average depth of approximately 0.5 to 1 inch. No deep pools were observed within the intermittent portion of Stream 8a during the site visit. The substrates of Stream 8a primarily consisted of bedrock, but also consisted of flat boulders, cobble, and gravel to a lesser extent. The USEPA High Gradient Stream score for the intermittent portion of Stream 8a was 127. No stream salamanders, frogs, or fish were observed within this sample reach. Overall, benthic macroinvertebrates were rare and diversity was very low within this sample reach. Benthic macroinvertebrate taxa observed within the sample reach

included one species of Oligochaeta (aquatic worms), one aquatic beetle species, larvae of one mayfly species, and larvae of one dobsonfly species. Benthic macroinvertebrate taxa observed within the Stream 3 sample reach also are not dependent upon a perennial source of water, other than dobsonfly larvae, which are sometimes dependent upon water being present within a stream for more than a year at a time. The presence of the dobsonfly larvae could be assumed to be the result of the overall wetter conditions and continued presence of water in the shallow bedrock pools in 2011. The USEPA High Gradient Stream forms and the USACE High-gradient Stream Forms are provided in Appendix C and Appendix D, respectively. A representative photograph of the intermittent portion of Stream 8a is provided in Appendix B.

Stream 8b consists of an unnamed ephemeral stream that originates in the eastern (Option 2) portion of the Project Area. Stream 8b flows generally southeast to Stream 8. Approximately 201 linear feet of Stream 8b were identified within the Project Area. During the site visit, Stream 8b was characterized by an average width at the OWHM of approximately 1.5 to 2 feet and an average bankfull width of approximately 3 to 4 feet. No flowing water or pools were observed within Stream 8b during the site visit. The substrates of Stream 8b consisted primarily of bedrock, cobble, and clay, with flat boulders, gravel, and leaf pack/woody debris present to a lesser extent. No fish or amphibians were observed within Stream 8b during the field survey. The USEPA High Gradient Stream score for the representative sample reach of Stream 8b was 113. A representative photograph of Stream 8b can be found in Appendix B, with the photograph location depicted on Figure 5. USEPA High Gradient Stream forms for Stream 8b are provided in Appendix C.

Stream 9 consists of an unnamed intermittent stream, which originates as an ephemeral stream in the northeastern (Option 2) portion of the Project Area, as shown on Figure 4. Stream 9 flows west within the Project Area to Stream 8. Approximately 89 linear feet of Stream 9 were interpreted as being ephemeral, while approximately 210 linear feet of Stream 9 were interpreted as being intermittent. During the site visits, CEC sampled one reach within the ephemeral portion of Stream 9 and one reach within the intermittent portion of Stream 9.

The ephemeral portion of Stream 9 did not have flowing water or pools present during the site visit conducted on August 13, 2011. On August 14, 2011, no flowing water was present, but some small/shallow pools were observed, presumably from the significant rainfall that had fallen overnight. The average OHWM width of this portion of Stream 9 was approximately 1.5 feet and the average bankfull width was approximately 2 to 3 feet. Substrates within the ephemeral portion of Stream 9 consisted primarily of cobble, gravel, and clay, with a few flat boulders and areas of leaf pack/woody debris also present. The USEPA High Gradient Stream score for the Stream 9 ephemeral sample reach was 107 (see Appendix C). Representative photographs of the ephemeral portion of Stream 9 are provided in Appendix B and the photograph locations are shown on Figure 5.

The intermittent portion of Stream 9 was very steep overall and was characterized by an average OHWM width of approximately 3 feet and an average bankfull width of approximately 4 to 5 feet. Slowly flowing water was observed within this portion of Stream 9, within an average depth of approximately 0.5 to 1 inch. No deep pools were observed. The substrates within this portion of Stream 9 primarily consisted of bedrock, cobble, and leaf pack/woody debris, with small areas of flat boulders and leaf pack/woody debris also being present. The USEPA High Gradient Stream score for this representative reach of the intermittent portion of Stream 9 was 125. Adult northern dusky salamanders were observed, but no frogs or fish were observed within this sample reach. Overall, benthic macroinvertebrates were rare and diversity was very low within this sample reach, as larvae of one species of mayfly and one species of dobsonfly larvae were the only benthic macroinvertebrate taxa observed within the sample reach. The USEPA High Gradient Stream forms and the USACE High-gradient Stream Forms are provided in Appendix C and Appendix D, respectively. Representative photographs of the intermittent portion of Stream 9 are provided in Appendix B.

Stream 10 consists of an unnamed intermittent stream, which originates as an ephemeral stream in the northeastern (Option 2) portion of the Project Area, as shown on Figure 4. Stream 10 flows southeast within the Project Area to Stream 8. Approximately 199 linear feet of Stream 10 were interpreted as being ephemeral, while approximately 395 linear feet of Stream 10 were

interpreted as being intermittent. During the site visits, CEC sampled one reach within the ephemeral portion of Stream 10 and one reach within the intermittent portion of Stream 10.

The ephemeral portion of Stream 10 did not have flowing water or pools present during the site visit conducted on August 13, 2011. On August 14, 2011, shallow flowing water approximately 0.5 to 1 inch deep was present, and some small/shallow pools were observed, presumably from the significant rainfall that had fallen overnight. The average OHWM width of this portion of Stream 10 was approximately 2 to 3 feet and the average bankfull width was approximately 3 to 5 feet. Substrates within the ephemeral portion of Stream 10 consisted primarily of clay, silt, gravel, and cobble, with flat boulders present to a lesser extent. The USEPA High Gradient Stream score for the Stream 10 ephemeral sample reach was 92 (see Appendix C). Representative photographs of the ephemeral portion of Stream 10 are provided in Appendix B and the photograph locations are shown on Figure 5.

The intermittent portion of Stream 10 was characterized by an average OHWM width of approximately 6 to 8 feet and an average bankfull width of approximately 10 to 12 feet. Slowly flowing water was observed within Stream 10, within an average depth of approximately 0.5 to 1.5 inches, and pools of water up to 6 inches deep were also present. The substrates of this portion of Stream 10 primarily consisted of flat boulders, cobble, and gravel, with small areas of bedrock and large boulders also being present. The USEPA High Gradient Stream score for this representative reach of the intermittent portion of Stream 10 was 137. Adult northern dusky salamanders were observed, but no frogs or fish were observed within this sample reach. Overall, benthic macroinvertebrates were abundant but diversity was relatively low within this sample reach. Benthic macroinvertebrate taxa observed within the sample reach included crayfish, aquatic beetles, dobsonfly larvae, mayfly larvae, and caddisfly larvae. Benthic macroinvertebrate taxa observed within the Stream 10 sample reach also are not dependent upon a perennial source of water for completion of their life cycles, with the exception of dobsonfly larvae, which are sometimes dependent upon flowing water being present for periods of longer than 1 year. The USEPA High Gradient Stream forms and the USACE High-gradient Stream Forms are provided in Appendix C and Appendix D, respectively. Representative photographs of the intermittent portion of Stream 10 are provided in Appendix B.

Stream 10a consists of an unnamed ephemeral stream that originates in the northeastern (Option 2) portion of the Project Area. Stream 10a flows generally east to Stream 10. Approximately 160 linear feet of Stream 10a were identified within the Project Area. During the site visit, Stream 10a was characterized by an average OHWM width of approximately 1.5 feet and an average bankfull width of approximately 3 feet. Stream 10a did not have flowing water or pools present during the site visit conducted on August 13, 2011. On August 14, 2011, shallow flowing water approximately 0.1 to 1 inch deep was present, and some small/shallow pools were observed, presumably from the significant rainfall that had fallen overnight. The substrates of Stream 10a primarily consisted of cobble and clay. No fish or amphibians were observed within Stream 10a during the site visit. The USEPA High Gradient Stream score for this representative reach of Stream 10a was 103. A representative photograph of Stream 10a can be found in Appendix B, with the photograph location depicted on Figure 5. USEPA High Gradient Stream forms for Stream 10a are provided in Appendix C.

Stream 11 consists of an unnamed ephemeral stream that originates in the eastern portion of the Option 2 limits of disturbance within the Project Area. Stream 11 flows generally northeast to Stream 8. Approximately 289 linear feet of Stream 11 were identified within the Project Area. During the site visit, Stream 11 was characterized by an average OHWM width of approximately 3 feet and an average bankfull width of approximately 6 to 8 feet. Stream 11 did not have flowing water or pools present during the site visit conducted on August 13, 2011. On August 14, 2011, shallow flowing water approximately 0.5 to 1 inch deep was present, presumably from the heavy rains that occurred the previous night. The substrates of Stream 11 consisted primarily of boulders, cobble, and gravel. No fish or amphibians were observed within Stream 11 during the field survey. The USEPA High Gradient Stream score for this representative reach of Stream 11 was 124. Representative photographs of Stream 11 can be found in Appendix B, with the photograph locations depicted on Figure 5. USEPA High Gradient Stream forms for Stream 11 are provided in Appendix C.

Stream 12 consists of an unnamed ephemeral stream that originates in the eastern portion of the Option 2 limits of disturbance within the Project Area. Stream 12 flows generally

west/southwest to Stream 8. Approximately 439 linear feet of Stream 12 were identified within the Project Area. During the site visit, Stream 12 was characterized by an average OHWM width of approximately 3 to 4 feet and an average bankfull width of approximately 6 to 8 feet. Stream 12 did not have flowing water or pools present during the site visit conducted on August 13, 2011. On August 14, 2011, shallow flowing water approximately 0.5 inch deep and scattered small shallow pools up to 2 inches deep were present, presumably from the heavy rains that occurred the previous night. The substrates of Stream 12 consisted primarily of boulders, cobble, and gravel, with clay, silt and leaf pack/woody debris also present to a lesser degree. No fish or amphibians were observed within Stream 12 during the field survey. The USEPA High Gradient Stream score for this representative reach of Stream 12 was 111. Representative photographs of Stream 12 can be found in Appendix B, with the photograph locations depicted on Figure 5. USEPA High Gradient Stream forms for Stream 12 are provided in Appendix C.

Stream 13 consists of an unnamed intermittent stream, which originates as an ephemeral stream in the eastern (Option 2) portion of the Project Area, as shown on Figure 4. Stream 13 flows generally northeast within the Project Area to Stream 8. Approximately 202 linear feet of Stream 13 were interpreted as being ephemeral, while approximately 333 linear feet of Stream 13 were interpreted as being intermittent. During the site visits, CEC sampled one reach within the ephemeral portion of Stream 13 and one reach within the intermittent portion of Stream 13.

The ephemeral portion of Stream 13 did not have flowing water or pools present during the site visit conducted on August 13, 2011. On August 14, 2011, shallow flowing water approximately 0.5-inch deep was present within portions of the stream channel, presumably from the significant rainfall that had fallen overnight. The average OHWM width of this portion of Stream 13 was approximately 2 feet and the average bankfull width was approximately 4 feet. Substrates within the ephemeral portion of Stream 13 consisted primarily of boulders, gravel, and cobble, with some leaf pack/woody debris also present to a lesser extent. The USEPA High Gradient Stream score for the Stream 13 ephemeral sample reach was 129 (see Appendix C). A representative photograph of the ephemeral portion of Stream 13 is provided in Appendix B and the photograph location is shown on Figure 5.

The intermittent portion of Stream 13 was very steep overall and characterized by an average OHWM width of approximately 5 to 6 feet and an average bankfull width of approximately 8 feet. Slowly flowing water was observed within Stream 13, within an average depth of approximately 0.5 to 1.5 inches, and pools of water up to 6 inches deep were also present. The substrates of the lower portion of this section of Stream 13 primarily consisted of bedrock (including bedrock waterfall areas), while the upper portion of this section of Stream 13 was more typical and included substrates consisting primarily of boulders, cobble, and gravel, with some bedrock and clay being present to a lesser extent. The USEPA High Gradient Stream score for this representative reach of the intermittent portion of Stream 13 was 125. Adult and juvenile northern dusky salamanders were observed, but no frogs or fish were observed within this sample reach. Overall, benthic macroinvertebrates were common but diversity was very low within this sample reach. Benthic macroinvertebrate taxa observed within the sample reach included larvae of one species of mayfly and larvae of one species of caddisfly. Benthic macroinvertebrate taxa observed within the Stream 13 sample reach also are not dependent upon a perennial source of water for completion of their life cycles. The USEPA High Gradient Stream forms and the USACE High-gradient Stream Forms are provided in Appendix C and Appendix D, respectively. Representative photographs of the intermittent portion of Stream 13 are provided in Appendix B.

Stream 14 consists of an unnamed intermittent stream, which originates as an ephemeral stream in the eastern (Option 2) portion of the Project Area, as shown on Figure 4. Stream 14 generally flows northeast within the Project Area to Stream 8. Approximately 194 linear feet of Stream 14 were interpreted as being ephemeral, while approximately 174 linear feet of Stream 14 were interpreted as being intermittent. During the site visits, CEC sampled one reach within the ephemeral portion of Stream 14 and one reach within the intermittent portion of Stream 14.

The ephemeral portion of Stream 14 did not have flowing water or pools present during the site visit. The average OHWM width of this portion of Stream 14 was approximately 3 to 4 feet and the average bankfull width was approximately 5 to 6 feet. Substrates within the ephemeral portion of Stream 14 consisted primarily of cobble, boulders, and gravel, with clay and leaf pack/woody debris also present to a lesser extent. The USEPA High Gradient Stream score for

the Stream 14 ephemeral sample reach was 109 (see Appendix C). Representative photographs of the ephemeral portion of Stream 14 are provided in Appendix B and the photograph locations are shown on Figure 5.

The intermittent portion of Stream 14 was very steep overall and characterized by an average OHWM width of approximately 6 feet and an average bankfull width of approximately 8 to 10 feet. Slowly flowing water was observed within Stream 14, within an average depth of approximately 0.5 to 1.0 inches. The substrates of this portion of Stream 14 primarily consisted of bedrock, with some cobble, boulders, gravel, and bedrock waterfalls also present. The USEPA High Gradient Stream score for this representative reach of the intermittent portion of Stream 14 was 140. Adult and juvenile northern dusky salamanders were observed, but no frogs or fish were observed within this sample reach. Overall, benthic macroinvertebrates were common but diversity was relatively low within this sample reach. Benthic macroinvertebrate taxa observed within the sample reach included mayfly larvae, caddisfly larvae, and leeches. Benthic macroinvertebrate taxa observed within the Stream 14 sample reach also are not dependent upon a perennial source of water for completion of their life cycles. The USEPA High Gradient Stream forms and the USACE High-gradient Stream Forms are provided in Appendix C and Appendix D, respectively. Representative photographs of the intermittent portion of Stream 14 are provided in Appendix B.

Stream 15 consists of an unnamed ephemeral stream that originates in the eastern portion of the Option 2 limits of disturbance within the Project Area. Stream 15 flows generally west/southwest to Stream 8. Approximately 290 linear feet of Stream 15 were identified within the Project Area. During the site visit, Stream 12 was characterized by an average OHWM width of approximately 3 feet and an average bankfull width of approximately 5 feet. Stream 15 did not have any flowing water or pools present during the site visit. The substrates of Stream 15 consisted primarily of cobble, clay, and flat boulders, with leaf pack/woody debris and bedrock also present to a lesser degree. No fish or amphibians were observed within Stream 15 during the field survey. The USEPA High Gradient Stream score for this representative reach of Stream 15 was 112. Representative photographs of Stream 15 can be found in Appendix B, with



the photograph locations depicted on Figure 5. USEPA High Gradient Stream forms for Stream 15 are provided in Appendix C.

Stream 16 consists of an unnamed intermittent stream, which originates at the downstream portion of Wetland B and flows into a pond (Open Water 1), where it is impounded. Below Open Water 1, Stream 16 continues from an outlet pipe from the pond and flows southeast and off-site in the western (Option 1) portion of the Project Area, as shown on Figure 4. A total of approximately 191 linear feet of Stream 16 were identified within the Project Area. The upper portion of Stream 16 was characterized by an average OHWM width of approximately 3 feet and an average bankfull width of approximately 5 feet. Slowly flowing water was observed within the upper portion of Stream 16, within an average depth of approximately 0.5 inches. This surface water was observed to originate from a spring located just above Wetland B. The lower portion of Stream 16 was characterized by an average OHWM width of approximately 2 feet and an average bankfull width of approximately 4 feet. Slow flowing water was observed within the lower portion of Stream 16, with an average depth of approximately 0.25 to 1 inch deep. No deep pools were observed within Stream 16 during the time of the site visit on August 15, 2011. The substrates of Stream 16 primarily consisted of silt and clay, with some cobble, gravel, and a few flat boulders also being present. The USEPA High Gradient Stream score for this representative reach of Stream 16 was 91. No stream salamanders, frogs, or fish were observed within this sample reach. Overall, benthic macroinvertebrates were rare within this sample reach. The diversity was very low, with only caddisfly larvae observed within the sample reach, which are not dependent upon a perennial source of water. The USEPA High Gradient Stream forms and the USACE High-gradient Stream Forms for Stream 16 are provided in Appendix C and Appendix D, respectively. Representative photographs of Stream 16 are provided in Appendix B and the locations where the photographs were taken are shown on Figure 5.

In addition to the aforementioned streams and as stated above, one pond (Open Water 1) was identified within the Project Area (Figure 4). Open Water 1 was an impoundment of Stream 16 and is approximately 1 acre in size. An outlet pipe from this pond is present below the impoundment and outfalls into the lower portion of the Stream 16 channel. Therefore, Open Water 1 would likely be considered a jurisdictional water of the U.S.



3.0 REGULATORY CONSIDERATIONS

3.1 MEETINGS WITH REGULATORY AGENCIES

No meetings between regulatory agencies and CEC had taken place at the time this report was prepared. The wetland and stream delineation findings presented in this document were developed based upon CEC's professional training and experience and the results of the wetland and stream delineation completed on August 11 through August 15 and on September 27 and 28, 2011.

3.2 REGULATORY PERMITTING

Jurisdictional waters of the United States, including wetlands, are defined by *33 CFR Part 328* and are protected by Sections 404 and 401 of the Clean Water Act (CWA)(*33 USC 1344*). Within this portion of West Virginia, the Regulatory Branch of the Pittsburgh District of the USACE administers Section 404 of the CWA. The WVDEP administers Section 401 of the CWA (a.k.a. the Water Quality Certification Program [WQC]). Impacts to jurisdictional waters/wetlands/open waters associated with proposed development require permits issued by these agencies.

Based on the results of the delineation, CEC identified approximately 6,368 linear feet of ephemeral stream and approximately 8,624 linear feet of intermittent stream within the boundaries of the Project Area. CEC also identified approximately 0.02 acres of palustrine emergent wetland and approximately 1 acre of open water body within the Project Area. It is noted that this stream length, wetland acreage, and open water acreage may include portions of waterbodies that may not be affected by landfill construction and operation activities within the Project Area.

A formal jurisdictional determination (JD) will need to be conducted by the USACE and the WVDEP to verify CEC's delineation findings, prior to permit issuance. The JD will identify those waters, including wetlands, that are classified as waters of the United States. Activities in



waters of the United States will be regulated by the USACE and WVDEP under the CWA. At this time, it appears that the wetlands and streams identified herein within the Project Area would be considered waters of the United States.

Two types of Section 404 CWA permits have been implemented by the USACE – Nationwide Permits (NWP) and Individual Section 404 Permits, which are both utilized in conjunction with WVDEP 401 WQCs. The purpose of NWPs is to protect the aquatic environment and public interest while authorizing activities that have minimal individual and cumulative adverse effects on the aquatic environment. When impacts to waterbodies are greater than allowed by NWPs, an Individual Section 404 Permit and Individual 401 WQC are typically required. The Individual Permit and Individual 401 WQC application and approval process is significantly more involved relative to the NWP process, and requires interaction and review by a number of federal and state agencies, as well as opportunities for public comment. Based on conversations with AEP regarding proposed landfill construction and operation activities, it is anticipated that impacts to streams within the Project Area would require Individual Section 404 Permit and Individual Section 401 WQC permit applications. Individual permit applications would be required because stream impacts within the Project Area would exceed the thresholds authorized under applicable NWPs.

Individual Section 401/404 Permits require a sequencing review, which requires the permit applicant to demonstrate that the project purpose cannot be accomplished without impacting wetlands and other jurisdictional waters to the extent practicable. If this can be demonstrated, then the applicant is required to further demonstrate that the scope of the project has been revised to minimize impacts to jurisdictional waters. The sequencing process requires that an alternatives analysis be performed, and that the alternatives analysis must address other potential sites. Alternative site plans which attempt to avoid or minimize jurisdictional water impacts must be developed and evaluated. The regulatory agencies will only consider mitigation of jurisdictional water impacts after satisfactory completion of the sequencing requirements. A mitigation plan will be required for unavoidable impacts to jurisdictional streams and wetlands.



4.0 CONCLUSIONS

Approximately 6,368 linear feet of ephemeral stream and 8,624 linear feet of intermittent stream were identified within the Project Area. Two palustrine emergent wetland areas totaling approximately 0.02 acres were identified and delineated within the Project Area. The delineated wetland boundaries were flagged in the field and subsequently located by CEC scientists using a Trimble GeoXT GPS unit (sub-meter accuracy). Additionally, one pond/open waterbody totaling approximately 1 acre in size was identified within the Project Area. Wetland boundaries, stream locations, and the open waterbody location are shown on Figure 4.



5.0 LEVEL OF CARE

The jurisdictional waters delineation services performed by CEC were conducted in a manner consistent with the criteria contained in the USACE Manual and Eastern Mountain and Piedmont Supplement and with the level of care and skill ordinarily exercised by members of the environmental consulting profession practicing contemporaneously under similar conditions in the locality of the project. It must be recognized that the wetland and stream delineation was based on field observations and CEC's professional interpretation of the criteria in the USACE Manual and corresponding supplement at the time of our field visits. Jurisdictional water determinations may change subsequent to CEC's delineation based on changes in the regulatory criteria, seasonal variations in hydrology, alterations to drainage patterns and other human activities and/or land disturbances.



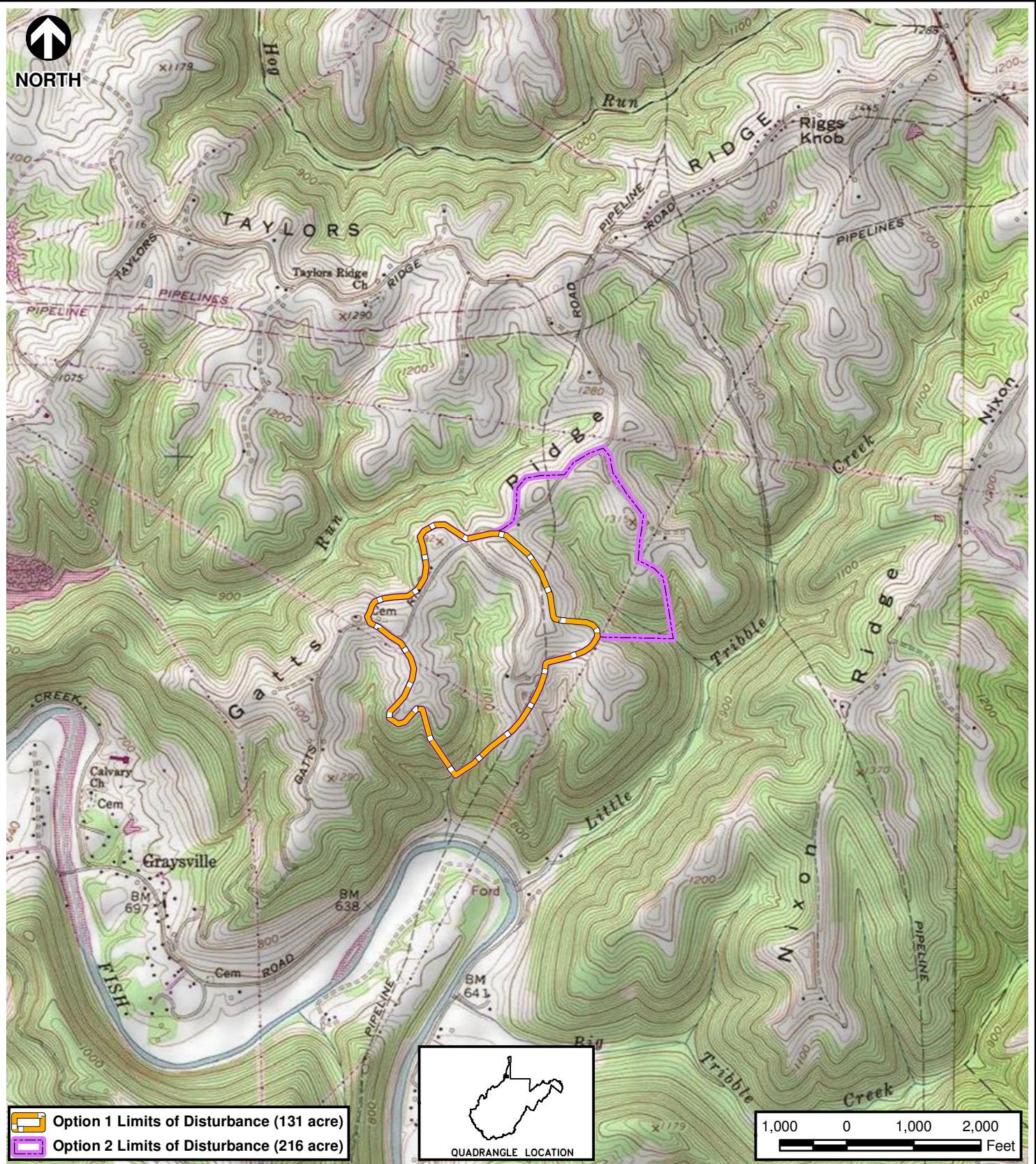
6.0 REFERENCES

- Cowardin, L. M., V. Carter, and F. C. Golet. 1979. Classification of Wetlands and Deep Water Habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service. Washington D. C. FWS/OBS-79/31.
- National Oceanic and Atmospheric Administration, National Climatic Data Center (NOAA). 2011. Record of Climatological Observations. Available at <http://www.ncdc.noaa.gov/oa/mpp/#MR>. Accessed August 23, 2011.
- Reed, P.B., Jr. 1988. National List of Plant Species that Occur in Wetlands: Northeast (Region 1). U.S. Fish and Wildlife Service Biological Report 88(26.1). Fort Collins, Colorado.
- The Weather Channel (TWC). 2011. Monthly Weather Forecast for Moundsville, WV. Available at <http://www.weather.com/weather/monthly/USWV0508?month=-1>. Accessed September 2, 2011.
- U.S. Army Corps of Engineers (USACE), Environmental Laboratory. 1987. Corps of Engineers Wetlands Delineation Manual, Technical Report Y-87-1, U.S. Army Engineer Waterway Experiment Station, Vicksburg, Mississippi.
- U.S. Army Corps of Engineers (USACE), Environmental Laboratory. 2008. Corps of Engineers Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region, U.S. Army Engineer Research and Development Center, Vicksburg, Mississippi.
- U.S. Department of Agriculture Natural Resources Conservation Service (USDA). 2010. Web Soil Survey. Available online at <http://websoilsurvey.nrcs.usda.gov/>. Accessed August 26, 2011.
- U.S. Department of Agriculture Natural Resources Conservation Service (USDA). 2009. Hydric Soils – Marshall County, West Virginia. Available online at <http://soildatamart.nrcs.usda.gov>. Accessed August 26, 2011.

FIGURES



NORTH



SOURCE: PORTION OF THE USGS 7.5-MINUTE SERIES TOPOGRAPHIC QUADRANGLE MAP - GLEN EASTON, WV - 1978 AND POWHATAN POINT, WV - 1978.



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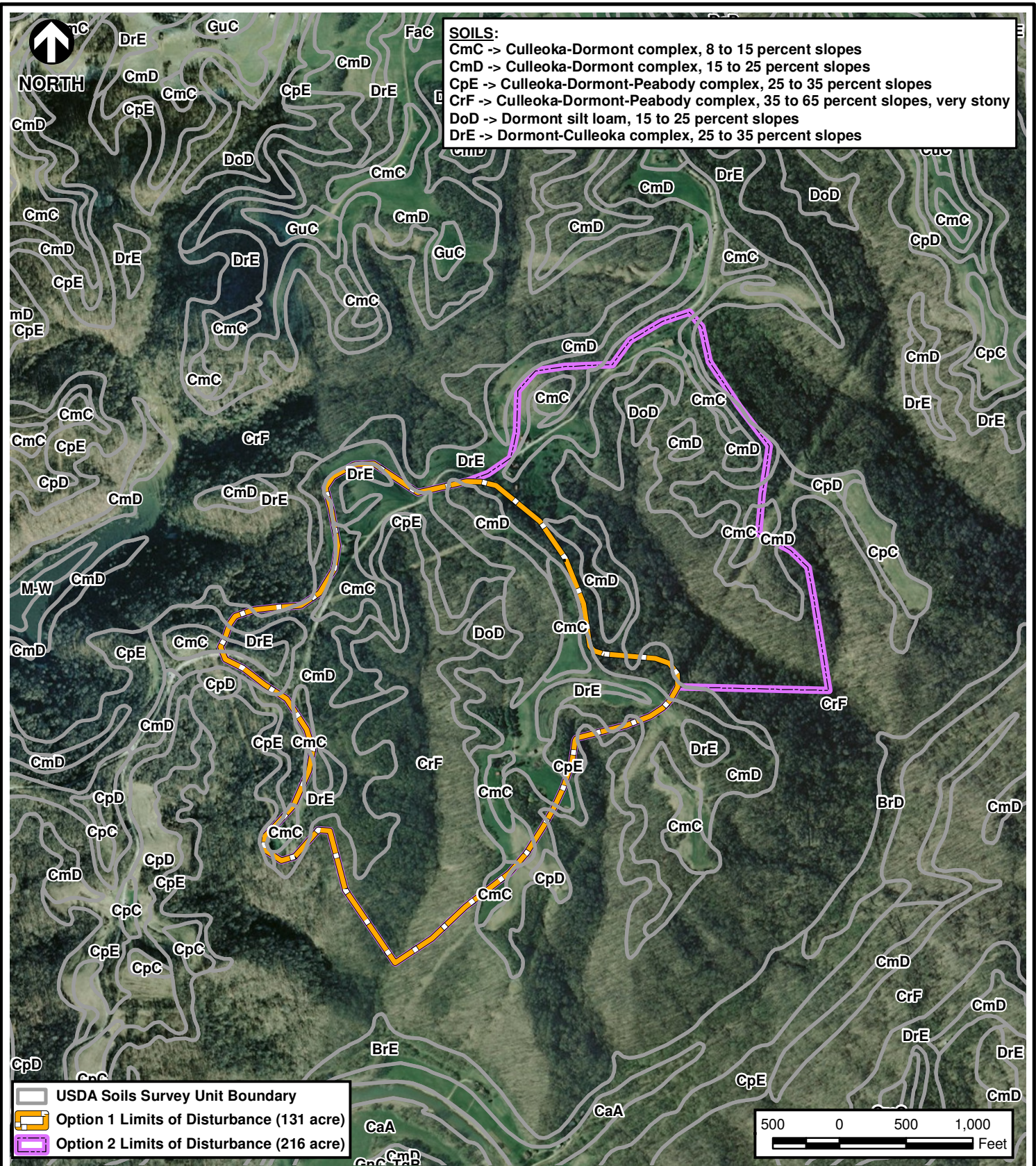
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CRESAP, MARSHALL CO., WEST VIRGINIA

SITE LOCATION MAP

DRAWN BY:	MJB	CHECKED BY:	DJG	APPROVED BY:	JEZ*	FIGURE NO:	1
DATE:	SEPTEMBER 2, 2011	DWG SCALE:	1" = 2,000'	PROJECT NO:	110-416.8000		

Signature on File *

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SOURCE: SOILS DATA OBTAINED FROM THE USDA NCRS WEBSITE (<http://soildatamart.ncrs.usda.gov/>), 2010.
PORTION OF THE ESRI ARCGIS ONLINE MAPPING SERVICE - "WORLD IMAGERY" - AERIALS EXPRESS - "NORTHERN WV 2010" COLOR AERIAL MOSAIC, 2010.



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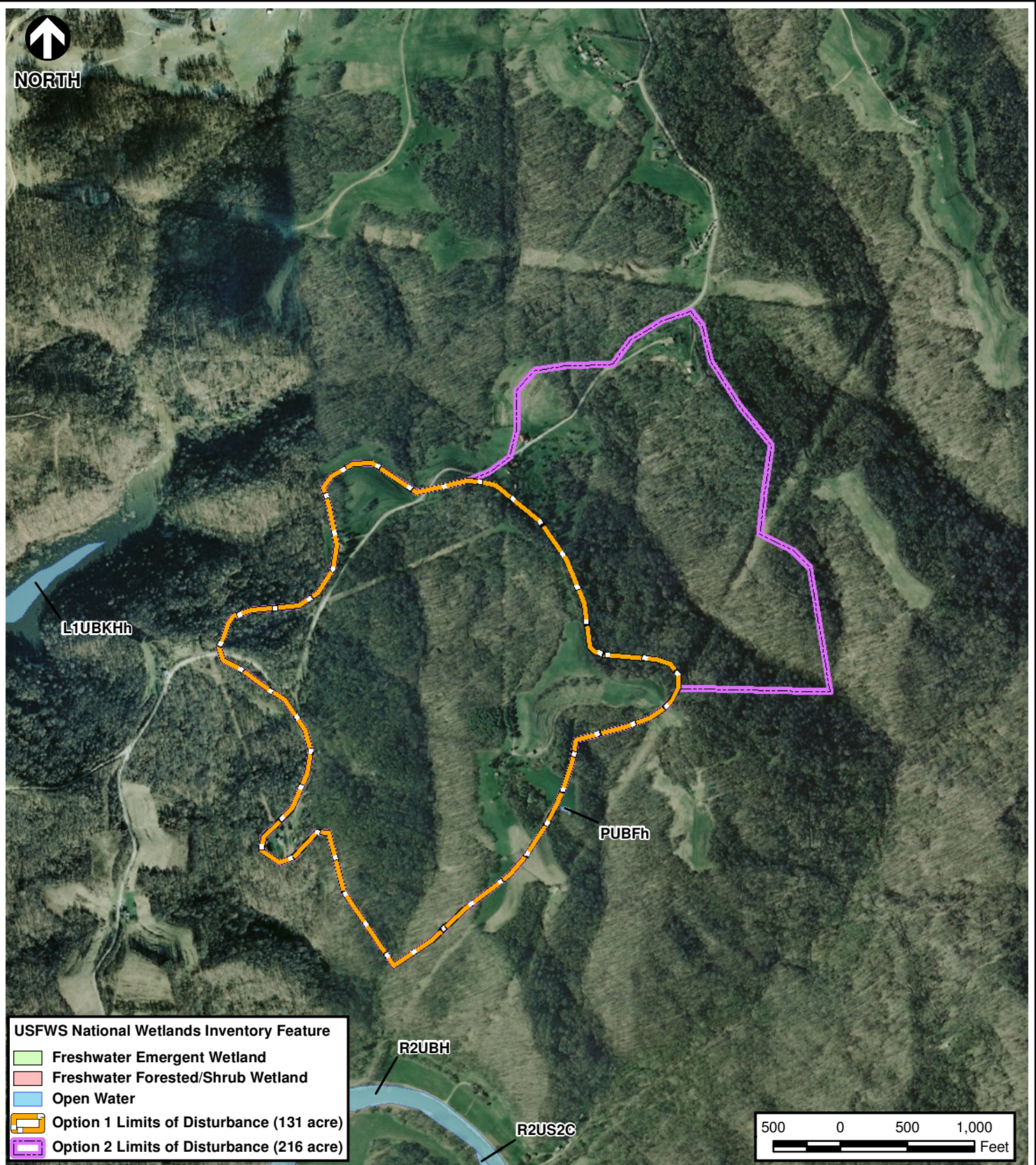
USDA SOIL SURVEY MAP

DRAWN BY:	MJB	CHECKED BY:	DJG	APPROVED BY:	JEZ*	FIGURE NO:	2
DATE:	SEPTEMBER 2, 2011	DWG SCALE:	1" = 1,000'	PROJECT NO:	110-416.8000		

Signature on File *



NORTH



- USFWS National Wetlands Inventory Feature**
- Freshwater Emergent Wetland
 - Freshwater Forested/Shrub Wetland
 - Open Water
 - Option 1 Limits of Disturbance (131 acre)
 - Option 2 Limits of Disturbance (216 acre)

SOURCE: WETLANDS DATA OBTAINED FROM THE USFWS WEBSITE (http://wetlandsfws.er.usgs.gov/imf/imf.jsp?site=extract_tool), 2011.
PORTION OF THE ESRI ARCGIS ONLINE MAPPING SERVICE - "WORLD_IMAGERY" - AERIALS EXPRESS - "NORTHERNWV2010" COLOR AERIAL MOSAIC, 2010.



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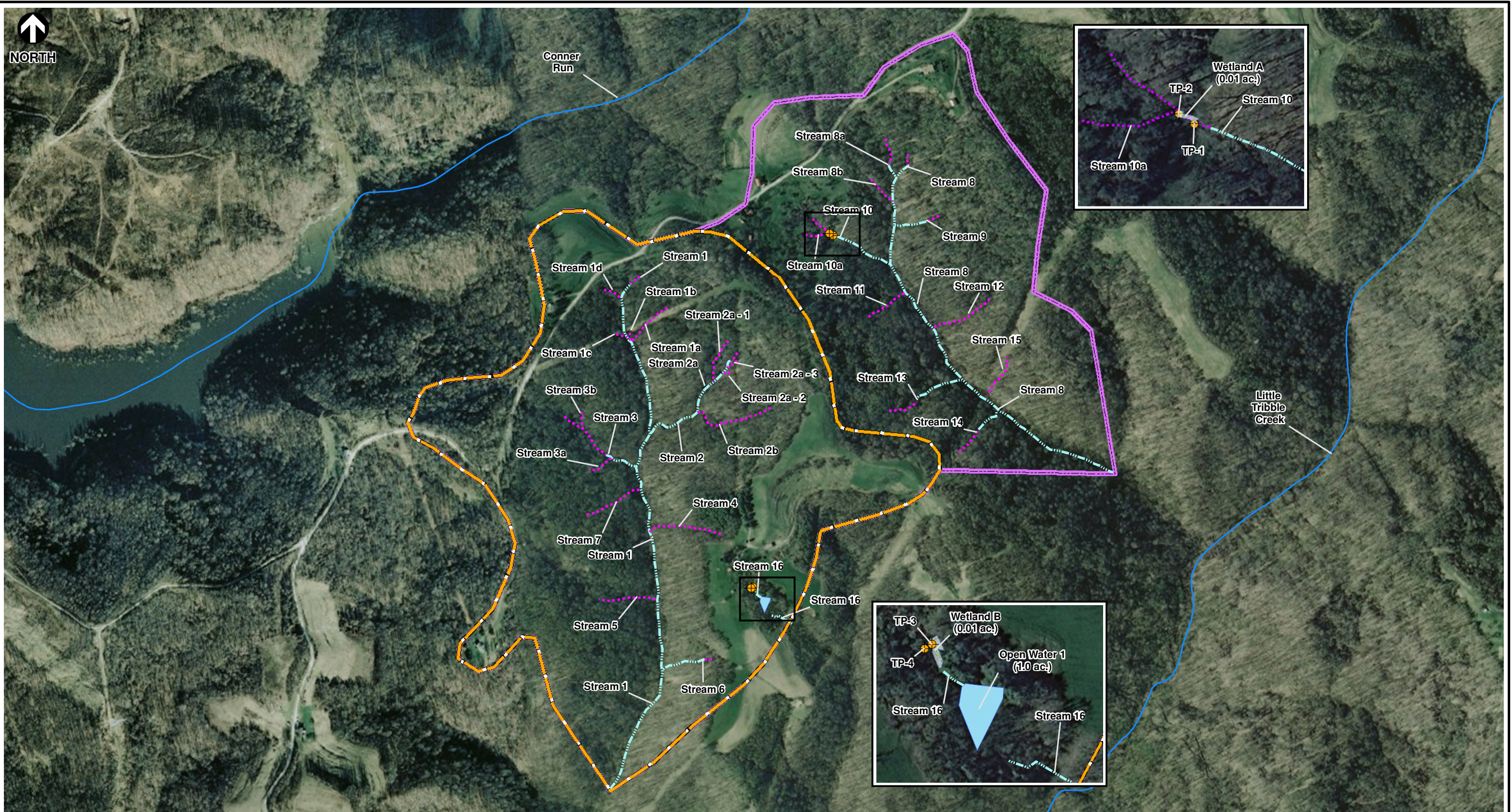
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NATIONAL WETLANDS INVENTORY MAP

DRAWN BY:	MJB	CHECKED BY:	DJG	APPROVED BY:	JEZ*	FIGURE NO:	3
DATE:	SEPTEMBER 2, 2011	DWG SCALE:	1" = 1,000'	PROJECT NO:	110-416.8000		

Signature on File *

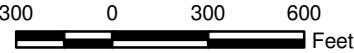
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SOURCE: PORTION OF THE ESRI ARCGIS ONLINE MAPPING SERVICE - "WORLD_IMAGERY" - AERIALS EXPRESS - "NORTHERNWX2010" COLOR AERIAL MOSAIC, 2010.

- Wetland Determination Test Pit
- Intermittent Stream
- Ephemeral Stream
- Open Water
- Wetland Feature
- Option 1 Limits of Disturbance (131 acre)
- Option 2 Limits of Disturbance (216 acre - Includes Footprint of Option 1)

NOTES:
- All stream locations are approximate and based off of topographic interpretation from the AutoCAD file titled - "ML_ConnerRun&Plant_11-10-10_8388SF.dwg", June 26, 2011, and GPS data collected during CEC's August 11-15, 2011, wetland and waterbody delineation site visits.

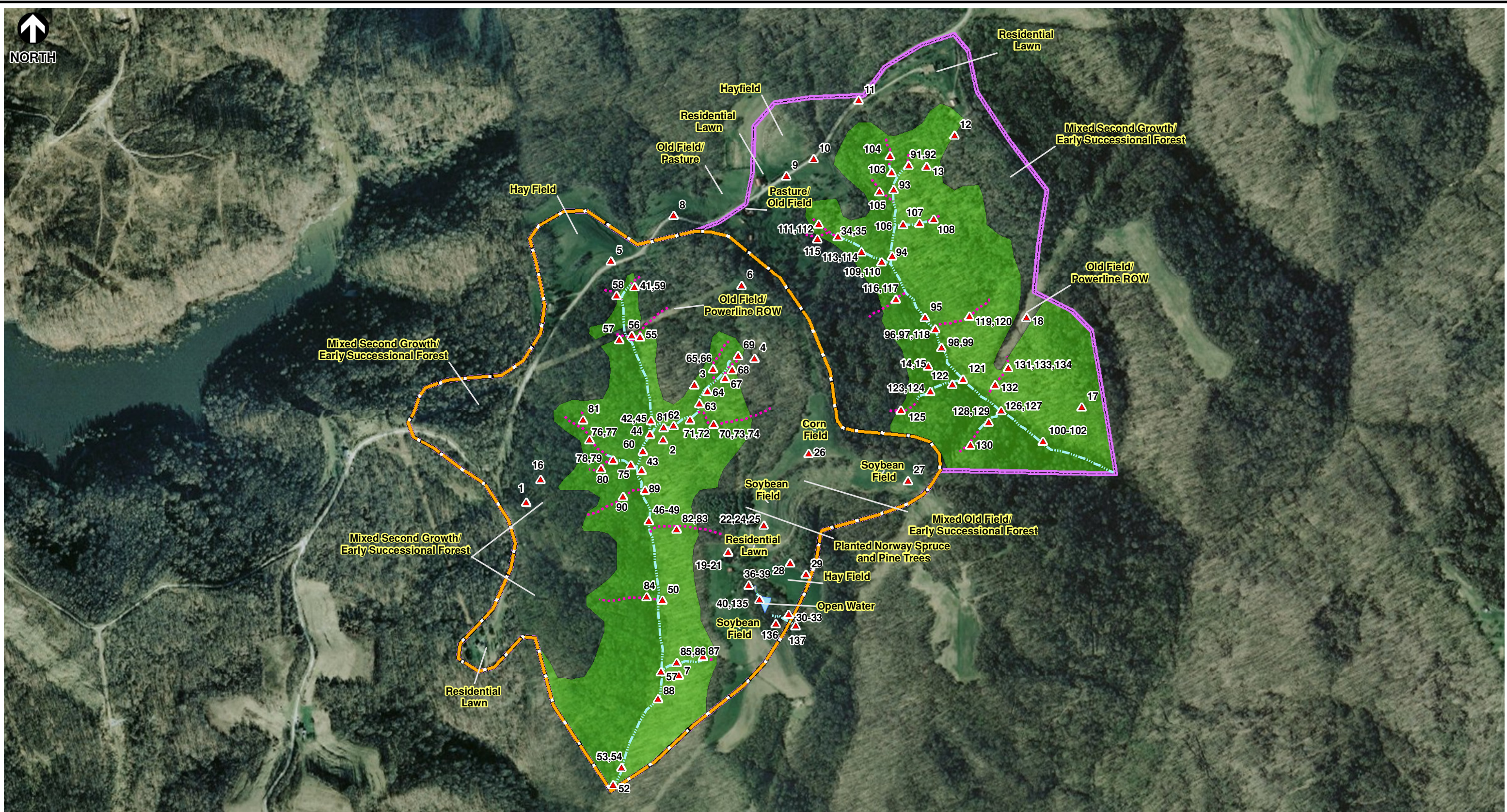


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JURISDICTIONAL WATERS DELINEATION MAP

DRAWN BY: MJB	CHECKED BY: DJG	APPROVED BY: JEZ*	FIGURE NO: 4
DATE: SEPTEMBER 2, 2011	DWG SCALE: 1" = 600'	PROJECT NO: 110-416.8000	Signature on File *

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SOURCE: PORTION OF THE ESRI ARCGIS ONLINE MAPPING SERVICE - "WORLD_IMAGERY" - AERIALS EXPRESS - "NORTHERN WV 2010" COLOR AERIAL MOSAIC, 2010.

- ▲ Approximate Photograph Location
- Intermittent Stream
- Ephemeral Stream
- Open Water
- Second Growth Forest
- Wetland Feature
- Option 1 Limits of Disturbance (131 acre)
- Option 2 Limits of Disturbance (216 acre - Includes Footprint of Option 1)

NOTES:
- All stream locations are approximate and based off of topographic interpretation from the AutoCAD file titled - "ML_ConnerRun&Plant_11-10-10_8388SF.dwg", June 26, 2011, and GPS data collected during CEC's August 11-15, 2011, wetland and waterbody delineation site visits.

300 0 300 600
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DATE: SEPTEMBER 2, 2011 DWG SCALE: 1" = 600'

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PHOTOGRAPH LOCATIONS MAP

APPROVED BY: JEZ* FIGURE NO:
PROJECT NO: 110-416.8000

5

Signature on File *



APPENDIX A

WETLAND DETERMINATION DATA FORMS

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: AEP Mitchell Landfill Project City/County: Cresap/Marshall Co. Sampling Date: 8-14-11
 Applicant/Owner: AEP State: WV Sampling Point: TP-1
 Investigator(s): D. Godtec, G. Gerke Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 3-5%
 Subregion (LRR or MLRA): LRRN Lat: 80.771528 Long: 39.830365 Datum: _____
 Soil Map Unit Name: Culleoka-Dormont-Peabody Complex, 35-65% slopes NWI classification: N/A
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No _____ (If no, explain in Remarks.)
 Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No _____
 Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____ No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland?	Yes _____ No <input checked="" type="checkbox"/>
Hydric Soil Present?	Yes _____ No <input checked="" type="checkbox"/>		
Wetland Hydrology Present?	Yes _____ No <input checked="" type="checkbox"/>		
Remarks:			

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ___ Surface Water (A1) ___ True Aquatic Plants (B14) ___ High Water Table (A2) ___ Hydrogen Sulfide Odor (C1) ___ Saturation (A3) ___ Oxidized Rhizospheres on Living Roots (C3) ___ Water Marks (B1) ___ Presence of Reduced Iron (C4) ___ Sediment Deposits (B2) ___ Recent Iron Reduction in Tilled Soils (C6) ___ Drift Deposits (B3) ___ Thin Muck Surface (C7) ___ Algal Mat or Crust (B4) ___ Other (Explain in Remarks) ___ Iron Deposits (B5) ___ Inundation Visible on Aerial Imagery (B7) ___ Water-Stained Leaves (B9) ___ Aquatic Fauna (B13)		<u>Secondary Indicators (minimum of two required)</u> ___ Surface Soil Cracks (B6) ___ Sparsely Vegetated Concave Surface (B8) ___ Drainage Patterns (B10) ___ Moss Trim Lines (B16) ___ Dry-Season Water Table (C2) ___ Crayfish Burrows (C8) ___ Saturation Visible on Aerial Imagery (C9) ___ Stunted or Stressed Plants (D1) ___ Geomorphic Position (D2) ___ Shallow Aquitard (D3) ___ Microtopographic Relief (D4) ___ FAC-Neutral Test (D5)	
Field Observations: Surface Water Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ (includes capillary fringe)		Wetland Hydrology Present? Yes _____ No <input checked="" type="checkbox"/>	
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:			
Remarks:			

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: TP-1

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____

= Total Cover

Sapling/Shrub Stratum (Plot size: _____)

1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
10. _____	_____	_____	_____

= Total Cover

Herb Stratum (Plot size: _____)

1. <i>Verbesina alternifolia</i>	70%	Yes	FAC
2. <i>Dactylis glomerata</i>	20%	Yes	FACU
3. <i>Impatiens capensis</i>	5%	No	FACW
4. <i>Solidago altissima</i>	5%	No	FACU
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
10. _____	_____	_____	_____
11. _____	_____	_____	_____
12. _____	_____	_____	_____

100% = Total Cover

Woody Vine Stratum (Plot size: _____)

1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____

= Total Cover

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species <u>5</u>	x 2 = <u>10</u>
FAC species <u>70</u>	x 3 = <u>210</u>
FACU species <u>25</u>	x 4 = <u>100</u>
UPL species _____	x 5 = _____
Column Totals: <u>100</u> (A)	<u>320</u> (B)
Prevalence Index = B/A = <u>3.2</u>	

Hydrophytic Vegetation Indicators:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0¹
- ___ 4 - Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic
Vegetation
Present?

Yes _____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

<u>50/20 Rule</u>	<u>% Cover</u>	<u>Dominant?</u>
<i>Verbesina alternifolia</i>	70	Yes
<i>Dactylis glomerata</i>	20	Yes
<i>Impatiens capensis</i>	5	No
<i>Solidago altissima</i>	5	No

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: AEP Mitchell Landfill Project City/County: Cresap/Marshall Co. Sampling Date: 8/14/11
 Applicant/Owner: AEP State: WV Sampling Point: TP-2
 Investigator(s): D. Godek, G. Gerke Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Swale Local relief (concave, convex, none): slightly concave Slope (%): 0-2%
 Subregion (LRR or MLRA): LRR N Lat: 80.771616 Long: 39.830406 Datum: _____
 Soil Map Unit Name: Culleoka-Dormont-Pearbody Complex, 35-65% slopes NWI classification: N/A
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)
 Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No _____
 Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes <u>X</u> No _____	Is the Sampled Area within a Wetland? Yes <u>X</u> No _____
Hydric Soil Present?	Yes <u>X</u> No _____	
Wetland Hydrology Present?	Yes <u>X</u> No _____	
Remarks:		

HYDROLOGY

Wetland Hydrology Indicators:		Secondary Indicators (minimum of two required)
Primary Indicators (minimum of one is required; check all that apply)		
<input type="checkbox"/> Surface Water (A1)	<input type="checkbox"/> True Aquatic Plants (B14)	<input type="checkbox"/> Surface Soil Cracks (B6)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)	<input type="checkbox"/> Sparsely Vegetated Concave Surface (B8)
<input type="checkbox"/> Saturation (A3)	<input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3)	<input checked="" type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Presence of Reduced Iron (C4)	<input type="checkbox"/> Moss Trim Lines (B16)
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)	<input type="checkbox"/> Dry-Season Water Table (C2)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Thin Muck Surface (C7)	<input type="checkbox"/> Crayfish Burrows (C8)
<input type="checkbox"/> Algal Mat or Crust (B4)	<input type="checkbox"/> Other (Explain in Remarks)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
<input type="checkbox"/> Iron Deposits (B5)		<input checked="" type="checkbox"/> Stunted or Stressed Plants (D1)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)		<input checked="" type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Water-Stained Leaves (B9)		<input type="checkbox"/> Shallow Aquitard (D3)
<input type="checkbox"/> Aquatic Fauna (B13)		<input checked="" type="checkbox"/> Microtopographic Relief (D4)
		<input checked="" type="checkbox"/> FAC-Neutral Test (D5)
Field Observations:		
Surface Water Present? Yes _____ No <u>X</u>	Depth (inches): _____	Wetland Hydrology Present? Yes <u>X</u> No _____
Water Table Present? Yes _____ No <u>X</u>	Depth (inches): _____	
Saturation Present? (includes capillary fringe) Yes _____ No <u>X</u>	Depth (inches): _____	
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:		
Remarks:		

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: TP-2

Tree Stratum (Plot size: _____)		Absolute % Cover	Dominant Species?	Indicator Status
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
		_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: _____)				
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
		_____ = Total Cover		
Herb Stratum (Plot size: _____)				
1.	<i>Glyceria striata</i>	35%	Yes	OBL
2.	<i>Carex frankii</i>	15%	No	OBL
3.	<i>Asclepias incarnata</i>	5%	No	OBL
4.	<i>Pilea pumila</i>	15%	No	FACW
5.	<i>Leersia oryzoides</i>	20%	Yes	OBL
6.	<i>Polygonum punctatum</i>	10%	No	OBL
7.				
8.				
9.				
10.				
11.				
12.				
		100% = Total Cover		
Woody Vine Stratum (Plot size: _____)				
1.				
2.				
3.				
4.				
5.				
6.				
		_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____	(A) _____ (B) _____
Prevalence Index = B/A = _____	

Hydrophytic Vegetation Indicators:

☒ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0¹

___ 4 - Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ☒ No _____

Remarks: (Include photo numbers here or on a separate sheet.)

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: AEP Mitchell Landfill Project City/County: Cresap/Marshall Co. Sampling Date: 8-15-11
 Applicant/Owner: AEP State: WV Sampling Point: TP-3
 Investigator(s): D. Godec Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): swale Local relief (concave, convex, none): slightly concave Slope (%): 1-3%
 Subregion (LRR or MLRA): LRR N Lat: 80.773249 Long: 39.824129 Datum: _____
 Soil Map Unit Name: Culleoka-Dorment-Peabody Complex, 25 to 35 % slopes NWI classification: N/A
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)
 Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No _____
 Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes <u>X</u> No _____	Is the Sampled Area within a Wetland?	Yes <u>X</u> No _____
Hydric Soil Present?	Yes <u>X</u> No _____		
Wetland Hydrology Present?	Yes <u>X</u> No _____		
Remarks:			

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> <input checked="" type="checkbox"/> Surface Water (A1) _____ True Aquatic Plants (B14) <input checked="" type="checkbox"/> High Water Table (A2) _____ Hydrogen Sulfide Odor (C1) <input checked="" type="checkbox"/> Saturation (A3) _____ Oxidized Rhizospheres on Living Roots (C3) _____ Water Marks (B1) _____ Presence of Reduced Iron (C4) _____ Sediment Deposits (B2) _____ Recent Iron Reduction in Tilled Soils (C6) _____ Drift Deposits (B3) _____ Thin Muck Surface (C7) _____ Algal Mat or Crust (B4) _____ Other (Explain in Remarks) _____ Iron Deposits (B5) _____ _____ Inundation Visible on Aerial Imagery (B7) _____ _____ Water-Stained Leaves (B9) _____ _____ Aquatic Fauna (B13) _____		<u>Secondary Indicators (minimum of two required)</u> _____ Surface Soil Cracks (B6) _____ Sparsely Vegetated Concave Surface (B8) <input checked="" type="checkbox"/> Drainage Patterns (B10) _____ Moss Trim Lines (B16) _____ Dry-Season Water Table (C2) _____ Crayfish Burrows (C8) _____ Saturation Visible on Aerial Imagery (C9) _____ Stunted or Stressed Plants (D1) <input checked="" type="checkbox"/> Geomorphic Position (D2) _____ Shallow Aquitard (D3) _____ Microtopographic Relief (D4) <input checked="" type="checkbox"/> FAC-Neutral Test (D5)	
Field Observations: Surface Water Present? Yes <u>X</u> No _____ Depth (inches): <u>1-2</u> Water Table Present? Yes _____ No <u>X</u> Depth (inches): _____ Saturation Present? Yes <u>X</u> No _____ Depth (inches): <u>0</u> (includes capillary fringe)		Wetland Hydrology Present? Yes <u>X</u> No _____	
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:			
Remarks:			

Sampling Point: TP-3

VEGETATION (Four Strata) – Use scientific names of plants.

Tree Stratum (Plot size: <u>20' x 15'</u>)	Absolute % Cover	Dominant Species?	Indicator Status
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____

Sapling/Shrub Stratum (Plot size: 20' x 15') _____ = Total Cover

1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
10. _____	_____	_____	_____

Herb Stratum (Plot size: 20' x 15') _____ = Total Cover

1. <u>Pilea pumila</u>	<u>40%</u>	<u>FACW</u>
2. <u>Impatiens capensis</u>	<u>10%</u>	<u>FACW</u>
3. <u>Rumex verticillatus</u>	<u>5%</u>	<u>OBL</u>
4. <u>Polygonum pennsylvanicum</u>	<u>10%</u>	<u>FACW</u>
5. <u>Typha latifolia</u>	<u>5%</u>	<u>OBL</u>
6. <u>Equisetum arvense</u>	<u>5%</u>	<u>FAC</u>
7. <u>Symphoricarpos puniceus</u>	<u>25%</u>	<u>OBL</u>
8. _____	_____	_____
9. _____	_____	_____
10. _____	_____	_____
11. _____	_____	_____
12. _____	_____	_____

Woody Vine Stratum (Plot size: 20' x 15') 100% = Total Cover

1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____

Remarks: (Include photo numbers here or on a separate sheet.)

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by: _____

OBL species _____ x 1 = _____

FACW species _____ x 2 = _____

FAC species _____ x 3 = _____

FACU species _____ x 4 = _____

UPL species _____ x 5 = _____

Column Totals: _____ (A) _____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☒ 1 - Rapid Test for Hydrophytic Vegetation
- ☒ 2 - Dominance Test is >50%
- ☐ 3 - Prevalence Index is $\leq 3.0^1$
- ☐ 4 - Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
- ☐ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic
Vegetation
Present?

Yes ☒ No _____

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont

Project/Site: AEP Mitchell Landfill Project City/County: Cresap/Marshall Co. Sampling Date: 8/15/11
 Applicant/Owner: AEP State: WV Sampling Point: TP-4
 Investigator(s): D. Godec Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none Slope (%): 5%
 Subregion (LRR or MLRA): LRR N Lat: 80.773292 Long: 39.824109 Datum: _____
 Soil Map Unit Name: Culleoka-Dormant-Preabody Complex, 25-35% slopes NWI classification: N/A
 Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)
 Are Vegetation N, Soil N, or Hydrology N significantly disturbed? Are "Normal Circumstances" present? Yes X No _____
 Are Vegetation N, Soil N, or Hydrology N naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes _____ No <u>X</u>	Is the Sampled Area within a Wetland? Yes _____ No <u>X</u>
Hydric Soil Present? Yes _____ No <u>X</u>	
Wetland Hydrology Present? Yes _____ No <u>X</u>	
Remarks:	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ___ Surface Water (A1) ___ True Aquatic Plants (B14) ___ High Water Table (A2) ___ Hydrogen Sulfide Odor (C1) ___ Saturation (A3) ___ Oxidized Rhizospheres on Living Roots (C3) ___ Water Marks (B1) ___ Presence of Reduced Iron (C4) ___ Sediment Deposits (B2) ___ Recent Iron Reduction in Tilled Soils (C6) ___ Drift Deposits (B3) ___ Thin Muck Surface (C7) ___ Algal Mat or Crust (B4) ___ Other (Explain in Remarks) ___ Iron Deposits (B5) ___ Inundation Visible on Aerial Imagery (B7) ___ Water-Stained Leaves (B9) ___ Aquatic Fauna (B13)		<u>Secondary Indicators (minimum of two required)</u> ___ Surface Soil Cracks (B6) ___ Sparsely Vegetated Concave Surface (B8) ___ Drainage Patterns (B10) ___ Moss Trim Lines (B16) ___ Dry-Season Water Table (C2) ___ Crayfish Burrows (C8) ___ Saturation Visible on Aerial Imagery (C9) ___ Stunted or Stressed Plants (D1) ___ Geomorphic Position (D2) ___ Shallow Aquitard (D3) ___ Microtopographic Relief (D4) ___ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No <u>X</u> Depth (inches): _____ Water Table Present? Yes _____ No <u>X</u> Depth (inches): _____ Saturation Present? Yes _____ No <u>X</u> Depth (inches): _____ (includes capillary fringe)		Wetland Hydrology Present? Yes _____ No <u>X</u>
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:		
Remarks:		

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: TP-4

Tree Stratum (Plot size: <u>10'x20'</u>)		Absolute % Cover	Dominant Species?	Indicator Status
1.	<u>Acer negundo</u>	<u>25%</u>	<u>Yes</u>	<u>FAC</u>
2.				
3.				
4.				
5.				
6.				
7.				
8.				

Sapling/Shrub Stratum (Plot size: <u>10'x20'</u>)		Absolute % Cover	Dominant Species?	Indicator Status
1.	<u>Rosa multiflora</u>	<u>20%</u>	<u>Yes</u>	<u>FACU</u>
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				

Herb Stratum (Plot size: <u>10'x20'</u>)		Absolute % Cover	Dominant Species?	Indicator Status
1.	<u>Verbesina alternifolia</u>	<u>30%</u>	<u>Yes</u>	<u>FAC</u>
2.	<u>Equisetum arvense</u>	<u>5%</u>	<u>No</u>	<u>FAC</u>
3.	<u>Parthenocissus quinquefolia</u>	<u>5%</u>	<u>No</u>	<u>FACU</u>
4.	<u>Polystichum acrostichoides</u>	<u>10%</u>	<u>Yes</u>	<u>FACU</u>
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				

Woody Vine Stratum (Plot size: <u>10'x20'</u>)		Absolute % Cover	Dominant Species?	Indicator Status
1.				
2.				
3.				
4.				
5.				
6.				

25% = Total Cover

20% = Total Cover

20% = Total Cover

50% = Total Cover

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species <u>60</u>	x 3 = <u>180</u>
FACU species <u>35</u>	x 4 = <u>140</u>
UPL species _____	x 5 = _____
Column Totals: <u>95</u> (A)	<u>320</u> (B)
Prevalence Index = B/A = <u>3.37</u>	

Hydrophytic Vegetation Indicators:

___ 1 - Rapid Test for Hydrophytic Vegetation

___ 2 - Dominance Test is >50%

___ 3 - Prevalence Index is ≤3.0¹

___ 4 - Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes _____ No X

Remarks: (Include photo numbers here or on a separate sheet.)

Herb Stratum
50/20 Rule
50% of 50% = 25%
20% of 50% = 10%

Sampling Point:

[illegible]



APPENDIX B

SITE PHOTOGRAPHS



Photograph 1. View of mixed early successional/second growth forest in the northwest portion of the Project Area. Photo taken facing northeast.



Photograph 2. View of second growth forest on hillside adjacent to Stream 1. Photo taken facing southeast from the confluence of Stream 1 and Stream 2.

American Electric Power Co., Inc.
Proposed Mitchell Landfill Project
Cresap, Marshall County, West Virginia
CEC Project No. 110-416
Photographs taken on 8-11-2011 through 8-15-2011



Photograph 3. View of second growth forest adjacent to Stream 2A.
Photo taken facing northwest.



Photograph 4. View of second growth forest adjacent to Stream 2A-3.
Photo taken facing southeast.

American Electric Power Co., Inc.
Proposed Mitchell Landfill Project
Cresap, Marshall County, West Virginia
CEC Project No. 110-416
Photographs taken on 8-11-2011 through 8-15-2011



Photograph 5. View of hay field north of Gatts Ridge Road.
Photo taken facing northwest.



Photograph 6. View of old field habitat within powerline right-of-way in Option 1 Limits of Disturbance. Photo taken facing south.

American Electric Power Co., Inc.
Proposed Mitchell Landfill Project
Cresap, Marshall County, West Virginia
CEC Project No. 110-416
Photographs taken on 8-11-2011 through 8-15-2011



Photograph 7. View of second growth forest adjacent to Stream 6.
Photo taken facing southwest.



Photograph 8. View of old field/pasture in northern portion of
Option 2 Limits of Disturbance. Photo taken facing northeast.

American Electric Power Co., Inc.
Proposed Mitchell Landfill Project
Cresap, Marshall County, West Virginia
CEC Project No. 110-416
Photographs taken on 8-11-2011 through 8-15-2011



Photograph 9. View of lawn and hayfield in northern portion of Option 2 Limits of Disturbance. Photo taken facing north.



Photograph 10. View of pasture/old field habitat south of Gatts Ridge Road in Option 2 Limits of Disturbance. Photo taken facing southeast.

American Electric Power Co., Inc.
 Proposed Mitchell Landfill Project
 Cresap, Marshall County, West Virginia
 CEC Project No. 110-416
 Photographs taken on 8-11-2011 through 8-15-2011



Photograph 11. View of residential lawn and driveway in northeast portion of Option 2 Limits of Disturbance. Photo taken facing northeast.



Photograph 12. View of mixed early successional/second growth forest in northeast portion of Option 2 Limits of Disturbance. Photo taken facing south.

American Electric Power Co., Inc.
 Proposed Mitchell Landfill Project
 Cresap, Marshall County, West Virginia
 CEC Project No. 110-416
 Photographs taken on 8-11-2011 through 8-15-2011



Photograph 13. View of second growth forest at the headwaters of Stream 8.
Photo taken facing west.



Photograph 14. View of second growth forest near confluence of Stream 8 and
Stream 13. Photo taken facing east.

American Electric Power Co., Inc.
Proposed Mitchell Landfill Project
Cresap, Marshall County, West Virginia
CEC Project No. 110-416
Photographs taken on 8-11-2011 through 8-15-2011



Photograph 15. View of second growth forest near the junction of Stream 8 and Stream 13. Photo taken facing south.



Photograph 16. View of mixed early successional/second growth forest adjacent to Gatts Ridge Road. Photo taken facing southeast.

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Photograph 17. View of second growth forest at southern end of Option 2 Limits of Disturbance. Photo taken facing west.



Photograph 18. View of old field habitat within powerline right-of-way. Photo taken facing southwest.

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Photograph 19. View of residential lawn habitat on Gatts Farmstead within Option 1 Limits of Disturbance. Photo taken facing south.



Photograph 20. View of mowed lawn habitat on Gatts Farmstead within Option 1 Limits of Disturbance. Photo taken facing southwest.

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Photograph 21. View of residential lawn and planted coniferous trees along access road to Gatts Farmstead. Photo taken facing north.



Photograph 22. View of soybean field on Gatts Farmstead. Photo taken facing southwest.

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Photograph 23. View of soybean field on Gatts Farmstead.
Photo taken facing southeast.



Photograph 24. View of soybean field and mixed old field/early successional forest habitat. Photo taken facing northeast.

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Photograph 25. View of soybean field and mixed old field/early successional forest.
Photo taken facing north.



Photograph 26. View of corn, soybean, and hayfields on Gatts Farmstead.
Photo taken facing northeast.

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Photograph 27. View of soybean field and powerline right-of-way on Gatts Farmstead. Photo taken facing east.



Photograph 28. View of hayfield southeast of Gatts Farmhouse. Photo taken facing south.

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Photograph 29. View of old field habitat in natural gas pipeline right-of-way near Gatts Farmstead. Photo taken facing north.



Photograph 30. View of mapped National Wetlands Inventory wetland located just outside of the Project Area boundary on Gatts Farmstead. Photo taken facing west.

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Photograph 31. View of mapped National Wetlands Inventory wetland located just outside of the Project Area boundary on Gatts Farmstead. Photo taken facing south.



Photograph 32. View of mapped National Wetlands Inventory wetland located just outside of the Project Area boundary on Gatts Farmstead. Photo taken facing southeast.

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Photograph 33. View of mapped National Wetlands Inventory wetland located just outside of the Project Area boundary on Gatts Farmstead. Photo taken facing southwest.



Photograph 34. Representative view of Wetland A. Photo taken facing west.

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Photograph 35. View of upland test pit at Wetland A. Photo taken facing south.



Photograph 36. View of bathtub located at spring on the north side of Wetland B.
Photo taken facing north.

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Photograph 37. Representative view of Wetland B. Photo taken facing south.



Photograph 38. View of Wetland Determination Test Pit 3 within Wetland B.

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Photograph 39. View of Wetland B. Photo taken facing north.



Photograph 40. View of Open Water 1. Photo taken facing south.

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Photograph 41. View of upper/ephemeral portion of Stream 1. Photo taken facing upstream.



Photograph 42. View of Stream 1 within the upper sample reach in Option 1 Limits of Disturbance. Photo taken facing upstream.

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Photograph 43. View of Stream 1 downstream from the confluence with Stream 3.
Photo taken facing downstream.



Photograph 44. View of Stream 1 above the confluence with Stream 2.
Photo taken facing upstream.

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Photograph 45. View of Stream 1 upstream of the confluence with Stream 2.
Photo taken facing upstream.



Photograph 46. View of large bedrock pool along Stream 1 upstream with Stream 4 confluence
and within middle sample reach. Photo taken facing upstream.

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Photograph 47. View of Stream 1 upstream of the confluence with Stream 4 and within middle sample reach. Photo taken facing south.



Photograph 48. View of Stream 1 upstream of confluence with Stream 4 and within middle sample reach. Photo taken facing upstream.

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Photograph 49. View of Stream 1 upstream of confluence with Stream 4 and within middle sample reach. Photo taken facing downstream.



Photograph 50. View of Stream 1 at confluence with Stream 5. Photo taken facing downstream.

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Photograph 51. View of Stream 1 at confluence with Stream 6.
Photo taken facing upstream.



Photograph 52. View of Stream 1 directly upstream of the southern edge of
Option 1 Limits of Disturbance boundary. Photo taken facing downstream.

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Photograph 53. View of Stream 1 within lower sample reach.
Photo taken facing upstream.



Photograph 54. View of Stream 1 within lower sample reach.
Photo taken facing downstream.

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Photograph 55. View of Stream 1A. Photo taken facing upstream.



Photograph 56. View of Stream 1B. Photo taken facing upstream.

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Photograph 57. View of Stream 1C. Photo taken facing upstream.



Photograph 58. View of Stream 1D. Photo taken facing upstream.

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Photograph 59. View of ephemeral portion of Stream 1.
Photo taken facing upstream.



Photograph 60. View of Stream 1 upstream of confluence with Stream 3.
Photo taken facing upstream.

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Photograph 61. View of Stream 2 above confluence with Stream 1.
Photo taken facing upstream.



Photograph 62. View of Stream 2 above confluence with Stream 1.
Photo taken facing downstream.

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Photograph 63. View of the downstream portion of Stream 2A.
Photo taken facing upstream.



Photograph 64. View of Stream 2A within sample reach. Photo taken facing upstream.

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Photograph 65. View of Stream 2A-1. Photo taken facing upstream.



Photograph 66. View of Stream 2A-1. Photo taken facing downstream.

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Photograph 67. View of Stream 2A-2. Photo taken facing upstream.



Photograph 68. View of Stream 2A-3. Photo taken facing downstream.

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Photograph 69. View of ephemeral portion of Stream 2A. Photo taken facing upstream.



Photograph 70. View of Stream 2B. Photo taken facing downstream.

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Photograph 71. View of Stream 2 below the confluence of Stream 2A and Stream 2B and within sample reach. Photo taken facing downstream.



Photograph 72. View of Stream 2 below the confluence of Stream 2A and Stream 2B and within sample reach. Photo taken facing upstream.

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Photograph 73. View of Stream 2B upstream of confluence with Stream 2A.
Photo taken facing downstream.



Photograph 74. View of Stream 2B upstream of confluence with Stream 2A.
Photo taken facing upstream.

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Photograph 75. View of Stream 3 above the confluence with Stream 1.
Photo taken facing upstream.



Photograph 76. View of ephemeral portion of Stream 3.
Photo taken facing upstream.

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Photograph 77. View of ephemeral portion of Stream 3.
Photo taken facing downstream.



Photograph 78. View of intermittent portion of Stream 3 near confluence with
Stream 3A and within sample reach. Photo taken facing downstream.

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Photograph 79. View of intermittent portion of Stream 3 near confluence with Stream 3A and within sample reach. Photo taken facing upstream.



Photograph 80. View of Stream 3A. Photo taken facing upstream.

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Photograph 81. View of Stream 3B. Photo taken facing upstream.



Photograph 82. View of Stream 4. Photo taken facing upstream.

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Photograph 83. View of Stream 4. Photo taken facing upstream.



Photograph 84. View of lower portion of Stream 5. Photo taken facing upstream.

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Photograph 85. View of intermittent portion of Stream 6 within sample reach.
Photo taken facing upstream.



Photograph 86. View of intermittent portion of Stream 6 within sample reach.
Photo taken facing downstream.

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Photograph 87. View of ephemeral portion of Stream 6.
Photo taken facing upstream.



Photograph 88. View of portion of Stream 1 with large boulders downstream of the
confluence with Stream 6. Photo taken facing upstream.

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Photograph 89. View of lower portion of Stream 7. Photo taken facing upstream from confluence with Stream 1.



Photograph 90. View of Stream 7. Photo taken facing upstream.

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Photograph 91. View of ephemeral portion of Stream 8.
Photo taken facing upstream.



Photograph 92. View of beginning of intermittent portion of Stream 8.
Photo taken facing downstream.

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Photograph 93. View of Stream 8, downstream of Stream 8A.
Photo taken facing upstream.



Photograph 94. View of Stream 8 upstream of confluence with Stream 10 and within upper sample reach. Photo taken facing upstream.

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Photograph 95. View of bedrock waterfall and pool along Stream 8 upstream of confluence with Stream 12. Photo taken facing upstream.



Photograph 96. View of Stream 8. Photo taken facing upstream from confluence with Stream 12.

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Photograph 97 View of Stream 8. Photo taken facing downstream from confluence with Stream 12.



Photograph 98. View of bedrock waterfall and pool area along Stream 8. Photo taken facing upstream.

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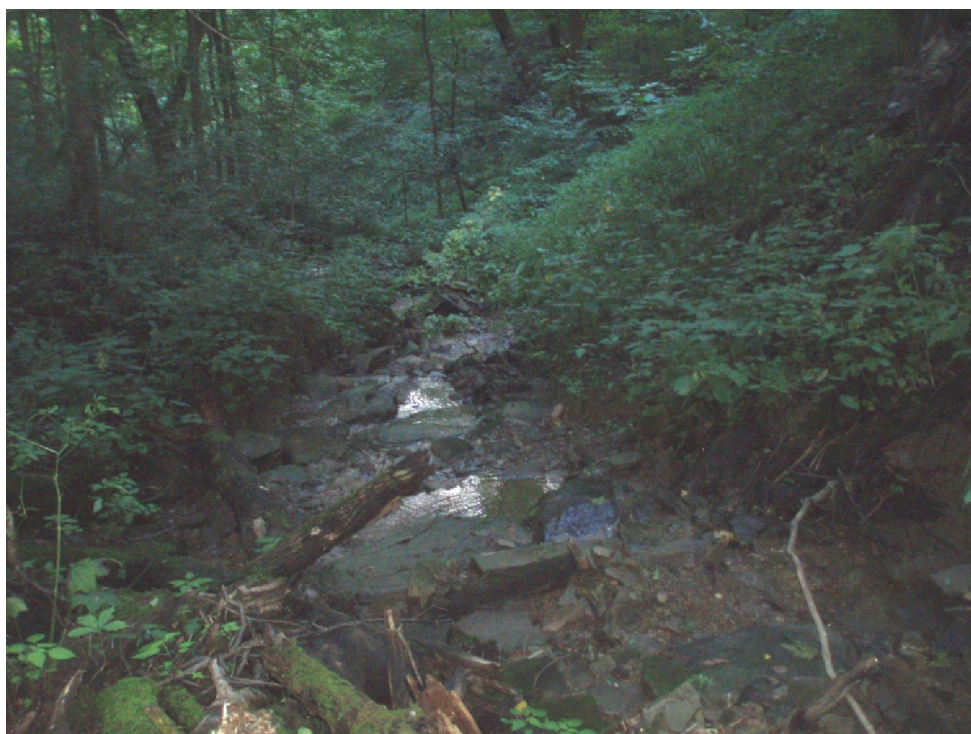


Photograph 99. View of bedrock waterfall and pool area along Stream 8.
Photo taken facing upstream.



Photograph 100. View of Stream 8 within the lower sample reach near the
Limits of Disturbance boundary. Photo taken facing upstream.

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Photograph 101. View of Stream 8 within the lower sample reach near the Limits of Disturbance boundary. Photo taken facing upstream.



Photograph 102. View of Stream 8 within the Lower Sample Reach near the Limits of Disturbance boundary. Photo taken facing upstream.

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Photograph 103. View of intermittent portion of Stream 8A.
Photo taken facing upstream.



Photograph 104. View of ephemeral portion of Stream 8A.
Photo taken facing upstream.

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Photograph 105. View of Stream 8B.
Photo taken facing upstream.



Photograph 106. View of downstream portion of Stream 9.
Photo taken facing upstream.

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Photograph 107. View of intermittent portion of Stream 9 within sample reach. Photo taken facing downstream.



Photograph 108. View of ephemeral portion of Stream 9. Photo taken facing upstream.

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Photograph 109. View of downstream portion of Stream 10.
Photo taken facing upstream.



Photograph 110. View of downstream portion of Stream 10.
Photo taken facing upstream.

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Photograph 111. View of ephemeral portion of Stream 10 after heavy rainfall occurred.
Photo taken facing upstream.



Photograph 112. View of ephemeral portion of Stream 10 after heavy rainfall occurred.
Photo taken facing upstream.

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Photograph 113. View of intermittent portion of Stream 10 within sample reach. Photo taken facing upstream.



Photograph 114. View of intermittent portion of Stream 10 within sample reach. Photo taken facing downstream.

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Photograph 115. View of Stream 10A after heavy rainfall occurred.
Photo taken facing upstream.



Photograph 116. View of Stream 11. Photo taken facing upstream.

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Photograph 117. View of Stream 11. Photo taken facing upstream.



Photograph 118. View of lower portion of Stream 12 after heavy rainfall occurred. Photo taken facing upstream.

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Photograph 119. View of Stream 12. Photo taken facing upstream.



Photograph 120. View of Stream 12. Photo taken facing upstream.

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Photograph 121. View of Stream 13. Photo taken facing upstream from the confluence with Stream 8.



Photograph 122. View of bedrock waterfall and small pool along the lower portion of Stream 13. Photo taken facing upstream.

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Photograph 123. View of Stream 13 within the sample reach.
Photo taken facing upstream.



Photograph 124. View of Stream 13 within the sample reach.
Photo taken facing downstream.

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Photograph 125. View of ephemeral portion of Stream 13.
Photo taken facing upstream.



Photograph 126. View of Stream 14. Photo taken facing upstream from
the confluence with Stream 8.

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Photograph 127. View of downstream/bedrock portion of Stream 14.
Photo taken facing upstream.



Photograph 128. View of bedrock waterfall within downstream portion of Stream 14.
Photo taken facing upstream.

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Photograph 129. View of upper intermittent portion of Stream 14 within sample reach.
Photo taken facing downstream.



Photograph 130. View of ephemeral portion of Stream 14.
Photo taken facing upstream.

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Photograph 131. View of upper portion of Stream 15.
Photo taken facing upstream.



Photograph 132. View of lower portion of Stream 15.
Photo taken facing upstream.

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Photograph 133. View of upper portion of Stream 15.
Photo taken facing upstream.



Photograph 134. View of upper portion of Stream 15.
Photo taken facing downstream.

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Photograph 135. View of upper portion of Stream 16. Photo taken facing upstream.



Photograph 136. View of lower portion of Stream 16. Photo taken facing upstream.

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Photograph 137. View of lower portion of Stream 16.
Photo taken facing upstream.



APPENDIX C

USEPA RAPID BIOASSESSMENT PROTOCOL STREAM DATA FORMS

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

Upstream of Confluence w/ Stream 2

STREAM NAME <u>Stream 1</u>	LOCATION <u>Mitchell Landfill, Cresap, WV</u>
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>
LAT <u>39°49'36.46"N</u> LONG <u>80°46'32.43"W</u>	RIVER BASIN <u>Ohio River</u>
STORET # _____	AGENCY _____
INVESTIGATORS <u>D. Goddec, G. Gerke</u>	
FORM COMPLETED BY <u>D. Goddec</u>	DATE <u>8/12/11</u> AM <input checked="" type="radio"/> PM <input type="radio"/> REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient). SCORE <u>15</u>	20 19 18 17 16 15 14 13 12 11	10 9 8 7 6 5 4 3 2 1 0		
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>16</u>	20 19 18 17 16 15 14 13 12 11	10 9 8 7 6 5 4 3 2 1 0		
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m). SCORE <u>2</u>	20 19 18 17 16 15 14 13 12 11	10 9 8 7 6 5 4 3 2 1 0	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low). <u>slow shallow</u>	
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>12</u>	20 19 18 17 16 15 14 13 12 11	10 9 8 7 6 5 4 3 2 1 0		
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>9</u>	20 19 18 17 16 15 14 13 12 11	10 9 8 7 6 5 4 3 2 1 0		

Stream 1 - upstream of confluence with Stream 2 (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																			
	Optimal					Suboptimal					Marginal					Poor				
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.														
SCORE 20	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.					Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.														
SCORE 5	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.														
Note: determine left or right side by facing downstream.																				
SCORE 8 (LB)	Left Bank	10	9	8	7	6	5	4	3	2	1	0								
SCORE 8 (RB)	Right Bank	10	9	8	7	6	5	4	3	2	1	0								
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.														
SCORE 8 (LB)	Left Bank	10	9	8	7	6	5	4	3	2	1	0								
SCORE 8 (RB)	Right Bank	10	9	8	7	6	5	4	3	2	1	0								
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.														
SCORE 10 (LB)	Left Bank	10	9	8	7	6	5	4	3	2	1	0								
SCORE 10 (RB)	Right Bank	10	9	8	7	6	5	4	3	2	1	0								

Total Score 131

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)**

Just upstream of con fl. w/Stream 2

STREAM NAME <i>Stream 1</i>	LOCATION <i>Cresap, Marshall Co., WV</i>
STATION # _____ RIVERMILE _____	STREAM CLASS <i>Intermittent</i>
LAT <i>39°49'36.46"N</i> LONG <i>80°46'32.42"W</i>	RIVER BASIN <i>Ohio River</i>
STORET # _____	AGENCY _____
INVESTIGATORS <i>D. Godec, G. Gerke</i>	
FORM COMPLETED BY <i>G. Gerke, D. Godec</i>	DATE <i>8/12/11</i> TIME <i>11:25</i> <input checked="" type="radio"/> AM <input type="radio"/> PM REASON FOR SURVEY <i>AEP Mitchell Landfill Project</i>

WEATHER CONDITIONS	Now <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover <input checked="" type="checkbox"/> clear/sunny	Past 24 hours <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> 40 % <input type="checkbox"/>	Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Air Temperature <i>21.1</i> °C Other _____
	SITE LOCATION/MAP Draw a map of the site and indicate the areas sampled (or attach a photograph) <i>See photographs and Figure 5 from Jurisdictional Waters Delineation Report</i>		
STREAM CHARACTERIZATION	Stream Subsystem <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Intermittent <input type="checkbox"/> Tidal Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input checked="" type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____ Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater Catchment Area _____ km ²		

Stream 1 - upstream of stream 2 (cont.)

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential	Local Watershed NPS Pollution <input checked="" type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources Local Watershed Erosion <input checked="" type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous dominant species present <u>sugar maple, red maple, white ash, shagbark hickory, witch hazel, spicebush, wood nettle</u>	
INSTREAM FEATURES	Estimated Reach Length <u>30.8</u> m <u>100</u> ft. Canopy Cover <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input checked="" type="checkbox"/> Shaded Estimated Stream Width <u>1.8</u> m <u>6</u> ft. High Water Mark <u>~1.8</u> m (6 ft.) Sampling Reach Area <u>55.7</u> m ² <u>600</u> ft ² Proportion of Reach Represented by Stream Morphology Types <input type="checkbox"/> Riffle <u>65</u> % <input type="checkbox"/> Run <u>25</u> % <input type="checkbox"/> Pool <u>10</u> % Area in km² (m² x 1000) <u>0.00557</u> km ² Estimated Stream Depth <u>0.03</u> m <u>1</u> inch Surface Velocity <u>0.2</u> m/sec Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (at thalweg) Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
LARGE WOODY DEBRIS	LWD <u>3</u> m ² Density of LWD <u>53859.9</u> m ² /km ² (LWD/ reach area)	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present <u>Clearweed, Polygonum sp.</u> Portion of the reach with aquatic vegetation <u>2</u> %	
WATER QUALITY	Temperature <u>17.1</u> °C Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Specific Conductance <u>0.396</u> ms/cm Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Dissolved Oxygen <u>5.47</u> Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____ pH <u>6.8</u> WQ Instrument Used <u>Horiba U-52</u>	
SEDIMENT/SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		<u>20%</u>	Detritus	sticks, wood, coarse plant materials (CPOM)	<u>2%</u>
Boulder	> 256 mm (10")	<u>30%</u>	Muck-Mud	black, very fine organic (FPOM)	<u>0%</u>
Cobble	64-256 mm (2.5"-10")	<u>20%</u>	Marl	grey, shell fragments	<u>0%</u>
Gravel	2-64 mm (0.1"-2.5")	<u>20%</u>			
Sand	0.06-2mm (gritty)				
Silt	0.004-0.06 mm	<u>10%</u>			
Clay	< 0.004 mm (slick)				

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

Just upstream of Confl. w/ Stream 2

STREAM NAME <u>Stream 1</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>
LAT <u>31°41'36.46"N</u> LONG <u>80°46'32.43"W</u>	RIVER BASIN <u>Ohio River</u>
STORET # _____	AGENCY _____
INVESTIGATORS <u>D. Godec, G. Gerke</u>	LOT NUMBER _____
FORM COMPLETED BY <u>G. Gerke/D. Godec</u>	DATE <u>8/12/11</u> TIME <u>1:30</u> <input checked="" type="checkbox"/> AM <input type="checkbox"/> PM
	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>20</u> % <input checked="" type="checkbox"/> Snags <u>5</u> % <input checked="" type="checkbox"/> Vegetated Banks <u>5</u> % <input type="checkbox"/> Sand <u>0</u> % <input type="checkbox"/> Submerged Macrophytes <u>5</u> % <input type="checkbox"/> Other () _____ %
SAMPLE COLLECTION	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input type="checkbox"/> Other <u>Grab sample; Aquanum net</u> How were the samples collected? <input checked="" type="checkbox"/> wading <input checked="" type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble <u>20</u> <input type="checkbox"/> Snags _____ <input checked="" type="checkbox"/> Vegetated Banks <u>5</u> <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input checked="" type="checkbox"/> Other (<u>pools</u>) <u>15</u>
GENERAL COMMENTS	<u>N. Dusky salamander larvae observed</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	<u>0</u>	1	2	3	4	Slimes	<u>0</u>	1	2	3	4
Filamentous Algae	<u>0</u>	1	2	3	4	Macroinvertebrates	<u>0</u>	<u>1</u>	2	3	4
Macrophytes	<u>0</u>	<u>1</u>	2	3	4	Fish	<u>0</u>	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	<u>Ephemeroptera</u>	0	1	<u>2</u>	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	<u>Coleoptera</u>	0	<u>1</u>	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	<u>Corydalidae</u>	0	<u>1</u>	2	3	4						
Amphipoda	0	1	2	3	4	<u>Tipulidae</u>	0	<u>1</u>	2	3	4						
<u>Decapoda</u>	0	<u>1</u>	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culeidae	0	1	2	3	4						

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

At confluence with stream 4

STREAM NAME <u>Stream 1</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall County, WV</u>
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>Intermittent</u>
LAT <u>39°49'30.21"N</u> , LONG <u>80°42'32.40"W</u>	RIVER BASIN <u>Ohio River</u>
STORET #	AGENCY
INVESTIGATORS <u>D. Godec, G. Gerke</u>	
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/12/11</u> AM <input checked="" type="radio"/> PM <u>7:00</u> REASON FOR SURVEY <u>AEF Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE <u>15</u>	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE <u>13</u>	20 19 18 17 16	(15) 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE <u>9</u>	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE <u>13</u>	20 19 18 17 16	15 14 (13) 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <u>9</u>	20 19 18 17 16	15 14 13 12 11	10 (9) 8 7 6	5 4 3 2 1 0

Parameters to be evaluated in sampling reach

Stream 1 at Conf. w/Stream 4 (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>20</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE <u>13</u>	20 19 18 17 16	15 14 <u>13</u> 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream. SCORE <u>9</u> (LB) SCORE <u>9</u> (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
Left Bank	10 <u>9</u>	8 7 6	5 4 3	2 1 0
Right Bank	10 <u>9</u>	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
SCORE <u>7</u> (LB)	Left Bank 10 9	8 <u>7</u> 6	5 4 3	2 1 0
SCORE <u>7</u> (RB)	Right Bank 10 9	8 <u>7</u> 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
SCORE <u>10</u> (LB)	Left Bank <u>10</u> 9	8 7 6	5 4 3	2 1 0
SCORE <u>10</u> (RB)	Right Bank <u>10</u> 9	8 7 6	5 4 3	2 1 0

Total Score 146

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET

(FRONT)

At Confluence with Stream 4

STREAM NAME <u>Stream 1</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'30.21"N</u> LONG <u>81°46'32.40"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. GODEL; G. GERKE</u>		
FORM COMPLETED BY <u>D. GODEL</u>	DATE <u>8/12/11</u> TIME <u>7:00</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

WEATHER CONDITIONS	<p>Now</p> <p><input type="checkbox"/> storm (heavy rain)</p> <p><input type="checkbox"/> rain (steady rain)</p> <p><input type="checkbox"/> showers (intermittent)</p> <p><input type="checkbox"/> %cloud cover</p> <p><input checked="" type="checkbox"/> clear/sunny</p>	<p>Past 24 hours</p> <p><input type="checkbox"/> storm (heavy rain)</p> <p><input type="checkbox"/> rain (steady rain)</p> <p><input type="checkbox"/> showers (intermittent)</p> <p><input type="checkbox"/> %cloud cover</p> <p><input checked="" type="checkbox"/> clear/sunny</p>	<p>Has there been a heavy rain in the last 7 days?</p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Air Temperature <u>25</u> °C</p> <p>Other _____</p>
SITE LOCATION/MAP	<p>Draw a map of the site and indicate the areas sampled (or attach a photograph)</p> <p>See photographs and figure 5 of the Jurisdictional Waters delineation report</p>		
STREAM CHARACTERIZATION	<p>Stream Subsystem</p> <p><input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Intermittent <input type="checkbox"/> Tidal</p> <p>Stream Origin</p> <p><input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed</p> <p><input checked="" type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins</p> <p><input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____</p> <p>Stream Type</p> <p><input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater</p> <p>Catchment Area _____ km²</p>		

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

Stream 1 at confluence with Stream 4 (cont.)

WATERSHED FEATURES	Predominant Surrounding Landuse <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential	Local Watershed NPS Pollution <input type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources Local Watershed Erosion <input checked="" type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous dominant species present <u>Sugar maple, basswood, witch hazel, christmas fern, Impatiens</u>	
INSTREAM FEATURES	Estimated Reach Length <u>30.48</u> m <u>100 ft.</u> Estimated Stream Width <u>3.05</u> m <u>10 ft.</u> Sampling Reach Area <u>90.29</u> m ² <u>10 ft x 100 ft.</u> Area in km ² (m ² x 1000) <u>0.000929</u> km ² Estimated Stream Depth <u>0-0.5</u> m <u>0-2 inch</u> Surface Velocity <u>0.1</u> m/sec <u>6-14</u> inch Canopy Cover <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input checked="" type="checkbox"/> Shaded High Water Mark <u>~3.05</u> m <u>10 ft.</u> on avg. Proportion of Reach Represented by Stream Morphology Types <input type="checkbox"/> Riffle <u>60</u> % <input type="checkbox"/> Run <u>20</u> % <input type="checkbox"/> Pool <u>20</u> % Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
LARGE WOODY DEBRIS	LWD <u>2</u> m ² Density of LWD <u>21,528.5</u> m ² /km ² (LWD/ reach area)	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation <u>0</u> %	
WATER QUALITY	Temperature <u>18.4</u> °C Specific Conductance <u>0.336</u> mS/cm Dissolved Oxygen <u>7.05</u> mg/L pH <u>7.15</u> Turbidity <u>12.1</u> WQ Instrument Used <u>Horiba U-52</u> Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____	
SEDIMENT/ SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Deposits <u>None</u> <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

Impatiens pallida, cleaverweed, white ash

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		<u>36%</u>	Detritus	sticks, wood, coarse plant materials (CPOM)	
Boulder	> 256 mm (10")	<u>20%</u>			
Cobble	64-256 mm (2.5"-10")	<u>30%</u>	Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")	<u>15%</u>			
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)				

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

At intersection w/ Stream 1

STREAM NAME <u>Stream 1</u>	LOCATION <u>Mitchell Landfill, Cross, Marshall Co., WV</u>	
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'30.21"N</u> LONG <u>80°40'32.46"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET #	AGENCY	
INVESTIGATORS <u>D. Godee, G. Gerke</u>	LOT NUMBER	
FORM COMPLETED BY <u>D. Godee</u>	DATE <u>8/12/11</u> TIME <u>6:30</u> AM <input checked="" type="checkbox"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>50</u> % <input type="checkbox"/> Snags _____ % <input type="checkbox"/> Vegetated Banks _____ % <input type="checkbox"/> Sand _____ % <input type="checkbox"/> Submerged Macrophytes _____ % <input checked="" type="checkbox"/> Other (<u>pools</u>) _____ %
SAMPLE COLLECTION	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input checked="" type="checkbox"/> Other <u>Grab Samples</u> How were the samples collected? <input checked="" type="checkbox"/> wading <input checked="" type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble _____ <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks _____ <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input checked="" type="checkbox"/> Other (<u>pools/riffles</u>) _____
GENERAL COMMENTS	<u>N. Dusky Salamanders (adults)</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	<u>0</u>	1	2	3	4	Slimes	<u>0</u>	1	2	3	4
Filamentous Algae	<u>0</u>	1	2	3	4	Macroinvertebrates	0	1	2	3	4
Macrophytes	<u>0</u>	1	2	3	4	Fish	<u>0</u>	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	<u>3</u>	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	<u>1</u>	2	3	4	Trichoptera	0	<u>1</u>	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	<u>1</u>	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	<u>3</u>	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culicidae	0	1	2	3	4						

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

At downstream end of project Area

STREAM NAME <u>Stream 1</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall County, WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'13.90"N</u> LONG <u>80°46'35.08"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Godec, G. Gerke</u>		
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/13/11</u> TIME <u>12:30</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>AEF Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient). SCORE <u>16</u>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient). 20 19 18 17 <u>16</u>	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). 15 14 13 12 11	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. 10 9 8 7 6	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 5 4 3 2 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>18</u>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. 20 19 <u>18</u> 17 16	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. 15 14 13 12 11	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. 10 9 8 7 6	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. 5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) SCORE <u>9</u>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) 20 19 18 17 16	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes). 15 14 13 12 11	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low). 10 <u>9</u> 8 7 6	Dominated by 1 velocity/depth regime (usually slow-deep). 5 4 3 2 1 0
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>15</u>	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. 20 19 18 17 16	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools. <u>15</u> 14 13 12 11	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent. 10 9 8 7 6	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition. 5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>8</u>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. 20 19 18 17 16	Water fills >75% of the available channel; or <25% of channel substrate is exposed. 15 14 13 12 11	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed. 10 9 <u>8</u> 7 6	Very little water in channel and mostly present as standing pools. 5 4 3 2 1 0

Stream 1 at downstream end of Project Area (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>20</u>	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE <u>16</u>	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream. SCORE <u>10</u> (LB) SCORE <u>7</u> (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
Left Bank (10) 9	8 7 6	5 4 3	2 1 0	
Right Bank 10 9	8 (7) 6	5 4 3	2 1 0	
9. Vegetative Protection (score each bank) SCORE <u>8</u> (LB) SCORE <u>7</u> (RB)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
Left Bank 10 9	(8) 7 6	5 4 3	2 1 0	
Right Bank 10 9	8 (7) 6	5 4 3	2 1 0	
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE <u>10</u> (LB) SCORE <u>10</u> (RB)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
Left Bank (10) 9	8 7 6	5 4 3	2 1 0	
Right Bank (10) 9	8 7 6	5 4 3	2 1 0	

Total Score 154

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET

(FRONT)
Stream 1 at downstream end of project Area

STREAM NAME <u>Stream 1</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall County, WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'13.90"N</u> LONG <u>80°46'23.08"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Godec, G. Gorke</u>		
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/12/11</u> TIME <u>6:30</u> AM <input checked="" type="radio"/> PM <input type="radio"/>	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

WEATHER CONDITIONS	<p>Now</p> <p><input type="checkbox"/> storm (heavy rain)</p> <p><input type="checkbox"/> rain (steady rain)</p> <p><input type="checkbox"/> showers (intermittent)</p> <p><input checked="" type="checkbox"/> %cloud cover</p> <p><input checked="" type="checkbox"/> clear/sunny</p>	<p>Past 24 hours</p> <p><input type="checkbox"/> storm (heavy rain)</p> <p><input type="checkbox"/> rain (steady rain)</p> <p><input type="checkbox"/> showers (intermittent)</p> <p><input checked="" type="checkbox"/> %cloud cover</p> <p><input checked="" type="checkbox"/> clear/sunny</p>	<p>Has there been a heavy rain in the last 7 days?</p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Air Temperature <u>26</u> °C</p> <p>Other _____</p>
SITE LOCATION/MAP	<p>Draw a map of the site and indicate the areas sampled (or attach a photograph)</p> <p>see photographs and figure 5 of the Jurisdictional waters delineation report</p>		
STREAM CHARACTERIZATION	<p>Stream Subsystem</p> <p><input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Intermittent <input type="checkbox"/> Tidal</p> <p>Stream Origin</p> <p><input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed</p> <p><input checked="" type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins</p> <p><input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____</p> <p>Stream Type</p> <p><input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater</p> <p>Catchment Area _____ km²</p>		

Stream 1 at downstream end of project area

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other <input type="checkbox"/> Residential		Local Watershed NPS Pollution <input checked="" type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources
			Local Watershed Erosion <input checked="" type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous dominant species present <u>Sugar maple, tulip poplar, basswood, spice bush, paw paw, clearweed, Christmas fern</u>		
INSTREAM FEATURES	Estimated Reach Length <u>30.5</u> m <u>100</u> ft. Estimated Stream Width <u>3-3.7</u> m <u>10-12</u> ft. Sampling Reach Area <u>102.1</u> m ² Area in km ² (m ² x 1000) <u>0.00021</u> km ² Estimated Stream Depth <u>0-0.08</u> m <u>0-3</u> inches Surface Velocity <u>0.05</u> m/sec (at 10m w/g) Canopy Cover <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input checked="" type="checkbox"/> Shaded High Water Mark <u>3-3.7</u> m <u>10-12</u> ft. Proportion of Reach Represented by Stream Morphology Types <input checked="" type="checkbox"/> Riffle <u>75</u> % <input checked="" type="checkbox"/> Run <u>10</u> % <input checked="" type="checkbox"/> Pool <u>15</u> % Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
LARGE WOODY DEBRIS	LWD <u>10</u> m ² Density of LWD <u>97943.2</u> m ² /km ² (LWD/ reach area)		
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <u>None</u> <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation <u>0</u> %		
WATER QUALITY	Temperature <u>18.7</u> °C Specific Conductance <u>0.324</u> mS/cm Dissolved Oxygen <u>6.31</u> mg/L pH <u>7.35</u> Turbidity <u>26.8</u> WQ Instrument Used <u>Horiba U-52</u> Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained		
SEDIMENT/ SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Deposits <u>None</u> <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Looking at stones which are not deeply embedded, are the undersides black in color? <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No		

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	15%
Boulder	> 256 mm (10")	60%	Muck-Mud	black, very fine organic (FPOM)	0%
Cobble	64-256 mm (2.5"-10")	25%			
Gravel	2-64 mm (0.1"-2.5")	15%			
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	0%
Silt	0.004-0.06 mm				
Clay	<0.004 mm (slick)				

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

At downstream end of Project Area

STREAM NAME <u>Stream 1</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>	
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'13.90"N</u> LONG <u>80°46'35.08"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET #	AGENCY	
INVESTIGATORS <u>D. Godec, G. Gerke</u>	LOT NUMBER	
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/13/11</u> TIME <u>12:30</u> AM <input checked="" type="checkbox"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>25</u> % <input type="checkbox"/> Snags _____ % <input type="checkbox"/> Vegetated Banks _____ % <input type="checkbox"/> Sand _____ % <input type="checkbox"/> Submerged Macrophytes _____ % <input checked="" type="checkbox"/> Other (<u>pools</u>) <u>15</u> %
SAMPLE COLLECTION	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input checked="" type="checkbox"/> Other <u>Grub samples</u> How were the samples collected? <input checked="" type="checkbox"/> wading <input checked="" type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble <u>50</u> <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks _____ <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input checked="" type="checkbox"/> Other (<u>pools/riffles</u>) <u>50</u>
GENERAL COMMENTS	<u>N. Dusky Salamanders (juveniles and larvae)</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	<u>0</u>	1	2	3	4	Slimes	<u>0</u>	1	2	3	4
Filamentous Algae	<u>0</u>	1	2	3	4	Macroinvertebrates	<u>0</u>	<u>1</u>	2	3	4
Macrophytes	<u>0</u>	1	2	3	4	Fish	<u>0</u>	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	<u>Ephemeroptera</u>	0	<u>1</u>	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
<u>Decapoda</u>	0	1	2	<u>3</u>	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

Ephemeral portion of Stream 1

STREAM NAME <i>Stream 1</i>	LOCATION <i>Mitchell Landfill, Cresap, Marshall Co, WV</i>
STATION # _____ RIVERMILE _____	STREAM CLASS <i>Ephemeral</i>
LAT <i>39°49'46.32"N</i> LONG <i>80°46'33.85"W</i>	RIVER BASIN <i>Ohio River</i>
STORET # _____	AGENCY _____
INVESTIGATORS <i>D. Godec, G. Gerke</i>	
FORM COMPLETED BY <i>D. Godec</i>	DATE <i>8/12/11</i> TIME <i>2:45</i> AM <input checked="" type="radio"/> PM <input type="radio"/> REASON FOR SURVEY <i>AEP Mitchell Landfill Project</i>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE <i>8</i>	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE <i>11</i>	20 19 18 17 16	15 14 13 12 (11)	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE <i>0</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 (0)
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE <i>10</i>	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <i>0</i>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 (0)

Parameters to be evaluated in sampling reach

no flow

no flow or pools

Stream 1 - ephemeral portion (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE 19	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE 2	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected. Note: determine left or right side by facing downstream.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	
SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 96

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 1A</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall County, WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Ephemeral</u>	
LAT <u>39°49'43.51"N</u> LONG <u>80°46'32.17"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Godlec, G. Gerke</u>		
FORM COMPLETED BY <u>D. Godlec</u>	DATE <u>8/12/11</u> TIME <u>1:00</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>AEF Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). SCORE <u>11</u>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 12 <u>11</u>	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>17</u>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	20 19 18 <u>17</u> 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) SCORE <u>0</u>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>13</u>	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	20 19 18 17 16	15 14 <u>13</u> 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>0</u>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>

Stream 1A (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE 20	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE 2	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 (2) 1 0
8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected. Note: determine left or right side by facing downstream.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	
SCORE 8 (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
SCORE 2 (LB)	Left Bank 10 9	8 7 6	5 4 3	(2) 1 0
SCORE 2 (RB)	Right Bank 10 9	8 7 6	5 4 3	(2) 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
SCORE 10 (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 103

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 1B</u>	LOCATION <u>Mitchell Landfill, Creap, Marshall Co., WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Ephemeral</u>	
LAT <u>31°49'42.15"N</u> LONG <u>80°46'34.21"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Godeo, G. Gerke</u>		
FORM COMPLETED BY <u>D. Godeo</u>	DATE <u>8/12/11</u> TIME <u>1:30</u> <input checked="" type="radio"/> AM <input type="radio"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE <u>1</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 <u>1</u> 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE <u>5</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	<u>5</u> 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE <u>0</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material; increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE <u>3</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 <u>3</u> 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <u>2</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 <u>2</u> 1 0

Parameters to be evaluated in sampling reach

no flow

no flow

Stream 1B (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>19</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE <u>1</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream. SCORE <u>3</u> (LB) SCORE <u>3</u> (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) SCORE <u>9</u> (LB) SCORE <u>9</u> (RB)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE <u>10</u> (LB) SCORE <u>10</u> (RB)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 75

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 1C</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>
STATION # <u> </u> RIVERMILE <u> </u>	STREAM CLASS <u>Ephemeral</u>
LAT <u>39°49'42.75" N</u> LONG <u>78°46'34.91" W</u>	RIVER BASIN <u>Ohio River</u>
STORET # <u> </u>	AGENCY <u> </u>
INVESTIGATORS <u>D. Godec, B. Gerke</u>	
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/12/11</u> TIME <u>2:15</u> AM <input checked="" type="radio"/> PM <u>REASON FOR SURVEY</u> <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient). SCORE <u>5</u>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	<u>5</u> 4 3 2 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>6</u>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 <u>6</u>	5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) SCORE <u>0</u>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>7</u>	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	20 19 18 17 16	15 14 13 12 11	10 9 8 <u>7</u> 6	5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>0</u>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>

Parameters to be evaluated in sampling reach

No flow

No flow or pools

Stream 1C (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>16</u>	20 19 18 17 <u>(16)</u>	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE <u>1</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 <u>(1)</u> 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream. SCORE <u>1</u> (LB) SCORE <u>1</u> (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
	Left Bank 10 9	8 7 6	5 4 3	2 <u>(1)</u> 0
	Right Bank 10 9	8 7 6	5 4 3	2 <u>(1)</u> 0
9. Vegetative Protection (score each bank) SCORE <u>8</u> (LB) SCORE <u>8</u> (RB)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	<u>(8)</u> 7 6	5 4 3	2 1 0
	Right Bank 10 9	<u>(8)</u> 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE <u>10</u> (LB) SCORE <u>10</u> (RB)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
	Left Bank <u>(10)</u> 9	8 7 6	5 4 3	2 1 0
	Right Bank <u>(10)</u> 9	8 7 6	5 4 3	2 1 0

Total Score 73

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 1D</u>	LOCATION <u>Mitchell Landfill, Crossap, Marshall Co, WV</u>
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Ephemeral</u>
LAT <u>39°49'45.49"N</u> LONG <u>80°46'35.66"W</u>	RIVER BASIN <u>Ohio River</u>
STORET # _____	AGENCY _____
INVESTIGATORS <u>D. Godlee, G. Gerke</u>	
FORM COMPLETED BY <u>D. Godlee</u>	DATE <u>8/12/11</u> TIME <u>2:30</u> AM <input checked="" type="radio"/> PM <input type="radio"/>
	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient). SCORE <u>8</u>	20 19 18 17 16	15 14 13 12 11	10 9 <u>8</u> 7 6	5 4 3 2 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>11</u>	20 19 18 17 16	15 14 13 12 <u>11</u>	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m). SCORE <u>0</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>11</u>	20 19 18 17 16	15 14 13 12 <u>11</u>	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>0</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>

Stream ID (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE <u>19</u>	20 <u>(19)</u> 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE <u>1</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 <u>(1)</u> 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE <u>8</u> (LB)	Left Bank 10 9	<u>(8)</u> 7 6	5 4 3	2 1 0
SCORE <u>8</u> (RB)	Right Bank 10 9	<u>(8)</u> 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE <u>8</u> (LB)	Left Bank 10 9	<u>(8)</u> 7 6	5 4 3	2 1 0
SCORE <u>8</u> (RB)	Right Bank 10 9	<u>(8)</u> 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE <u>10</u> (LB)	Left Bank <u>(10)</u> 9	8 7 6	5 4 3	2 1 0
SCORE <u>10</u> (RB)	Right Bank <u>(10)</u> 9	8 7 6	5 4 3	2 1 0

Total Score 102

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 2</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>
LAT <u>39°49'37.36"N</u> LONG <u>80°41'32.31"W</u>	RIVER BASIN <u>Ohio River</u>
STORET # _____	AGENCY _____
INVESTIGATORS <u>D. Godec, G. Gerke</u>	
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/12/11</u> TIME <u>9:00</u> <input checked="" type="radio"/> AM <input type="radio"/> PM
REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>	

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover SCORE <u>16</u>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 <u>(16)</u>	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness SCORE <u>15</u>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	20 19 18 17 16	<u>(15)</u> 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime SCORE <u>4</u>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 <u>(4)</u> 3 2 1 0
4. Sediment Deposition SCORE <u>11</u>	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	20 19 18 17 16	15 14 13 12 <u>(11)</u>	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status SCORE <u>6</u>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 <u>(6)</u>	5 4 3 2 1 0

Stream 2 (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>20</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE <u>5</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream. SCORE <u>8</u> (LB) SCORE <u>9</u> (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
Left Bank	10 9	8 7 6	5 4 3	2 1 0
Right Bank	10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) SCORE <u>8</u> (LB) SCORE <u>8</u> (RB)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
Left Bank	10 9	8 7 6	5 4 3	2 1 0
Right Bank	10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE <u>10</u> (LB) SCORE <u>10</u> (RB)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
Left Bank	10 9	8 7 6	5 4 3	2 1 0
Right Bank	10 9	8 7 6	5 4 3	2 1 0

Total Score 130

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (FRONT)

AT CONFLUENCE
OF STREAM 2a
AND STREAM 2b

STREAM NAME <u>Stream 2</u>	LOCATION <u>KEP MITCHELL LANDFILL, MARSHALL CO. NV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>INTERMITTENT</u>	
LAT <u>39° 49' 38.23" N</u> LONG <u>80° 46' 28.51" W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY <u>CEC</u>	
INVESTIGATORS <u>G. GERKE, D. GODEC</u>		
FORM COMPLETED BY <u>G. GERKE, D. GODEC</u>	DATE <u>8/11/11</u> TIME <u>6:40</u> AM <input checked="" type="checkbox"/> PM	REASON FOR SURVEY <u>MITCHELL LANDFILL PROJECT</u>

WEATHER CONDITIONS	<p>Now</p> <p><input type="checkbox"/> storm (heavy rain)</p> <p><input type="checkbox"/> rain (steady rain)</p> <p><input type="checkbox"/> showers (intermittent)</p> <p><input checked="" type="checkbox"/> %cloud cover _____</p> <p><input checked="" type="checkbox"/> clear/sunny</p>	<p>Past 24 hours</p> <p><input type="checkbox"/> storm (heavy rain)</p> <p><input type="checkbox"/> rain (steady rain)</p> <p><input type="checkbox"/> showers (intermittent)</p> <p><input checked="" type="checkbox"/> %cloud cover <u>50%</u></p> <p><input type="checkbox"/> clear/sunny</p>	<p>Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Air Temperature <u>70° C</u></p> <p>Other _____</p>
SITE LOCATION/MAP	<p>Draw a map of the site and indicate the areas sampled (or attach a photograph)</p> <p align="center"><u>SEE PHOTOGRAPHS & FIGURE 5 from JURISDICTIONAL WATERS REPORT</u></p>		
STREAM CHARACTERIZATION	<p>Stream Subsystem <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Intermittent <input type="checkbox"/> Tidal</p> <p>Stream Origin <input type="checkbox"/> Glacial <input checked="" type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input checked="" type="checkbox"/> Other <u>RUNOFF</u></p> <p>Stream Type <input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater</p> <p>Catchment Area _____ km²</p>		

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

Stream 2 (cont.)

WATERSHED FEATURES	Predominant Surrounding Landuse <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other <input type="checkbox"/> Residential	Local Watershed NPS Pollution <input checked="" type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources Local Watershed Erosion <input checked="" type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Trees <input type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <u>ACER, SALICARIA, LIRODENDRON, FRAX AMER., FAGUS</u>	
INSTREAM FEATURES	Estimated Reach Length <u>30.5</u> m Estimated Stream Width <u>1.5</u> m Sampling Reach Area <u>45.75</u> m ² Area in km² (m²x1000) <u>0.004575</u> km ² Estimated Stream Depth <u>0.05</u> m Surface Velocity <u>0.01</u> m/sec (at thalweg) Canopy Cover <input checked="" type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <u>1.2-1.8</u> m Proportion of Reach Represented by Stream Morphology Types <input type="checkbox"/> Riffle <u>80</u> % <input type="checkbox"/> Run <u> </u> % <input type="checkbox"/> Pool <u> </u> % Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
LARGE WOODY DEBRIS	LWD <u>5</u> m ³ Density of LWD <u>109290</u> m ² /km ² (LWD/ reach area)	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present <u>PULCA, IMPATIENS, POLYGONUM SP.</u> Portion of the reach with aquatic vegetation <u>0</u> %	
WATER QUALITY	Temperature <u>19.13</u> °C Specific Conductance <u>333</u> DRP mV Dissolved Oxygen <u>6.68</u> mg/L pH <u>6.94</u> Turbidity <u>0.370</u> mS/cm WQ Instrument Used <u>HORIBA U-52</u> Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other Turbidity (if not measured) <input type="checkbox"/> Clear <input checked="" type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other	
SEDIMENT/SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

Q. RUBRA
LABORIEA
IMPATIENS
LINDEPA

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		<u>5</u>	Detritus	sticks, wood, coarse plant materials (CPOM)	<u>10%</u>
Boulder	> 256 mm (10")	<u>30</u>			
Cobble	64-256 mm (2.5"-10")	<u>30</u>	Muck-Mud	black, very fine organic (FPOM)	<u>—</u>
Gravel	2-64 mm (0.1"-2.5")	<u>10</u>			
Sand	0.06-2mm (gritty)	<u>10</u>	Marl	grey, shell fragments	<u>—</u>
Silt	0.004-0.06 mm	<u>5</u>			
Clay	< 0.004 mm (slick)				

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>STREAM 2</u>	LOCATION <u>ARP MITCHELL LANDFILL, CRESAP, MARSHAL</u>	CO, WV
STATION # <u> </u> RIVERMILE <u> </u>	STREAM CLASS <u>INTERMITTENT</u>	
LAT <u>39°49'37.30"N</u> LONG <u>80°42'32.37"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # <u> </u>	AGENCY <u> </u>	
INVESTIGATORS <u>GREG GERICE, DAN GODEC</u>	LOT NUMBER <u> </u>	
FORM COMPLETED BY <u>D. GODEC, G. GERICE</u>	DATE <u>8/11/11</u> TIME <u>6:30</u> AM <input checked="" type="radio"/> PM <input type="radio"/>	REASON FOR SURVEY <u>ARP MITCHELL LANDFILL PROJECT</u>

UPSTREAM END
OF REACH AT
CONFLUENCE
OF STREAM 2A
& STREAM 2B

DOWNSTREAM
FROM CONFLUENCE
OF STREAM 2A
AND STREAM 2B

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>80</u> % <input checked="" type="checkbox"/> Snags <u>10</u> % <input checked="" type="checkbox"/> Vegetated Banks <u>10</u> % <input type="checkbox"/> Sand <u> </u> % <input type="checkbox"/> Submerged Macrophytes <u> </u> % <input type="checkbox"/> Other (<u> </u>) <u> </u> %
SAMPLE COLLECTION	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input checked="" type="checkbox"/> Other <u>GRAB SAMPLE, Aquanometer</u> How were the samples collected? <input checked="" type="checkbox"/> wading <input checked="" type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble <u>15</u> <input checked="" type="checkbox"/> Snags <u>10</u> <input checked="" type="checkbox"/> Vegetated Banks <u>5</u> <input type="checkbox"/> Sand <u> </u> <input type="checkbox"/> Submerged Macrophytes <u> </u> <input type="checkbox"/> Other (<u> </u>) <u> </u>
GENERAL COMMENTS	<u>NOT MUCH FLOW TO TAKE SAMPLES FROM</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	<u>(0)</u>	1	2	3	4	Slimes	<u>(0)</u>	1	2	3	4
Filamentous Algae	<u>(0)</u>	1	2	3	4	Macroinvertebrates	<u>(0)</u>	1	2	<u>(3)</u>	4
Macrophytes	<u>(0)</u>	1	2	3	4	Fish	<u>(0)</u>	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	<u>(0)</u>	1	2	3	4	Anisoptera	<u>(0)</u>	1	2	3	4	Chironomidae	<u>(0)</u>	1	2	3	4
Hydrozoa	<u>(0)</u>	1	2	3	4	Zygoptera	<u>(0)</u>	1	2	3	4	Ephemeroptera	<u>(0)</u>	1	2	3	<u>(4)</u>
Platyhelminthes	<u>(0)</u>	1	2	3	4	Hemiptera	<u>(0)</u>	1	2	3	4	Trichoptera	<u>(0)</u>	1	2	3	4
Turbellaria	<u>(0)</u>	1	2	3	4	Coleoptera	<u>(0)</u>	1	2	3	4	Other	<u>(0)</u>	1	2	3	4
Hirudinea	<u>(0)</u>	1	2	3	4	Lepidoptera	<u>(0)</u>	1	2	3	4						
Oligochaeta	<u>(0)</u>	1	2	3	4	Sialidae	<u>(0)</u>	1	2	3	4						
Isopoda	<u>(0)</u>	1	2	3	4	Corydalidae	<u>(0)</u>	1	2	3	4						
Amphipoda	<u>(0)</u>	1	2	3	4	Tipulidae	<u>(0)</u>	1	2	3	4						
Decapoda	<u>(0)</u>	1	2	<u>(3)</u>	4	Empididae	<u>(0)</u>	1	2	3	4						
Gastropoda	<u>(0)</u>	1	2	3	4	Simuliidae	<u>(0)</u>	1	2	3	4						
Bivalvia	<u>(0)</u>	1	2	3	4	Tabinidae	<u>(0)</u>	1	2	3	4						
						Culicidae	<u>(0)</u>	1	2	3	4						

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 2A (eph. pool)</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Ephemeral</u>	
LAT <u>39°49'41.48" N</u> LONG <u>80°46'25.54" W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Godec, G. Gerke</u>		
FORM COMPLETED BY <u>D. Godec</u>	DATE _____ AM _____ PM _____	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE <u>4</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 <u>4</u> 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE <u>11</u>	20 19 18 17 16	15 14 13 12 <u>11</u>	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE <u>0</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE <u>8</u>	20 19 18 17 16	15 14 13 12 11	10 9 <u>8</u> 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <u>1</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 <u>1</u> 0

Parameters to be evaluated in sampling reach

no flow

Stream 2A - ephemeral portion (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 20	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 6	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream. SCORE 6 (LB) SCORE 6 (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0
9. Vegetative Protection (score each bank) SCORE 5 (LB) SCORE 5 (RB)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE 10 (LB) SCORE 10 (RB)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score **92**

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 2A</u>	LOCATION <u>AEP Mitchell Landfill, Cresap, Marshall Co., WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'37.73"N</u> LONG <u>80°46'27.49"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Godec, G. Gerke</u>		
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/11/11</u> TIME <u>3:06</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE <u>3</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 <u>3</u> 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE <u>11</u>	20 19 18 17 16	15 14 13 12 <u>11</u>	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep). <u>slow-shallow</u>
SCORE <u>3</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 <u>3</u> 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE <u>3</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 <u>3</u> 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <u>5</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	<u>5</u> 4 3 2 1 0

Stream 2A (cont.) - intermittent portion

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.					
SCORE 20	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.					Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.					Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.					Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.					
SCORE 3	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.					
Note: determine left or right side by facing downstream.																					
SCORE 5 (LB)	Left Bank 10 9					8 7 6					5 4 3					2 1 0					
SCORE 5 (RB)	Right Bank 10 9					8 7 6					5 4 3					2 1 0					
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.					
SCORE 2 (LB)	Left Bank 10 9					8 7 6					5 4 3					2 1 0					
SCORE 2 (RB)	Right Bank 10 9					8 7 6					5 4 3					2 1 0					
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.					
SCORE 10 (LB)	Left Bank 10 9					8 7 6					5 4 3					2 1 0					
SCORE 10 (RB)	Right Bank 10 9					8 7 6					5 4 3					2 1 0					

Total Score 82

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)**

STREAM NAME <u>Stream 2A</u>	LOCATION <u>AEP Mitchell Landfill, Cresap, Marshall Co., WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'39.13"N</u> LONG <u>80°46'27.49"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Godt, G. Gerke</u>		
FORM COMPLETED BY <u>D. Godt</u>	DATE <u>8/11/11</u> TIME <u>3:00</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

WEATHER CONDITIONS	Now <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input checked="" type="checkbox"/> 25% showers (intermittent) <input type="checkbox"/> %cloud cover <input type="checkbox"/> clear/sunny	Past 24 hours <input type="checkbox"/> <input type="checkbox"/> <input checked="" type="checkbox"/> 25% <input type="checkbox"/>	Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes? <input type="checkbox"/> No Air Temperature <u>25.6</u> °C Other _____
	SITE LOCATION/MAP Draw a map of the site and indicate the areas sampled (or attach a photograph) <u>See photographs and Figure 5 of Jurisdictional Waters Delination Report</u>		
STREAM CHARACTERIZATION	Stream Subsystem <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Intermittent <input type="checkbox"/> Tidal Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input checked="" type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____		
	Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater Catchment Area _____ km ²		

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

Stream 2A

WATERSHED FEATURES	Predominant Surrounding Landuse <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential	Local Watershed NPS Pollution <input checked="" type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources Local Watershed Erosion <input type="checkbox"/> None <input checked="" type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input type="checkbox"/> Herbaceous dominant species present <u>tulip poplar, spice bush, white ash, red maple, chestnut fern, cleome</u>	
INSTREAM FEATURES	Estimated Reach Length <u>62</u> m Estimated Stream Width <u>1</u> m Sampling Reach Area <u>62</u> m ² Area in km ² (m ² x1000) <u>.00062</u> km ² Estimated Stream Depth <u>0.08</u> m (1 ft.) Surface Velocity <u>0.05</u> m/sec Canopy Cover <input type="checkbox"/> Partly open <input checked="" type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <u>1</u> m Proportion of Reach Represented by Stream Morphology Types <input checked="" type="checkbox"/> Riffle <u>25</u> % <input checked="" type="checkbox"/> Run <u>65</u> % <input checked="" type="checkbox"/> Pool <u>10</u> % Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
LARGE WOODY DEBRIS	LWD <u>1</u> m ² Density of LWD <u>16/29</u> m ² /km ² (LWD/ reach area)	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present <u>Impatiens capensis, polygonum sp.</u> Portion of the reach with aquatic vegetation <u>5</u> %	
WATER QUALITY	Temperature <u>19.5</u> °C Specific Conductance <u>0.45</u> ms/cm Dissolved Oxygen <u>5.55</u> mg/L pH <u>6.92</u> Turbidity <u>0.0</u> WQ Instrument Used <u>Hanba U-52</u> Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input type="checkbox"/> Clear <input checked="" type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____	
SEDIMENT/SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input checked="" type="checkbox"/> Other <u>Silt</u> Looking at stones which are not deeply embedded, are the undersides black in color? <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse	

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	2%
Boulder	> 256 mm (10")	1%	Muck-Mud	black, very fine organic (FPOM)	0%
Cobble	64-256 mm (2.5"-10")	9%			
Gravel	2-64 mm (0.1"-2.5")	10%			
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	0%
Silt	0.004-0.06 mm	30%			
Clay	< 0.004 mm (slick)	50%			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Stream 2A</u>	LOCATION <u>AEP Mitchell Landfill, Cresap, Marshall Co., WV</u>	
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'39.73"N</u> LONG <u>80°46'27.49"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET #	AGENCY	
INVESTIGATORS <u>D. Godec, G. Gerke</u>	LOT NUMBER	
FORM COMPLETED BY <u>D. Godec, G. Gerke</u>	DATE <u>8/11/11</u> TIME <u>4:00</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>9</u> % <input checked="" type="checkbox"/> Snags <u><5</u> % <input type="checkbox"/> Vegetated Banks <u>25</u> % <input type="checkbox"/> Sand <u>0</u> % <input checked="" type="checkbox"/> Submerged Macrophytes <u>10</u> % <input type="checkbox"/> Other () %
SAMPLE COLLECTION	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> Kick-net <input checked="" type="checkbox"/> Other <u>Grab Sample</u> How were the samples collected? <input checked="" type="checkbox"/> wading <input checked="" type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble <u>20</u> <input type="checkbox"/> Snags <u>5</u> <input type="checkbox"/> Vegetated Banks <u>0</u> <input type="checkbox"/> Sand <u> </u> <input type="checkbox"/> Submerged Macrophytes <u> </u> <input type="checkbox"/> Other () <u> </u>
GENERAL COMMENTS	<u>NOT MUCH STANDING OR FLOWING WATER TO SAMPLE FROM, SAMPLING WAS LIMITED TO A HANDFUL OF SHALLOW POOLS.</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	<u>0</u> 1 2 3 4	Slimes	<u>0</u> 1 2 3 4
Filamentous Algae	<u>0</u> 1 2 3 4	Macroinvertebrates	0 <u>1</u> 2 3 4
Macrophytes	<u>0</u> 1 2 3 4	Fish	<u>0</u> 1 2 3 4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	<u>0</u> 1 2 3 4	Anisoptera	<u>0</u> 1 2 3 4	Chironomidae	<u>0</u> 1 2 3 4
Hydrozoa	<u>0</u> 1 2 3 4	Zygoptera	<u>0</u> 1 2 3 4	Ephemeroptera	0 <u>1</u> 2 3 4
Platyhelminthes	<u>0</u> 1 2 3 4	Hemiptera	<u>0</u> 1 2 3 4	Trichoptera	<u>0</u> 1 2 3 4
Turbellaria	<u>0</u> 1 2 3 4	Coleoptera	0 <u>1</u> 2 3 4	Other	<u>0</u> 1 2 3 4
Hirudinea	<u>0</u> 1 2 3 4	Lepidoptera	<u>0</u> 1 2 3 4		
Oligochaeta	<u>0</u> 1 2 3 4	Sialidae	<u>0</u> 1 2 3 4		
Isopoda	<u>0</u> 1 2 3 4	Corydalidae	<u>0</u> 1 2 3 4		
Amphipoda	<u>0</u> 1 2 3 4	Tipulidae	<u>0</u> 1 2 3 4		
Decapoda	<u>0</u> 1 2 3 4	Empididae	<u>0</u> 1 2 3 4		
Gastropoda	<u>0</u> 1 2 3 4	Simuliidae	<u>0</u> 1 2 3 4		
Bivalvia	<u>0</u> 1 2 3 4	Tabinidae	<u>0</u> 1 2 3 4		
		Culicidae	<u>0</u> 1 2 3 4		

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 2A-1</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Ephemeral</u>
LAT <u>39°49'41.29"N</u> LONG <u>80°46'27.14"W</u>	RIVER BASIN <u>Ohio River</u>
STORET # _____	AGENCY _____
INVESTIGATORS <u>D. Godes, G. Gerke</u>	
FORM COMPLETED BY <u>D. Godes</u>	DATE <u>8/11/11</u> TIME <u>5:50</u> AM <input checked="" type="radio"/> PM <u>AEF Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE <u>1</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 <u>1</u> 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE <u>5</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	<u>5</u> 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE <u>0</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE <u>2</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 <u>2</u> 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <u>0</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>

Parameters to be evaluated in sampling reach

no flow

no water or pools

Stream 2A-1 (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 20	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 6	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 6 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 6 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE 9 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 9 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 82

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 2A-2</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>e Phemera</u>	
LAT <u>39°49'40.42"N</u> LONG <u>80°46'26.14"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Godec, G. Gerke</u>		
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/11/11</u> TIME <u>6:00</u> AM <input checked="" type="radio"/> PM <input type="radio"/>	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient). SCORE <u>2</u>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 <u>2</u> 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>7</u>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	20 19 18 17 16	15 14 13 12 11	10 9 8 <u>7</u> 6	5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) SCORE <u>0</u>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>8</u>	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	20 19 18 17 16	15 14 13 12 11	10 9 <u>8</u> 7 6	5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE _____	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>

Stream 2A-2 (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.					
SCORE 20	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.					Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.					Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.					Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.					
SCORE 6	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.					
SCORE 8 (LB)	Left Bank 10 9					8 7 6					5 4 3					2 1 0					
SCORE 8 (RB)	Right Bank 10 9					8 7 6					5 4 3					2 1 0					
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.					
SCORE 5 (LB)	Left Bank 10 9					8 7 6					5 4 3					2 1 0					
SCORE 5 (RB)	Right Bank 10 9					8 7 6					5 4 3					2 1 0					
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.					
SCORE 10 (LB)	Left Bank 10 9					8 7 6					5 4 3					2 1 0					
SCORE 10 (RB)	Right Bank 10 9					8 7 6					5 4 3					2 1 0					

Total Score 89

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 2A-3</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>	
STATION # <u> </u> RIVERMILE <u> </u>	STREAM CLASS <u>ephemeral</u>	
LAT <u>39°49'41.00"N</u> LONG <u>80°46'25.64"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # <u> </u>	AGENCY <u> </u>	
INVESTIGATORS <u>D. Godec, G. Gerke</u>		
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/11/11</u> TIME <u>6:30</u> AM <input checked="" type="radio"/> PM <input type="radio"/>	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). SCORE <u>8</u>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 12 11	10 9 <u>8</u> 7 6	5 4 3 2 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>9</u>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	20 19 18 17 16	15 14 13 12 11	10 <u>9</u> 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) SCORE <u>0</u>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>8</u>	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	20 19 18 17 16	15 14 13 12 11	10 9 <u>8</u> 7 6	5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>2</u>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 <u>2</u> 1 0

no flow

Stream 2A-3 (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>20</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE <u>7</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 <u>7</u> 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected. Note: determine left or right side by facing downstream.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	
SCORE <u>4</u> (LB)	Left Bank 10 9	8 7 6	5 <u>4</u> 3	2 1 0
SCORE <u>4</u> (RB)	Right Bank 10 9	8 7 6	5 <u>4</u> 3	2 1 0
9. Vegetative Protection (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
SCORE <u>2</u> (LB)	Left Bank 10 9	8 7 6	5 4 3	<u>2</u> 1 0
SCORE <u>2</u> (RB)	Right Bank 10 9	8 7 6	5 4 3	<u>2</u> 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
SCORE <u>10</u> (LB)	Left Bank <u>10</u> 9	8 7 6	5 4 3	2 1 0
SCORE <u>10</u> (RB)	Right Bank <u>10</u> 9	8 7 6	5 4 3	2 1 0

Total Score 86

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 2B</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Ephemeral</u>
LAT <u>39°49'37.38"N</u> LONG <u>80°46'25.71"W</u>	RIVER BASIN <u>Ohio River</u>
STORET # _____	AGENCY _____
INVESTIGATORS <u>D. Godec, G. Gerke</u>	
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/12/11</u> TIME <u>8:30</u> <u>AM</u> PM REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE <u>12</u>	20 19 18 17 16	15 14 13 <u>(12)</u> 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE <u>12</u>	20 19 18 17 16	15 14 13 <u>(12)</u> 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE <u>1</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 <u>(1)</u> 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE <u>11</u>	20 19 18 17 16	15 14 13 12 <u>(11)</u>	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <u>1</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 <u>(1)</u> 0

Parameters to be evaluated in sampling reach

no flow

Stream 2B (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.					
SCORE 20	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.					Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.					Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.					Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.					
SCORE 8	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.					
Note: determine left or right side by facing downstream.																					
SCORE 7 (LB)	Left Bank 10 9					8 7 6					5 4 3					2 1 0					
SCORE 7 (RB)	Right Bank 10 9					8 7 6					5 4 3					2 1 0					
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.					
SCORE 5 (LB)	Left Bank 10 9					8 7 6					5 4 3					2 1 0					
SCORE 5 (RB)	Right Bank 10 9					8 7 6					5 4 3					2 1 0					
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.					
SCORE 10 (LB)	Left Bank 10 9					8 7 6					5 4 3					2 1 0					
SCORE 10 (RB)	Right Bank 10 9					8 7 6					5 4 3					2 1 0					

Total Score 109

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

just above fresh pt.

STREAM NAME <u>Stream 3 (eph. portion)</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall County, WV</u>
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Ephemeral</u>
LAT <u>39°49'36.48"N</u> LONG <u>80°46'37.59"W</u>	RIVER BASIN <u>Ohio River</u>
STORET # _____	AGENCY _____
INVESTIGATORS <u>D. Godec, G. Gerke</u>	
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/12/11</u> AM <input checked="" type="radio"/> PM <input type="radio"/> REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE <u>11</u>	20 19 18 17 16	15 14 13 12 <u>11</u>	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE <u>10</u>	20 19 18 17 16	15 14 13 12 11	<u>10</u> 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE <u>0</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE <u>7</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 <u>7</u> 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <u>0</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>

Parameters to be evaluated in sampling reach

no flow

no flow or pools

Stream 3-ephemeral porton (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE 20	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE 7	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
SCORE 7 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 7 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
SCORE 10 (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 103

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 3</u>	LOCATION <u>Mitchell Landfill</u>	
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'34.80"N</u> LONG <u>84°46'34.00"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET #	AGENCY	
INVESTIGATORS <u>D. Godec, G. Gerke</u>		
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/12/11</u> TIME <u>5:00</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). SCORE <u>11</u>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). 20 19 18 17 16	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). 15 14 13 12 <u>11</u>	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. 10 9 8 7 6	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 5 4 3 2 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>15</u>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. 20 19 18 17 16	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. <u>15</u> 14 13 12 11	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. 10 9 8 7 6	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. 5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) SCORE <u>2</u>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) 20 19 18 17 16	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes). 15 14 13 12 11	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low). 10 9 8 7 6	Dominated by 1 velocity/depth regime (usually slow-deep). <i>slow shallow</i> 5 4 3 <u>2</u> 1 0
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>15</u>	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. 20 19 18 17 16	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools. <u>15</u> 14 13 12 11	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent. 10 9 8 7 6	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition. 5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>8</u>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. 20 19 18 17 16	Water fills >75% of the available channel; or <25% of channel substrate is exposed. 15 14 13 12 11	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed. 10 9 <u>8</u> 7 6	Very little water in channel and mostly present as standing pools. 5 4 3 2 1 0

Stream 3 (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration SCORE <u>20</u>	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) SCORE <u>5</u>	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream. SCORE <u>8</u> (LB) SCORE <u>8</u> (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) SCORE <u>8</u> (LB) SCORE <u>8</u> (RB)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE <u>10</u> (LB) SCORE <u>10</u> (RB)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
	Left Bank <u>10</u> 9	8 7 6	5 4 3	2 1 0
	Right Bank <u>10</u> 9	8 7 6	5 4 3	2 1 0

Total Score 118

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)**

STREAM NAME <u>Stream 3</u>	LOCATION <u>AEP Mitchell Landfill, Cresap, Marshall Co, W</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'34.80"N</u> LONG <u>80°46'34.80"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Godec, G. Gerke</u>		
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/12/11</u> TIME <u>5:20</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill</u>

WEATHER CONDITIONS	Now <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover <input checked="" type="checkbox"/> clear/sunny	Past 24 hours <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> % <input checked="" type="checkbox"/>	Has there been a heavy rain in the last 7 days? <input type="checkbox"/> Yes <input type="checkbox"/> No Air Temperature <u>27</u> °C Other _____
	SITE LOCATION/MAP Draw a map of the site and indicate the areas sampled (or attach a photograph) <p align="center">see photographs and figure 6 of the Jurisdictional Waters Delineation Report</p>		
STREAM CHARACTERIZATION	Stream Subsystem <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Intermittent <input type="checkbox"/> Tidal Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____		
	Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater Catchment Area _____ km ²		

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

Stream 3 - Intermittent Portion (cont.)

WATERSHED FEATURES	Predominant Surrounding Landuse <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other <input type="checkbox"/> Residential		Local Watershed NPS Pollution <input checked="" type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources
			Local Watershed Erosion <input checked="" type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous dominant species present <i>Sugar maple, white ash, spicebush, shagbark hickory, Polygonum multiflorum, Cleome, and multi plant rose</i>		
INSTREAM FEATURES	Estimated Reach Length <i>30.48</i> m <i>100 ft.</i> Estimated Stream Width <i>2.7</i> m <i>8-10 ft.</i> Sampling Reach Area <i>82.3</i> m ² Area in km ² (m ² x 1000) <i>0.000823</i> km ² Estimated Stream Depth <i>0.03</i> m <i>1 inch</i> Surface Velocity <i><0.1</i> m/sec (at thalweg) Canopy Cover <input checked="" type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <i>1.67</i> m <i>5-6 ft</i> Proportion of Reach Represented by Stream Morphology Types <input checked="" type="checkbox"/> Riffle <i>80</i> % <input checked="" type="checkbox"/> Run <i>10</i> % <input checked="" type="checkbox"/> Pool <i>10</i> % Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
LARGE WOODY DEBRIS	LWD <i>10</i> m ² Density of LWD <i>121566</i> m ² /km ² (LWD/ reach area)		
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present <i>Cleome, wood hettle, Impatiens capensis</i> Portion of the reach with aquatic vegetation <i>5</i> %		
WATER QUALITY	Temperature <i>16.8</i> °C <i>60°F</i> Specific Conductance <i>0.34</i> mS/cm Dissolved Oxygen <i>7.25</i> mg/L pH <i>6.75</i> Turbidity <i>47.1</i> WQ Instrument Used <i>Horiba</i> Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other Water Surface Oils <input checked="" type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other		
SEDIMENT/ SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other Deposits <i>N/A</i> <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		<i>10%</i>	Detritus	sticks, wood, coarse plant materials (CPOM)	<i><5%</i>
Boulder	> 256 mm (10")	<i>30%</i>			
Cobble	64-256 mm (2.5"-10")	<i>30%</i>	Muck-Mud	black, very fine organic (FPOM)	<i>0%</i>
Gravel	2-64 mm (0.1"-2.5")	<i>20%</i>			
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	<i>0%</i>
Silt	0.004-0.06 mm	<i>5%</i>			
Clay	< 0.004 mm (slick)	<i>5%</i>			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Stream 3</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'34.80"N</u> LONG <u>80°46'34.80"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Godek, G. Gerke</u>	LOT NUMBER _____	
FORM COMPLETED BY <u>D. Godek</u>	DATE <u>8/12/11</u> TIME <u>5:30</u> AM <input checked="" type="checkbox"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

HABITAT TYPES	Indicate the percentage of each habitat type present <input type="checkbox"/> Cobble <u>30</u> % <input checked="" type="checkbox"/> Snags <u>5</u> % <input checked="" type="checkbox"/> Vegetated Banks <u>5</u> % <input type="checkbox"/> Sand _____ % <input type="checkbox"/> Submerged Macrophytes _____ % <input type="checkbox"/> Other (_____) _____ %
SAMPLE COLLECTION	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input checked="" type="checkbox"/> Other <u>Gmb sample; Aquarium Net</u> How were the samples collected? <input checked="" type="checkbox"/> wading <input checked="" type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble _____ <input checked="" type="checkbox"/> Vegetated Banks _____ <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input checked="" type="checkbox"/> Other (<u>potholes, riffles</u>) _____
GENERAL COMMENTS	<u>N. dusky salamanders (adult) observed</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	<u>0</u>	1	2	3	4	Slimes	<u>0</u>	1	2	3	4
Filamentous Algae	<u>0</u>	1	2	3	4	Macroinvertebrates	0	<u>1</u>	2	3	4
Macrophytes	0	<u>1</u>	2	3	4	Fish	<u>0</u>	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	<u>Ephemeroptera</u>	0	<u>1</u>	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	<u>Trichoptera</u>	0	<u>1</u>	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
<u>Hirudinea</u>	0	<u>1</u>	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
<u>Amphipoda</u>	0	<u>1</u>	2	3	4	Tipulidae	0	1	2	3	4						
<u>Decapoda</u>	0	<u>1</u>	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culicidae	0	1	2	3	4						

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 3A</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall County, WV</u>		
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>Ephemeral</u>		
LAT <u>39°49'34.38"N</u> LONG <u>80°46'36.42"W</u>	RIVER BASIN <u>Ohio River</u>		
STORET #	AGENCY		
INVESTIGATORS <u>D. Godec, G. Gerke</u>			
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/12/11</u> TIME <u>4:30</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>	

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient). SCORE <u>7</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 <u>7</u> 6	5 4 3 2 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>11</u>	20 19 18 17 16	15 14 13 12 <u>11</u>	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) SCORE <u>0</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>11</u>	20 19 18 17 16	15 14 13 12 <u>11</u>	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>2</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 <u>2</u> 1 0

Parameters to be evaluated in sampling reach

No flow

couple shallow small pools present

Stream 3A (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
SCORE <u>20</u>	<u>20</u> 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
SCORE <u>6</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 <u>6</u>	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream. SCORE <u>8</u> (LB) SCORE <u>8</u> (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
Left Bank	10 9	<u>8</u> 7 6	5 4 3	2 1 0
Right Bank	10 9	<u>8</u> 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
Left Bank	10 9	<u>8</u> 7 6	5 4 3	2 1 0
Right Bank	10 9	<u>8</u> 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
Left Bank	<u>10</u> 9	8 7 6	5 4 3	2 1 0
Right Bank	<u>10</u> 9	8 7 6	5 4 3	2 1 0

Total Score 109

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 3B</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>	
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>ephemeral</u>	
LAT <u>39°49'37.35"N</u> LONG <u>80°46'38.09"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET #	AGENCY	
INVESTIGATORS <u>D. Godec, G. Gerke</u>		
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/12/11</u> TIME <u>4:00</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE <u>7</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 <u>7</u> 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE <u>14</u>	20 19 18 17 16	15 <u>14</u> 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE <u>0</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE <u>14</u>	20 19 18 17 16	15 <u>14</u> 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <u>0</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>

Parameters to be evaluated in sampling reach

No flow

No flow or pools

Stream 3B (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration SCORE <u>20</u>	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) SCORE <u>2</u>	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 (2) 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream. SCORE <u>7</u> (LB) SCORE <u>7</u> (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
	Left Bank 10 9	8 (7) 6	5 4 3	2 1 0
	Right Bank 10 9	8 (7) 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) SCORE <u>6</u> (LB) SCORE <u>6</u> (RB)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 (6)	5 4 3	2 1 0
	Right Bank 10 9	8 7 (6)	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE <u>10</u> (LB) SCORE <u>10</u> (RB)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 103

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 4</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>Ephemeral</u>
LAT <u>39°49'30.66"N</u> LONG <u>80°46'29.36"W</u>	RIVER BASIN <u>Ohio River</u>
STORET #	AGENCY
INVESTIGATORS <u>D. Godec, G. Gerke</u>	
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/12/11</u> TIME <u>6:06</u> AM <input checked="" type="radio"/> PM <input type="radio"/> REASON FOR SURVEY <u>AEF Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE <u>13</u>	20 19 18 17 16	15 14 <u>(13)</u> 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE <u>13</u>	20 19 18 17 16	15 14 <u>(13)</u> 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE <u>0</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>(0)</u>
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE <u>13</u>	20 19 18 17 16	15 14 <u>(13)</u> 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <u>0</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>(0)</u>

Parameters to be evaluated in sampling reach

No flow

No flow or Pools

Stream 4 (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>20</u>	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE <u>6</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream. SCORE <u>8</u> (LB) SCORE <u>8</u> (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
Left Bank	10 9	(8) 7 6	5 4 3	2 1 0
Right Bank	10 9	(8) 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) SCORE <u>5</u> (LB) SCORE <u>5</u> (RB)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
Left Bank	10 9	8 7 6	(5) 4 3	2 1 0
Right Bank	10 9	8 7 6	(5) 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE <u>10</u> (LB) SCORE <u>10</u> (RB)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
Left Bank	(10) 9	8 7 6	5 4 3	2 1 0
Right Bank	(10) 9	8 7 6	5 4 3	2 1 0

Total Score 111

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 5</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>ephemeral</u>	
LAT <u>39°49'26.08"N</u> LONG <u>80°46'34.04"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Godec, G. Gerke</u>		
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/13/11</u> TIME <u>8:30</u> <input checked="" type="radio"/> AM <input type="radio"/> PM	REASON FOR SURVEY <u>AFR Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover, mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient). SCORE <u>12</u>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover, mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 <u>12</u> 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>15</u>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	20 19 18 17 16	<u>15</u> 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) SCORE <u>0</u>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>13</u>	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	20 19 18 17 16	15 14 <u>13</u> 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>0</u>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>

No flow

No flow or pools

Stream 5 (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>20</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE <u>6</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream. SCORE <u>7</u> (LB) SCORE <u>7</u> (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
	Left Bank 10 9 8 7 6	5 4 3 2 1 0		
	Right Bank 10 9 8 7 6	5 4 3 2 1 0		
9. Vegetative Protection (score each bank) SCORE <u>5</u> (LB) SCORE <u>5</u> (RB)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9 8 7 6	5 4 3 2 1 0		
	Right Bank 10 9 8 7 6	5 4 3 2 1 0		
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE <u>10</u> (LB) SCORE <u>10</u> (RB)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
	Left Bank 10 9 8 7 6	5 4 3 2 1 0		
	Right Bank 10 9 8 7 6	5 4 3 2 1 0		

Total Score 110

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 6</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>	
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>Ephemeral</u>	
LAT <u>39°49'22.21"N</u> LONG <u>80°46'27.31"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET #	AGENCY	
INVESTIGATORS <u>D. Godec, G. Gerke</u>		
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/18/11</u> TIME <u>10:30</u> <u>AM</u> <u>PM</u>	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE <u>2</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 <u>2</u> 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE <u>11</u>	20 19 18 17 16	15 14 13 12 <u>11</u>	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE <u>0</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE <u>11</u>	20 19 18 17 16	15 14 13 12 <u>11</u>	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <u>0</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>

Parameters to be evaluated in sampling reach

No flow

No flow

Stream 6 (ephemeral portion) - cont.

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>20</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE <u>1</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream. SCORE <u>4</u> (LB) SCORE <u>4</u> (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) SCORE <u>2</u> (LB) SCORE <u>2</u> (RB)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE <u>10</u> (LB) SCORE <u>10</u> (RB)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
	Left Bank <u>10</u> 9	8 7 6	5 4 3	2 1 0
	Right Bank <u>10</u> 9	8 7 6	5 4 3	2 1 0

Total Score 77

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream G</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>		
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>Intermittent</u>		
LAT <u>39°49'22.02"W</u> LONG <u>80°46'29.45"W</u>	RIVER BASIN <u>Ohio River</u>		
STORET #	AGENCY		
INVESTIGATORS <u>D. Goder, G. Gerke</u>			
FORM COMPLETED BY <u>D. Goder</u>	DATE <u>8/13/11</u> TIME <u>10:30</u> <u>AM</u> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>	

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE <u>11</u>	20 19 18 17 16	15 14 13 12 <u>11</u>	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE <u>13</u>	20 19 18 17 16	15 14 <u>13</u> 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE <u>2</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 <u>2</u> 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE <u>13</u>	20 19 18 17 16	15 14 <u>13</u> 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <u>9</u>	20 19 18 17 16	15 14 13 12 11	10 <u>9</u> 8 7 6	5 4 3 2 1 0

Stream 6 (intermittent portion) - cont.

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.					
SCORE <u>20</u>	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.					Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.					Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.					Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.					
SCORE <u>8</u>	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected. Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.					
SCORE <u>6</u> (LB)	Left Bank 10 9 8 7 6					8 7 6					5 4 3					2 1 0					
SCORE <u>8</u> (RB)	Right Bank 10 9 8 7 6					8 7 6					5 4 3					2 1 0					
9. Vegetative Protection (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.					
SCORE <u>2</u> (LB)	Left Bank 10 9 8 7 6					8 7 6					5 4 3					2 1 0					
SCORE <u>2</u> (RB)	Right Bank 10 9 8 7 6					8 7 6					5 4 3					2 1 0					
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.					
SCORE <u>10</u> (LB)	Left Bank 10 9 8 7 6					8 7 6					5 4 3					2 1 0					
SCORE <u>10</u> (RB)	Right Bank 10 9 8 7 6					8 7 6					5 4 3					2 1 0					

Total Score 116

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)**

STREAM NAME <u>Stream 6</u>	LOCATION <u>AEP Mitchell Landfill, Gasap, Marshall Co, WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'22.02"N</u> LONG <u>80°46'29.45"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Godec, G. Gerke</u>		
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/13/11</u> TIME <u>10:30</u> <u>AM</u> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

WEATHER CONDITIONS	<p>Now</p> <p><input type="checkbox"/> storm (heavy rain)</p> <p><input type="checkbox"/> rain (steady rain)</p> <p><input type="checkbox"/> showers (intermittent)</p> <p><input type="checkbox"/> %cloud cover _____</p> <p><input type="checkbox"/> clear/sunny</p>	<p>Past 24 hours</p> <p><input type="checkbox"/> storm (heavy rain)</p> <p><input type="checkbox"/> rain (steady rain)</p> <p><input type="checkbox"/> showers (intermittent)</p> <p><input type="checkbox"/> %cloud cover _____</p> <p><input type="checkbox"/> clear/sunny</p>	<p>Has there been a heavy rain in the last 7 days?</p> <p><input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Air Temperature _____ °C</p> <p>Other _____</p>
	<p>SITE LOCATION/MAP</p> <p>Draw a map of the site and indicate the areas sampled (or attach a photograph)</p> <p align="center"><u>see photographs and Figure 5 of the Jurisdictional Waters Delineation Report</u></p>		
STREAM CHARACTERIZATION	<p>Stream Subsystem</p> <p><input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Intermittent <input type="checkbox"/> Tidal</p> <p>Stream Origin</p> <p><input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed</p> <p><input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins</p> <p><input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____</p> <p>Stream Type</p> <p><input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater</p> <p>Catchment Area _____ km²</p>		

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

Stream 6 (cont.)

WATERSHED FEATURES	Predominant Surrounding Landuse <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other <input type="checkbox"/> Residential Local Watershed NPS Pollution <input checked="" type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources Local Watershed Erosion <input checked="" type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous dominant species present <u>Sugar maple, basswood, Am. beech, spice bush, Aster sp.,</u> <i>Christmas fern, white ash, boxelder</i>
INSTREAM FEATURES	Estimated Reach Length <u>30.6</u> m Estimated Stream Width <u>1.0</u> m Sampling Reach Area <u>30.6</u> m ² Area in km ² (m ² x1000) <u>0.000306</u> km ² Estimated Stream Depth <u>0.03</u> m <u>1</u> inch Surface Velocity <u>0.05</u> m/sec Canopy Cover <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <u>2.9</u> m Proportion of Reach Represented by Stream Morphology Types <input type="checkbox"/> Riffle <u>90</u> % <input type="checkbox"/> Run <u>5</u> % <input type="checkbox"/> Pool <u>5</u> % Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
LARGE WOODY DEBRIS	LWD <u>3</u> m ³ Density of LWD <u>98039.2</u> m ² /km ² (LWD/ reach area)
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present <u>None present</u> Portion of the reach with aquatic vegetation <u>0</u> %
WATER QUALITY	Temperature <u>17.8</u> °C Specific Conductance <u>412</u> µS/cm Dissolved Oxygen <u>5.30</u> mg/L pH <u>6.48</u> Turbidity <u>2.95</u> WQ Instrument Used <u>Horiba</u> Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other
SEDIMENT/SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other Deposits <u>None</u> <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		<u>10%</u>	Detritus	sticks, wood, coarse plant materials (CPOM)	<u><5%</u>
Boulder	> 256 mm (10")	<u>10%</u>	Muck-Mud	black, very fine organic (FPOM)	<u>0%</u>
Cobble	64-256 mm (2.5"-10")	<u>60%</u>			
Gravel	2-64 mm (0.1"-2.5")	<u>10%</u>			
Sand	0.06-2mm (gritty)				
Silt	0.004-0.06 mm		Marl	grey, shell fragments	<u>0%</u>
Clay	< 0.004 mm (slick)	<u>10%</u>			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Stream G</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'22.02"N</u> LONG <u>80°46'29.45"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Godlec, G. Gerke</u>	LOT NUMBER _____	
FORM COMPLETED BY <u>D. Godlec</u>	DATE <u>8/13/11</u> TIME <u>10:30</u> <u>AM</u> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>60</u> % <input type="checkbox"/> Snags _____ % <input type="checkbox"/> Vegetated Banks _____ % <input type="checkbox"/> Sand _____ % <input type="checkbox"/> Submerged Macrophytes _____ % <input checked="" type="checkbox"/> Other (<u>Pools</u>) <u>5</u> %
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input checked="" type="checkbox"/> Other <u>Aquarium net, grab sample</u> How were the samples collected? <input checked="" type="checkbox"/> wading <input checked="" type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble _____ <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks _____ <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input checked="" type="checkbox"/> Other (<u>pools</u>) _____
GENERAL COMMENTS	<u>N. DUSKY Salamanders (adult)</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	<u>0</u>	1	2	3	4	Slimes	<u>0</u>	1	2	3	4
Filamentous Algae	<u>0</u>	1	2	3	4	Macroinvertebrates	<u>0</u>	<u>1</u>	2	3	4
Macrophytes	<u>0</u>	1	2	3	4	Fish	<u>0</u>	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	<u>1</u>	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 7</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Ephemeral</u>	
LAT <u>39°49'32.00"N</u> LONG <u>80°46'35.27"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Goddec, G. Gerke</u>		
FORM COMPLETED BY <u>D. Goddec</u>	DATE <u>8/13/11</u> TIME <u>1:00</u> AM <input checked="" type="radio"/> PM <input type="radio"/>	REASON FOR SURVEY <u>AFIP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient). SCORE <u>11</u>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and <u>not</u> transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>13</u>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) SCORE <u>0</u>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>8</u>	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>0</u>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Parameters to be evaluated in sampling reach

No flow

No flow
pools

Stream 7 (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration SCORE <u>20</u>	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) SCORE <u>7</u>	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.
	20 19 18 17 16	15 14 13 12 11	10 9 8 <u>7</u> 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream. SCORE <u>7</u> (LB) SCORE <u>7</u> (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
	Left Bank 10 9	8 <u>7</u> 6	5 4 3	2 1 0
	Right Bank 10 9	8 <u>7</u> 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) SCORE <u>7</u> (LB) SCORE <u>7</u> (RB)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 <u>7</u> 6	5 4 3	2 1 0
	Right Bank 10 9	8 <u>7</u> 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE <u>10</u> (LB) SCORE <u>10</u> (RB)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
	Left Bank <u>10</u> 9	8 7 6	5 4 3	2 1 0
	Right Bank <u>10</u> 9	8 7 6	5 4 3	2 1 0

Total Score 107

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 8</u>	LOCATION <u>Mitchell Landfill Project, Cresap, Marshall Co., WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Ephemera</u>	
LAT <u>39°49'54.19"N</u> LONG <u>80°46'12.81"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Godec, G. Gerke</u>		
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/13/11</u> TIME <u>5:15</u> AM <input checked="" type="radio"/> PM <input type="radio"/>	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient). SCORE <u>6</u>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6 <u>6</u>	5 4 3 2 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>12</u>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	20 19 18 17 16	15 14 13 <u>12</u> 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) SCORE <u>0</u>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>11</u>	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	20 19 18 17 16	15 14 13 12 <u>11</u>	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>0</u>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>

Stream 8 - ephemeral portion (cont.)
HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>19</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE <u>3</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected. Note: determine left or right side by facing downstream.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	
SCORE <u>7</u> (LB)	Left Bank 10 9 8 7 6	5 4 3 2 1 0		
SCORE <u>7</u> (RB)	Right Bank 10 9 8 7 6	5 4 3 2 1 0		
9. Vegetative Protection (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
SCORE <u>6</u> (LB)	Left Bank 10 9 8 7 6	5 4 3 2 1 0		
SCORE <u>6</u> (RB)	Right Bank 10 9 8 7 6	5 4 3 2 1 0		
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
SCORE <u>10</u> (LB)	Left Bank 10 9 8 7 6	5 4 3 2 1 0		
SCORE <u>10</u> (RB)	Right Bank 10 9 8 7 6	5 4 3 2 1 0		

Total Score 97

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

Just upstream of confluence with Stream 10

STREAM NAME <u>Stream 8</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>
LAT <u>39°49'47.75"N</u> LONG <u>80°46'12.75"W</u>	RIVER BASIN <u>Ohio River</u>
STORET # _____	AGENCY _____
INVESTIGATORS <u>D. Godec, G. Gerke</u>	
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/14/11</u> TIME <u>2:00</u> AM <input checked="" type="radio"/> PM <input type="radio"/> REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE <u>13</u>	20 19 18 17 16	15 14 <u>13</u> 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE <u>16</u>	20 19 18 17 <u>16</u>	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE <u>8</u>	20 19 18 17 16	15 14 13 12 11	10 9 <u>8</u> 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE <u>13</u>	20 19 18 17 16	15 14 <u>13</u> 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <u>8</u>	20 19 18 17 16	15 14 13 12 11	10 9 <u>8</u> 7 6	5 4 3 2 1 0

Stream 8 just upstream of Stream 10 (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE 20	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE 16	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream. SCORE 7 (LB) SCORE 7 (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
	Left Bank 10 9 8 7 6	5 4 3 2 1 0		
	Right Bank 10 9 8 7 6	5 4 3 2 1 0		
9. Vegetative Protection (score each bank) SCORE 5 (LB) SCORE 5 (RB)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9 8 7 6	5 4 3 2 1 0		
	Right Bank 10 9 8 7 6	5 4 3 2 1 0		
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE 10 (LB) SCORE 10 (RB)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
	Left Bank 10 9 8 7 6	5 4 3 2 1 0		
	Right Bank 10 9 8 7 6	5 4 3 2 1 0		

Total Score **138**

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)**

Stream 8 just upstream of Stream 10

STREAM NAME <u>Stream 8</u>	LOCATION <u>AEP Mitchell Landfill, Cresap, Marshall Co, WV</u>
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>
LAT <u>39°49'47.75"N</u> LONG <u>80°40'12.75"W</u>	RIVER BASIN _____
STORET # _____	AGENCY _____
INVESTIGATORS <u>D. Godec, G. Gerke</u>	
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/14/11</u> TIME <u>2:00</u> AM <input checked="" type="radio"/> PM REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

WEATHER CONDITIONS	<div> <div> <p>Now</p> <p><input type="checkbox"/> storm (heavy rain)</p> <p><input type="checkbox"/> rain (steady rain)</p> <p><input checked="" type="checkbox"/> 75% showers (intermittent)</p> <p><input type="checkbox"/> %cloud cover</p> <p><input type="checkbox"/> clear/sunny</p> </div> <div> <p>Past 24 hours</p> <p><input type="checkbox"/></p> <p><input checked="" type="checkbox"/> 80% <input type="checkbox"/></p> </div> <div> <p>Has there been a heavy rain in the last 7 days?</p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Air Temperature <u>23</u> °C</p> <p>Other _____</p> </div> </div>
SITE LOCATION/MAP	<p>Draw a map of the site and indicate the areas sampled (or attach a photograph)</p> <p align="center">see photographs and figure 5 of Jurisdictional Waters Delineation Report</p>
STREAM CHARACTERIZATION	<div> <div> <p>Stream Subsystem</p> <p><input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Intermittent <input type="checkbox"/> Tidal</p> </div> <div> <p>Stream Type</p> <p><input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater</p> </div> </div> <div> <p>Stream Origin</p> <p><input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed</p> <p><input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins</p> <p><input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____</p> </div> <p>Catchment Area _____ km²</p>

Stream 8 just upstream of Stream 10

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		Local Watershed NPS Pollution <input checked="" type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources Local Watershed Erosion <input checked="" type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous dominant species present <u>sugar maple, beech, spicebush, wood nettle, basswood, ferns</u>		
INSTREAM FEATURES	Estimated Reach Length <u>30.48 m 100 ft.</u> Estimated Stream Width <u>1.83 m 6 ft.</u> Sampling Reach Area <u>55.77 m²</u> Area in km ² (m ² x 1000) <u>0.000558 km²</u> Estimated Stream Depth <u>0.40 - 0.8 m 0.5 - 3 ft.</u> Surface Velocity <u>0.07 m/sec</u> Canopy Cover <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input checked="" type="checkbox"/> Shaded High Water Mark <u>1.83 m 6 ft.</u> Proportion of Reach Represented by Stream Morphology Types <input checked="" type="checkbox"/> Riffle <u>20 %</u> <input checked="" type="checkbox"/> Run <u>20 %</u> <input checked="" type="checkbox"/> Pool <u>20 %</u> Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
LARGE WOODY DEBRIS	LWD <u>4 m²</u> Density of LWD <u>7104.5 m²/km²</u> (LWD/ reach area)		
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present <u>N/A</u> Portion of the reach with aquatic vegetation <u>0 %</u>		
WATER QUALITY	Temperature <u>18.42° C</u> Specific Conductance <u>0.309 mS/cm</u> Dissolved Oxygen <u>6.25 mg/L</u> pH <u>7.34</u> Turbidity <u>91.6</u> WQ Instrument Used <u>Horiba U-52</u> Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input checked="" type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____		
SEDIMENT/SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Deposits <u>None</u> <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	45%
Boulder	> 256 mm (10")	30%			
Cobble	64-256 mm (2.5"-10")	30%	Muck-Mud	black, very fine organic (FPOM)	0%
Gravel	2-64 mm (0.1"-2.5")	35%			
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	0%
Silt	0.004-0.06 mm	5%			
Clay	< 0.004 mm (slick)				

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

Just upstream of confluence with Stream 10

STREAM NAME <u>Stream 8</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>
LAT <u>39°49'47.5"N</u> LONG <u>80°46'12.75"W</u>	RIVER BASIN <u>Ohio River</u>
STORET # _____	AGENCY _____
INVESTIGATORS <u>D. Godee, G. Gerke</u>	LOT NUMBER _____
FORM COMPLETED BY <u>D. Godee</u>	DATE <u>8/14/11</u> TIME <u>2:00</u> AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>
	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>30</u> % <input checked="" type="checkbox"/> Snags <u><5</u> % <input type="checkbox"/> Vegetated Banks _____ % <input type="checkbox"/> Sand _____ % <input type="checkbox"/> Submerged Macrophytes _____ % <input checked="" type="checkbox"/> Other (<u>riffles, pools</u>) _____ %
SAMPLE COLLECTION	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input checked="" type="checkbox"/> Other <u>Grab sample; Aquavum net</u> How were the samples collected? <input checked="" type="checkbox"/> wading <input checked="" type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble _____ <input checked="" type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks _____ <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input checked="" type="checkbox"/> Other (<u>riffles, pools</u>) _____
GENERAL COMMENTS	<u>N. Dusky Salamanders (adults)</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	<u>0</u>	1	2	3	4	Slimes	<u>0</u>	1	2	3	4
Filamentous Algae	<u>0</u>	1	2	3	4	Macroinvertebrates	<u>0</u>	1	2	<u>3</u>	4
Macrophytes	<u>0</u>	1	2	3	4	Fish	<u>0</u>	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	<u>Ephemeroptera</u>	0	1	2	<u>3</u>	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	<u>Trichoptera</u>	0	1	2	<u>3</u>	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culicidae	0	1	2	3	4						

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

Downstream Sample Reach

STREAM NAME <u>Stream 8</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>Intermittent</u>
LAT <u>39°49'36.74"</u> LONG <u>80°46'0.51"</u>	RIVER BASIN <u>Ohio River</u>
STORET #	AGENCY
INVESTIGATORS <u>D. Godee, G. Gerke</u>	
FORM COMPLETED BY <u>D. Godee</u>	DATE <u>8/14/11</u> TIME <u>7:00</u> AM <input checked="" type="radio"/> PM <input type="radio"/> REASON FOR SURVEY <u>AEP Mitchell Landfill</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE <u>15</u>	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE <u>16</u>	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low). <u>fast shallow slow deep</u>	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE <u>10</u>	20 19 18 17 16	15 14 13 12 11	(10) 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE <u>14</u>	20 19 18 17 16	15 (14) 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <u>8</u>	20 19 18 17 16	15 14 13 12 11	10 9 (8) 7 6	5 4 3 2 1 0

Stream 8 (Downstream Sample Reach) - cont.
HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.					
SCORE <u>20</u>	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.					Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.					Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.					Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.					
SCORE <u>18</u>	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected. Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.					
SCORE <u>7</u> (LB)	Left Bank 10 9 8 7 6					8 7 6					5 4 3					2 1 0					
SCORE <u>7</u> (RB)	Right Bank 10 9 8 7 6					8 7 6					5 4 3					2 1 0					
9. Vegetative Protection (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.					
SCORE <u>9</u> (LB)	Left Bank 10 9 8 7 6					8 7 6					5 4 3					2 1 0					
SCORE <u>9</u> (RB)	Right Bank 10 9 8 7 6					8 7 6					5 4 3					2 1 0					
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.					
SCORE <u>10</u> (LB)	Left Bank 10 9 8 7 6					8 7 6					5 4 3					2 1 0					
SCORE <u>10</u> (RB)	Right Bank 10 9 8 7 6					8 7 6					5 4 3					2 1 0					

Total Score 153

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)**

Downstream Sample Reach

STREAM NAME <u>Stream 8</u>	LOCATION <u>Mitchell Landfill, Marshall Co., WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'36.74"</u> LONG <u>80°46'0.51"</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Goddec, G. Gerke</u>		
FORM COMPLETED BY <u>D. Goddec</u>	DATE <u>8/14/11</u> TIME <u>7:00</u> AM <input checked="" type="checkbox"/> PM <input type="checkbox"/>	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

WEATHER CONDITIONS	Now <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input checked="" type="checkbox"/> 50% showers (intermittent) <input type="checkbox"/> %cloud cover <input type="checkbox"/> clear/sunny	Past 24 hours <input type="checkbox"/> <input checked="" type="checkbox"/> % <input checked="" type="checkbox"/>	Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Air Temperature <u>75</u> °C Other <u>light rain at times</u>
	SITE LOCATION/MAP Draw a map of the site and indicate the areas sampled (or attach a photograph) <p align="center"><i>See Figure 5 from Jurisdictional Waters Delineation Report and photographs in Appendix B</i></p>		
STREAM CHARACTERIZATION	Stream Subsystem <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Intermittent <input type="checkbox"/> Tidal Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input checked="" type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____ Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater Catchment Area _____ km ²		

Stream 8 sample reach upstream of project boundary

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		Local Watershed NPS Pollution <input checked="" type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources Local Watershed Erosion <input checked="" type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous dominant species present <u>Basswood, sugar maple, Am. elm, Spicebush, Impatiens capensis, Wood nettle</u>		
INSTREAM FEATURES	Estimated Reach Length <u>30.48</u> m 100 ft. Estimated Stream Width <u>4.6</u> m 15 ft. Sampling Reach Area <u>140.28</u> m ² Area in km ² (m ² x 1000) <u>0.00143</u> km ² Estimated Stream Depth <u>0.37</u> m 1-3 inch Surface Velocity <u>0.2</u> m/sec (at thalweg) Canopy Cover <input checked="" type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <u>3 - 4.6</u> m 10-15 ft. Proportion of Reach Represented by Stream Morphology Types <input type="checkbox"/> Riffle <u>90</u> % <input type="checkbox"/> Run <u>0</u> % <input type="checkbox"/> Pool <u>10</u> % Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
LARGE WOODY DEBRIS	LWD <u>10</u> m ² Density of LWD <u>0.9930</u> m ² /km ² (LWD/ reach area)		
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation <u>0</u> %		
WATER QUALITY	Temperature <u>18.57</u> °C Specific Conductance <u>0.267</u> mS/cm Dissolved Oxygen <u>7.09</u> mg/L pH <u>7.16</u> Turbidity <u>34.9</u> WQ Instrument Used <u>HoriPa U-52</u> Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____		
SEDIMENT/ SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Deposits <u>None</u> <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	5%
Boulder	> 256 mm (10")	30%			
Cobble	64-256 mm (2.5"-10")	40%	Muck-Mud	black, very fine organic (FPOM)	0%
Gravel	2-64 mm (0.1"-2.5")	25%			
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	0%
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)				

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

Near Project Boundary (downstream sample reach)

STREAM NAME <u>Stream 8</u>	LOCATION <u>Mitchell Landfill, Marshall Co., WV</u>
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>Intermittent</u>
LAT <u>39°49'36.74"N</u> LONG <u>80°46'0.51"W</u>	RIVER BASIN <u>Ohio River</u>
STORET #	AGENCY
INVESTIGATORS <u>D. Godec, G. Gerke</u>	LOT NUMBER
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/14/11</u> TIME <u>7:00</u> AM <input checked="" type="radio"/> PM <input type="radio"/>
REASON FOR SURVEY	

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u> </u> % <input checked="" type="checkbox"/> Snags <u>5</u> % <input type="checkbox"/> Vegetated Banks <u>0</u> % <input type="checkbox"/> Sand <u> </u> % <input type="checkbox"/> Submerged Macrophytes <u>0</u> % <input type="checkbox"/> Other (riffs, pools) <u> </u> %
SAMPLE COLLECTION	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input checked="" type="checkbox"/> Other <u>Grab sample, Aquarium net</u> How were the samples collected? <input checked="" type="checkbox"/> wading <input checked="" type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble <u> </u> <input checked="" type="checkbox"/> Snags <u> </u> <input type="checkbox"/> Vegetated Banks <u> </u> <input type="checkbox"/> Sand <u> </u> <input type="checkbox"/> Submerged Macrophytes <u> </u> <input checked="" type="checkbox"/> Other (riffs, pools) <u> </u>
GENERAL COMMENTS	<u>most aquatic life present in deeper pools</u> <u>N. Dusky Salamanders (adults)</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	<u>1</u>	2	3	4	Slimes	<u>0</u>	1	2	3	4
Filamentous Algae	<u>0</u>	1	2	3	4	Macroinvertebrates	0	1	2	<u>3</u>	4
Macrophytes	<u>0</u>	1	2	3	4	Fish	<u>0</u>	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	<u>3</u>	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	<u>2</u>	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	<u>1</u>	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	<u>4</u>	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 8A</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>		
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Ephemeral</u>		
LAT <u>39° 49' 54.69" N</u> LONG <u>80° 46' 12.87" W</u>	RIVER BASIN <u>Ohio River</u>		
STORET # _____	AGENCY _____		
INVESTIGATORS <u>D. Godec, G. Gerke</u>			
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/13/11</u> TIME <u>5:30</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>	

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient). SCORE <u>6</u>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>13</u>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) SCORE <u>0</u>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>8</u>	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>0</u>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0

Parameters to be evaluated in sampling reach

No Flow

No Flow or Pools

Stream 8A - ephemeral portion (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>20</u>	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE <u>6</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 <u>6</u>	5 4 3 2 1 0
8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected. Note: determine left or right side by facing downstream.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	
SCORE <u>7</u> (LB)	Left Bank 10 9	8 <u>7</u> 6	5 4 3	2 1 0
SCORE <u>7</u> (RB)	Right Bank 10 9	8 <u>7</u> 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
SCORE <u>7</u> (LB)	Left Bank 10 9	8 <u>7</u> 6	5 4 3	2 1 0
SCORE <u>7</u> (RB)	Right Bank 10 9	8 <u>7</u> 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
SCORE <u>10</u> (LB)	Left Bank <u>10</u> 9	8 7 6	5 4 3	2 1 0
SCORE <u>10</u> (RB)	Right Bank <u>10</u> 9	8 7 6	5 4 3	2 1 0

Total Score 101

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 8A</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>	
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'53.42"N</u> LONG <u>80°46'12.70"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET #	AGENCY	
INVESTIGATORS <u>D. Godec, G. Gerke</u>		
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/13/11</u> TIME <u>6:30</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.	
SCORE <u>12</u>	20 19 18 17 16	15 14 13 <u>12</u> 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.	
SCORE <u>19</u>	20 <u>19</u> 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).	
SCORE <u>2</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 <u>2</u> 1 0
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.	
SCORE <u>16</u>	20 19 18 17 <u>16</u>	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.	
SCORE <u>6</u>	20 19 18 17 16	15 14 13 12 11	10 9 <u>8</u> 7 <u>6</u>	5 4 3 2 1 0

Stream 8A Intermittent Portion (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.						Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.					
SCORE 20	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.						Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.					Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.					Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.					
SCORE 6	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream.	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.					
SCORE 9 (LB)	Left Bank 10 9					8 7 6					5 4 3					2 1 0					
SCORE 9 (RB)	Right Bank 10 9					8 7 6					5 4 3					2 1 0					
9. Vegetative Protection (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.										
SCORE 6 (LB)	Left Bank 10 9					8 7 6					5 4 3					2 1 0					
SCORE 6 (RB)	Right Bank 10 9					8 7 6					5 4 3					2 1 0					
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally. <i>logged relatively recently (<10 years)</i>					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.										
SCORE 8 (LB)	Left Bank 10 9					8 7 6					5 4 3					2 1 0					
SCORE 8 (RB)	Right Bank 10 9					8 7 6					5 4 3					2 1 0					

Total Score **127**

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)**

STREAM NAME <u>Stream 8A</u>	LOCATION <u>AEP Mitchell Landfill, Cresap, Marshall Co. WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'53.42"N</u> LONG <u>80°46'12.70"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Godec, G. Gerke</u>		
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/13/11</u> TIME <u>6:30</u> AM <input checked="" type="radio"/> PM <input type="radio"/>	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

WEATHER CONDITIONS	<p>Now</p> <p><input type="checkbox"/> storm (heavy rain)</p> <p><input type="checkbox"/> rain (steady rain)</p> <p><input checked="" type="checkbox"/> showers (intermittent)</p> <p><u>45</u> % <input checked="" type="checkbox"/> %cloud cover</p> <p><input type="checkbox"/> clear/sunny</p> <p>Past 24 hours</p> <p><input type="checkbox"/> storm (heavy rain)</p> <p><input type="checkbox"/> rain (steady rain)</p> <p><input checked="" type="checkbox"/> showers (intermittent)</p> <p><input type="checkbox"/> %cloud cover</p> <p><input checked="" type="checkbox"/> clear/sunny</p> <p>Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Air Temperature <u>27.8</u> °C</p> <p>Other _____</p>
SITE LOCATION/MAP	<p>Draw a map of the site and indicate the areas sampled (or attach a photograph)</p> <p align="center"><u>see photographs & figure 5 of the jurisdictional waters delineation report</u></p>
STREAM CHARACTERIZATION	<p>Stream Subsystem <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Intermittent <input type="checkbox"/> Tidal</p> <p>Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____</p> <p>Stream Type <input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater</p> <p>Catchment Area _____ km²</p>

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET

(BACK)

Stream 8A (cont.) - Intermittent Portion

WATERSHED FEATURES	Predominant Surrounding Landuse <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		Local Watershed NPS Pollution <input checked="" type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources	
			Local Watershed Erosion <input checked="" type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy	
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous dominant species present <u>Carya ovalis, Spicebush, Multiflora rose, Christmas fern,</u>			
INSTREAM FEATURES	Estimated Reach Length <u>30.48 m 100 ft.</u> Estimated Stream Width <u>1.5 m 5 ft.</u> Sampling Reach Area <u>45.72 m²</u> Area in km² (m² x 1000) <u>0.00046 km²</u> Estimated Stream Depth <u>0.0127 m 0.5 inch</u> Surface Velocity <u>0.05 m/sec</u>		Canopy Cover <input type="checkbox"/> Partly open <input checked="" type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <u>1.5 m 5 ft.</u> Proportion of Reach Represented by Stream Morphology Types <input checked="" type="checkbox"/> Riffle <u>90</u> % <input type="checkbox"/> Run <u>10</u> % <input checked="" type="checkbox"/> Pool <u>0</u> % Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
LARGE WOODY DEBRIS	LWD <u>2</u> m² Density of LWD <u>6521.4</u> m²/km² (LWD/ reach area)			
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation <u>0</u> %			
WATER QUALITY	Temperature <u>20.44</u> °C Specific Conductance <u>0.335</u> mS/cm Dissolved Oxygen <u>4.98</u> mg/L pH <u>6.6</u> Turbidity <u>175</u> WQ Instrument Used <u>Hanna U-52</u>		Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____	
SEDIMENT/ SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse		Deposits <u>None</u> <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Looking at stones which are not deeply embedded, are the undersides black in color? <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

sugar maple, white sucker root, Impatiens capensis,

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		40%	Detritus	sticks, wood, coarse plant materials (CPOM)	<5%
Boulder	> 256 mm (10")	20%			
Cobble	64-256 mm (2.5"-10")	20%	Muck-Mud	black, very fine organic (FPOM)	0%
Gravel	2-64 mm (0.1"-2.5")	10%			
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	0%
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (stick)	10%			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Stream 8A</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall County, WV</u>
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>
LAT <u>39°49'53.42"N</u> LONG <u>80°46'12.70"W</u>	RIVER BASIN <u>Ohio River</u>
STORET # _____	AGENCY _____
INVESTIGATORS <u>D. Godec, G. Gerke</u>	LOT NUMBER _____
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/13/11</u> TIME <u>6:30</u> AM <input checked="" type="radio"/> PM <input type="radio"/>
REASON FOR SURVEY <u>AE p Mitchell Landfill Project</u>	

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>20</u> % <input checked="" type="checkbox"/> Snags <u>25</u> % <input type="checkbox"/> Vegetated Banks _____ % <input type="checkbox"/> Sand _____ % <input type="checkbox"/> Submerged Macrophytes <u>0</u> % <input type="checkbox"/> Other (_____) _____ %
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input checked="" type="checkbox"/> Other <u>Grab Sample, Aquanote Net</u> How were the samples collected? <input checked="" type="checkbox"/> wading <input checked="" type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble _____ <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks _____ <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input checked="" type="checkbox"/> Other <u>(shallow bog/rock pool)</u> _____
GENERAL COMMENTS	

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	<u>0</u>	1	2	3	4	Slimes	<u>0</u>	1	2	3	4
Filamentous Algae	<u>0</u>	1	2	3	4	Macroinvertebrates	0	<u>1</u>	2	3	4
Macrophytes	<u>0</u>	1	2	3	4	Fish	<u>0</u>	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	<u>1</u>	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	<u>1</u>	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	<u>1</u>	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	<u>1</u>	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 8B</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>		
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>Ephemeral</u>		
LAT <u>39°49'52.19"N</u> LONG <u>80°46'13.55"W</u>	RIVER BASIN <u>Ohio River</u>		
STORET # <u></u>	AGENCY <u></u>		
INVESTIGATORS <u>D. Godec, G. Gerke</u>			
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/14/11</u> TIME <u>8:30</u> <u>AM</u> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>	

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE <u>11</u>	20 19 18 17 16	15 14 13 12 <u>11</u>	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE <u>15</u>	20 19 18 17 16	<u>15</u> 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE <u>0</u>	20 19 18 17 16	15 14 13 12 <u>11</u>	10 9 8 7 6	5 4 3 2 1 <u>0</u>
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE <u>13</u>	20 19 18 17 16	15 14 <u>13</u> 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <u>0</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>

Parameters to be evaluated in sampling reach

No flow

No water or pools

Stream 8B (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>20</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE <u>6</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected. Note: determine left or right side by facing downstream. SCORE <u>8</u> (LB) SCORE <u>8</u> (RB)	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	
Left Bank	10 9	8 7 6	5 4 3	2 1 0
Right Bank	10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
Left Bank	10 9	8 7 6	5 4 3	2 1 0
Right Bank	10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
Left Bank	10 9	8 7 6	5 4 3	2 1 0
Right Bank	10 9	8 7 6	5 4 3	2 1 0

Total Score 113

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 9</u>	LOCATION <u>Mitchell Landfill, Cross, Marshall Co., WV</u>		
STATION # <u> </u> RIVERMILE <u> </u>	STREAM CLASS <u>Ephemeral</u>		
LAT <u>39°49'50.47"N</u> LONG <u>80°44'49.27"W</u>	RIVER BASIN <u>Ohio River</u>		
STORET # <u> </u>	AGENCY <u> </u>		
INVESTIGATORS <u>D. Godec, G. Gerke</u>			
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/14/11</u> TIME <u>10:30</u> <u>AM</u> <u>PM</u>	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>	

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient). SCORE <u>8</u>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient). 20 19 18 17 16	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). 15 14 13 12 11	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. 10 9 <u>8</u> 7 6	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 5 4 3 2 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>15</u>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. 20 19 18 17 16	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. <u>15</u> 14 13 12 11	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. 10 9 8 7 6	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. 5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) SCORE <u>0</u>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) 20 19 18 17 16	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes). 15 14 13 12 11	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low). 10 9 8 7 6	Dominated by 1 velocity/depth regime (usually slow-deep). 5 4 3 2 1 <u>0</u>
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>13</u>	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. 20 19 18 17 16	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools. 15 14 <u>13</u> 12 11	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent. 10 9 8 7 6	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition. 5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>1</u>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. 20 19 18 17 16	Water fills >75% of the available channel; or <25% of channel substrate is exposed. 15 14 13 12 11	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed. 10 9 8 7 6	Very little water in channel and mostly present as standing pools. 5 4 3 2 <u>1</u> 0

Parameters to be evaluated in sampling reach

no flow, just isolated small pools

some small pools present

Stream 9 - ephemeral portion (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.					
SCORE 20	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.					Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.					Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.					Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.					
SCORE 6	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.					
Note: determine left or right side by facing downstream.																					
SCORE 7 (LB)	Left Bank	10	9	8	7	6	5	4	3	2	1	0									
SCORE 7 (RB)	Right Bank	10	9	8	7	6	5	4	3	2	1	0									
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.					
SCORE 5 (LB)	Left Bank	10	9	8	7	6	5	4	3	2	1	0									
SCORE 5 (RB)	Right Bank	10	9	8	7	6	5	4	3	2	1	0									
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.					
SCORE 10 (LB)	Left Bank	10	9	8	7	6	5	4	3	2	1	0									
SCORE 10 (RB)	Right Bank	10	9	8	7	6	5	4	3	2	1	0									

Total Score 107

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 9</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>		
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>Intermittent</u>		
LAT <u>39°49'50.07"N</u> LONG <u>80°46'11.11"W</u>	RIVER BASIN <u>Ohio River</u>		
STORET #	AGENCY		
INVESTIGATORS <u>D. Godec, G. Gerke</u>			
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/14/11</u> TIME <u>10:00</u> <u>AM</u> PM	REASON FOR SURVEY <u>AFIP Mitchell Landfill Project</u>	

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient). SCORE <u>13</u>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient). 20 19 18 17 16	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). 15 14 <u>13</u> 12 11	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. 10 9 8 7 6	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 5 4 3 2 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>17</u>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. 20 19 18 <u>17</u> 16	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. 15 14 13 12 11	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. 10 9 8 7 6	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. 5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) SCORE <u>2</u>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) 20 19 18 17 16	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes). 15 14 13 12 11	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low). 10 9 8 7 6	Dominated by 1 velocity/depth regime (usually slow-deep). 5 4 3 <u>2</u> 1 0
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>15</u>	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. 20 19 18 17 16	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools. <u>15</u> 14 13 12 11	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent. 10 9 8 7 6	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition. 5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>6</u>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. 20 19 18 17 16	Water fills >75% of the available channel; or <25% of channel substrate is exposed. 15 14 13 12 11	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed. 10 9 8 7 <u>6</u>	Very little water in channel and mostly present as standing pools. 5 4 3 2 1 0

Stream 9 - intermittent portion (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE 20	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE 6	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	
Note: determine left or right side by facing downstream.				
SCORE 8 (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE 8 (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
SCORE 5 (LB)	Left Bank 10 9	8 7 6	(5) 4 3	2 1 0
SCORE 5 (RB)	Right Bank 10 9	8 7 6	(5) 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
SCORE 10 (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE 10 (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 125

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)**

STREAM NAME <u>Stream 9</u>	LOCATION <u>AEP Mitchell Landfill, Cresap, Marshall Co, WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'50.01"N</u> LONG <u>80°46'11.11"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Godec, G. Gerke</u>		
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/14/11</u> TIME <u>10:00</u> <input checked="" type="radio"/> AM <input type="radio"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

WEATHER CONDITIONS	<p>Now</p> <p><input type="checkbox"/> storm (heavy rain)</p> <p><input type="checkbox"/> rain (steady rain)</p> <p><input checked="" type="checkbox"/> showers (intermittent)</p> <p><input type="checkbox"/> %cloud cover _____</p> <p><input type="checkbox"/> clear/sunny</p> <p><u>90</u> % <input checked="" type="checkbox"/></p>	<p>Past 24 hours</p> <p><input checked="" type="checkbox"/> storm (heavy rain)</p> <p><input checked="" type="checkbox"/> rain (steady rain)</p> <p><input checked="" type="checkbox"/> showers (intermittent)</p> <p><input type="checkbox"/> % _____</p> <p><input type="checkbox"/> clear/sunny</p>	<p>Has there been a heavy rain in the last 7 days?</p> <p><input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Air Temperature <u>18</u> °C</p> <p>Other _____</p>
SITE LOCATION/MAP	<p>Draw a map of the site and indicate the areas sampled (or attach a photograph)</p> <p align="center"><u>see photographs and Figure 5 from the Jurisdictional Waters delineation Report</u></p>		
STREAM CHARACTERIZATION	<p>Stream Subsystem <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Intermittent <input type="checkbox"/> Tidal</p> <p>Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input checked="" type="checkbox"/> Non-glacial montane <input checked="" type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____</p> <p>Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater</p> <p>Catchment Area _____ km²</p>		

Stream 9 - intermittent portion (cont.)

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		Local Watershed NPS Pollution <input checked="" type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources Local Watershed Erosion <input checked="" type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous dominant species present <u>Sycamore, beech, red maple, spicebush, Christmas fern, Aster sp.</u>		
INSTREAM FEATURES	Estimated Reach Length <u>30.48</u> m <u>100 ft.</u> Estimated Stream Width <u>20.9</u> m <u>3 ft.</u> Sampling Reach Area <u>27.43</u> m ² Area in km ² (m ² x 1000) <u>.000274</u> km ² Estimated Stream Depth <u>0.03</u> m <u>1 inch.</u> Surface Velocity <u>0.05</u> m/sec Canopy Cover <input checked="" type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark <u>20.9</u> m <u>3 ft.</u> Proportion of Reach Represented by Stream Morphology Types <input checked="" type="checkbox"/> Riffle <u>100</u> % <input type="checkbox"/> Run <u>0</u> % <input type="checkbox"/> Pool <u>0</u> % Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
LARGE WOODY DEBRIS	LWD <u>2</u> m ² Density of LWD <u>72913</u> m ² /km ² (LWD/ reach area)		
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation <u>0</u> %		
WATER QUALITY	Temperature <u>19.02</u> °C Specific Conductance <u>0.286</u> mS/cm Dissolved Oxygen <u>5.38</u> mg/L pH <u>7.04</u> Turbidity <u>87.4</u> WQ Instrument Used <u>Horiba</u> Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____		
SEDIMENT/SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Deposits <input checked="" type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		<u>30%</u>	Detritus	sticks, wood, coarse plant materials (CPOM)	<u><5%</u>
Boulder	> 256 mm (10")	<u>10%</u>			
Cobble	64-256 mm (2.5"-10")	<u>50%</u>	Muck-Mud	black, very fine organic (FPOM)	
Gravel	2-64 mm (0.1"-2.5")	<u>10%</u>			
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)				

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Stream 9</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'50.07"N</u> LONG <u>80°46'11.11"W</u>	RIVER BASIN <u>Ohio R. Ver</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Godec</u>	LOT NUMBER _____	
FORM COMPLETED BY <u>D. Godec, G. Gerke</u>	DATE <u>8/14/11</u> TIME <u>10:00</u> <input checked="" type="radio"/> AM <input type="radio"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>50</u> % <input type="checkbox"/> Snags <u>0</u> % <input type="checkbox"/> Vegetated Banks <u>0</u> % <input type="checkbox"/> Sand <u>0</u> % <input type="checkbox"/> Submerged Macrophytes <u>0</u> % <input type="checkbox"/> Other (_____) _____ %
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input checked="" type="checkbox"/> Other <u>Grab Sample, Aquanunnet</u> How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble _____ <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks _____ <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input checked="" type="checkbox"/> Other (<u>rock</u>) _____
GENERAL COMMENTS	<u>Sample reach begins at ephemeral intermittent break point.</u> <u>N. Dusky Salamanders observed (adults)</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	<u>0</u>	1	2	3	4	Slimes	<u>0</u>	1	2	3	4
Filamentous Algae	<u>0</u>	1	2	3	4	Macroinvertebrates	0	<u>1</u>	2	3	4
Macrophytes	<u>0</u>	1	2	3	4	Fish	<u>0</u>	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	<u>Ephemeroptera</u>	0	1	<u>2</u>	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	<u>Corydalidae</u>	0	1	<u>2</u>	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culicidae	0	1	2	3	4						

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 10</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Ephemeral</u>	
LAT <u>39°49'49.75" N</u> LONG <u>80°46'18.26" W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Godes, G. Gerke</u>		
FORM COMPLETED BY <u>D. Godes</u>	DATE <u>8/14/11</u> TIME <u>11:30</u> <u>AM</u> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). SCORE <u>3</u>	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of new fall, but not yet prepared for colonization (may rate at high end of scale). 20 19 18 17 16	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. 15 14 13 12 11	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 10 9 8 7 6	5 4 <u>3</u> 2 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>13</u>	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. 20 19 18 17 16	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. 15 14 <u>13</u> 12 11	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. 10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) SCORE <u>1</u>	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes). 20 19 18 17 16	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low). 15 14 13 12 11	Dominated by 1 velocity/depth regime (usually slow-deep). 10 9 8 7 6	5 4 3 2 <u>1</u> 0
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>11</u>	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools. 20 19 18 17 16	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent. 15 14 13 12 <u>11</u>	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition. 10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>1</u>	Water fills >75% of the available channel; or <25% of channel substrate is exposed. 20 19 18 17 16	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed. 15 14 13 12 11	Very little water in channel and mostly present as standing pools. 10 9 8 7 6	5 4 3 2 <u>1</u> 0

Score based on 8/13/11 observations

Score based on 8/13/11 stream observations

Stream 10 - ephemeral portion (cont.)
HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>19</u>	20 <u>19</u> 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE <u>6</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 <u>6</u>	5 4 3 2 1 0
8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected. Note: determine left or right side by facing downstream.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	
SCORE <u>6</u> (LB)	Left Bank 10 9	8 7 <u>6</u>	5 4 3	2 1 0
SCORE <u>6</u> (RB)	Right Bank 10 9	8 7 <u>6</u>	5 4 3	2 1 0
9. Vegetative Protection (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
SCORE <u>4</u> (LB)	Left Bank 10 9	8 7 6	5 <u>4</u> 3	2 1 0
SCORE <u>4</u> (RB)	Right Bank 10 9	8 7 6	5 <u>4</u> 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
SCORE <u>9</u> (LB)	Left Bank 10 <u>9</u>	8 7 6	5 4 3	2 1 0
SCORE <u>9</u> (RB)	Right Bank 10 <u>9</u>	8 7 6	5 4 3	2 1 0

Total Score 92

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 10</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>	
STATION # <u> </u> RIVERMILE	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'48.34"N</u> LONG <u>80°46'15.00"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # <u> </u>	AGENCY <u> </u>	
INVESTIGATORS <u>D. Godec, G. Gerke</u>		
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/14/11</u> TIME <u>1:15</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient). SCORE <u>13</u>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient). 20 19 18 17 16	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). 15 14 <u>13</u> 12 11	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. 10 9 8 7 6	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 5 4 3 2 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>15</u>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. 20 19 18 17 16	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. <u>15</u> 14 13 12 11	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. 10 9 8 7 6	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. 5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) SCORE <u>10</u>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) 20 19 18 17 16	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes). 15 14 13 12 11	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low). <u>10</u> 9 8 7 6	Dominated by 1 velocity/depth regime (usually slow-deep). 5 4 3 2 1 0
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>10</u>	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. 20 19 18 17 16	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools. 15 14 13 12 11	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent. <u>10</u> 9 8 7 6	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition. 5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>8</u>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. 20 19 18 17 16	Water fills >75% of the available channel; or <25% of channel substrate is exposed. 15 14 13 12 11	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed. 10 9 <u>8</u> 7 6	Very little water in channel and mostly present as standing pools. 5 4 3 2 1 0

Stream 10-intermittent portion (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>20</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE <u>16</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream. SCORE <u>7</u> (LB) SCORE <u>7</u> (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) SCORE <u>3</u> (LB) SCORE <u>8</u> (RB)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE <u>10</u> (LB) SCORE <u>10</u> (RB)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
	Left Bank 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 137

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)**

STREAM NAME <u>Stream 10</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co, WV</u>
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>
LAT <u>39°49'48.34"N</u> LONG <u>80°46'15.00"W</u>	RIVER BASIN <u>Ohio River</u>
STORET # _____	AGENCY _____
INVESTIGATORS <u>D. Godec, G. Gerke</u>	
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/14/11</u> TIME <u>1:15</u> AM <input checked="" type="radio"/> PM <input type="radio"/> REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

WEATHER CONDITIONS	<div> <div>Now</div> <div> <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input checked="" type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover <input type="checkbox"/> clear/sunny </div> </div> <div> <div>Past 24 hours</div> <div> <input checked="" type="checkbox"/> storm (heavy rain) <input checked="" type="checkbox"/> rain (steady rain) <input type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover <input checked="" type="checkbox"/> clear/sunny </div> </div> <div> <div>Has there been a heavy rain in the last 7 days?</div> <div> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No </div> </div> <div> <div>Air Temperature <u>20</u> °C</div> <div>Other _____</div> </div>
SITE LOCATION/MAP	<p>Draw a map of the site and indicate the areas sampled (or attach a photograph)</p> <p align="center"><u>see photographs and figure 5 of the Jurisdictional Waters delineation report</u></p>
STREAM CHARACTERIZATION	<div> <div>Stream Subsystem</div> <div> <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Intermittent <input type="checkbox"/> Tidal </div> </div> <div> <div>Stream Type</div> <div> <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater </div> </div> <div> <div>Stream Origin</div> <div> <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input checked="" type="checkbox"/> Non-glacial montane <input checked="" type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____ </div> </div> <div> <div>Catchment Area _____ km²</div> </div>

Stream 10 (cont.)

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

WATERSHED FEATURES	Predominant Surrounding Landuse <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		Local Watershed NPS Pollution <input checked="" type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources
			Local Watershed Erosion <input checked="" type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous dominant species present <u>Sugar maple, red maple, tulip poplar, Am. elm, spice bush, wood nettle, glade fern</u>		
INSTREAM FEATURES	Estimated Reach Length <u>30.48 m 100 ft.</u> Canopy Cover <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded Estimated Stream Width <u>1.8-2.4 m 6-8 ft.</u> High Water Mark <u>1.8-2.4 m 6-8 ft.</u> Sampling Reach Area <u>64.01 m²</u> Area in km² (m²x1000) <u>0.000640 km²</u> Estimated Stream Depth <u>0.03-0.05 m 1-2 inch on avg.</u> Surface Velocity <u>0.02 m/sec</u> (at thalweg) Channelized <input type="checkbox"/> Yes <input type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input type="checkbox"/> No		
LARGE WOODY DEBRIS	LWD <u>2 m²</u> Density of LWD <u>31245.1 m²/km² (LWD/ reach area)</u>		
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present <u>N/A</u> Portion of the reach with aquatic vegetation <u>0 %</u>		
WATER QUALITY	Temperature <u>18.17 °C</u> Specific Conductance <u>0.311 mS/cm</u> Dissolved Oxygen <u>8.43 mg/L</u> pH <u>7.24</u> Turbidity <u>357</u> WQ Instrument Used <u>HORIBA</u> Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____		
SEDIMENT/ SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Deposits <u>None</u> <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Looking at stones which are not deeply embedded, are the undersides black in color? <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse		

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		15%	Detritus	sticks, wood, coarse plant materials (CPOM)	<5%
Boulder	> 256 mm (10")	25%			
Cobble	64-256 mm (2.5"-10")	30%	Muck-Mud	black, very fine organic (FPOM)	0%
Gravel	2-64 mm (0.1"-2.5")	20%			
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	0%
Silt	0.004-0.06 mm	10%			
Clay	< 0.004 mm (slick)				

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Stream 10</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>	
STATION # <u> </u> RIVERMILE <u> </u>	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'48.34"N</u> LONG <u>80°46'15.00"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # <u> </u>	AGENCY <u> </u>	
INVESTIGATORS <u>D. Godec, G. Gerke</u>	LOT NUMBER <u> </u>	
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/14/11</u> TIME <u>1:30</u> AM <input checked="" type="radio"/> PM <input type="radio"/>	REASON FOR SURVEY <u>AEP Mitchell Landfill</u>

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>30</u> % <input checked="" type="checkbox"/> Snags <u>25</u> % <input type="checkbox"/> Vegetated Banks <u> </u> % <input type="checkbox"/> Sand <u> </u> % <input type="checkbox"/> Submerged Macrophytes <u> </u> % <input checked="" type="checkbox"/> Other (riffles, pools) <u>70</u> %
SAMPLE COLLECTION	Gear used <input checked="" type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input checked="" type="checkbox"/> Other <u>Grub sample, Aquadunnet</u> How were the samples collected? <input checked="" type="checkbox"/> wading <input checked="" type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble <u> </u> <input checked="" type="checkbox"/> Snags <u> </u> <input type="checkbox"/> Vegetated Banks <u> </u> <input type="checkbox"/> Sand <u> </u> <input type="checkbox"/> Submerged Macrophytes <u> </u> <input checked="" type="checkbox"/> Other (riffles, pools) <u> </u>
GENERAL COMMENTS	<u>N. Dusky Salamanders (Adults)</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	<u>0</u>	1	2	3	4	Slimes	<u>0</u>	1	2	3	4
Filamentous Algae	<u>0</u>	1	2	3	4	Macroinvertebrates	<u>0</u>	1	2	<u>3</u>	4
Macrophytes	<u>0</u>	1	2	3	4	Fish	<u>0</u>	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	<u>3</u>	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	2	<u>3</u>	4
Turbellaria	0	1	2	3	4	Coleoptera	0	<u>1</u>	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	<u>2</u>	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	<u>2</u>	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culicidae	0	1	2	3	4						

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 10A</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co, WV</u>
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>ephemeral</u>
LAT <u>39°49'49.26"N</u> LONG <u>80°46'18.79"W</u>	RIVER BASIN <u>Ohio River</u>
STORET #	AGENCY
INVESTIGATORS <u>D. Godec, G. Gerke</u>	
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/14/11</u> TIME <u>12:30</u> AM <input checked="" type="checkbox"/> PM <input type="checkbox"/> REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). SCORE <u>6</u>	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>11</u>	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) SCORE <u>0</u>	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes). 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low). 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	Dominated by 1 velocity/depth regime (usually slow-deep). 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>13</u>	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools. 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent. 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition. 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>0</u>	20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	Water fills >75% of the available channel; or <25% of channel substrate is exposed. 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed. 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	Very little water in channel and mostly present as standing pools. 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

Score based on lack of flow observed on 8/13/11

Score based on lack of flow or pools observed on 8/13/11

Stream 10A (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>19</u>	20 <u>19</u> 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE <u>6</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 <u>6</u>	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream. SCORE <u>7</u> (LB) SCORE <u>7</u> (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
Left Bank	10 9	8 <u>7</u> 6	5 4 3	2 1 0
Right Bank	10 9	8 <u>7</u> 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) SCORE <u>7</u> (LB) SCORE <u>7</u> (RB)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
Left Bank	10 9	8 <u>7</u> 6	5 4 3	2 1 0
Right Bank	10 9	8 <u>7</u> 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE <u>10</u> (LB) SCORE <u>10</u> (RB)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
Left Bank	<u>10</u> 9	8 7 6	5 4 3	2 1 0
Right Bank	<u>10</u> 9	8 7 6	5 4 3	2 1 0

Total Score 103

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 11</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>		
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>Ephemeral</u>		
LAT <u>39°49'44.88"N</u> LONG <u>80°46'12.92"W</u>	RIVER BASIN <u>Ohio River</u>		
STORET #	AGENCY		
INVESTIGATORS <u>D. Godee, G. Gerke</u>			
FORM COMPLETED BY <u>D. Godee</u>	DATE <u>8/14/11</u> TIME <u>2:30</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>	

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE <u>15</u>	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE <u>16</u>	20 19 18 17 (16)	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE <u>0</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 (0)
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE <u>15</u>	20 19 18 17 16	(15) 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <u>0</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 (0)

Parameters to be evaluated in sampling reach

Score based on lack of flow observed on 8/13/11

Score based on lack of flow observed on 8/13/11

Stream 11 (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>20</u>	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE <u>6</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected. Note: determine left or right side by facing downstream.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	
SCORE <u>8</u> (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE <u>8</u> (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
SCORE <u>8</u> (LB)	Left Bank 10 9	(8) 7 6	5 4 3	2 1 0
SCORE <u>8</u> (RB)	Right Bank 10 9	(8) 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
SCORE <u>10</u> (LB)	Left Bank (10) 9	8 7 6	5 4 3	2 1 0
SCORE <u>10</u> (RB)	Right Bank (10) 9	8 7 6	5 4 3	2 1 0

Total Score 124

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 12</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>ephemeral</u>
LAT <u>39°49'44.13"N</u> LONG <u>80°46'6.53"W</u>	RIVER BASIN <u>Ohio River</u>
STORET #	AGENCY
INVESTIGATORS <u>D. Godec, G. Gerck</u>	
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/14/11</u> AM <input checked="" type="radio"/> PM <u>REASON FOR SURVEY</u> <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient). SCORE <u>13</u>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient). 20 19 18 17 16	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). 15 14 <u>(13)</u> 12 11	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. 10 9 8 7 6	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 5 4 3 2 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>16</u>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. 20 19 18 17 <u>(16)</u>	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. 15 14 13 12 11	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. 10 9 8 7 6	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. 5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) SCORE <u>0</u>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) 20 19 18 17 16	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes). 15 14 13 12 11	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low). 10 9 8 7 6	Dominated by 1 velocity/depth regime (usually slow-deep). 5 4 3 2 1 <u>(0)</u>
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>13</u>	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. 20 19 18 17 16	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools. 15 14 <u>(13)</u> 12 11	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent. 10 9 8 7 6	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition. 5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>1</u>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. 20 19 18 17 16	Water fills >75% of the available channel; or <25% of channel substrate is exposed. 15 14 13 12 11	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed. 10 9 8 7 6	Very little water in channel and mostly present as standing pools. 5 4 3 2 <u>(1)</u> 0

Score based on lack of flow observed on 8/13/11

Score based on lack of flow and pools observed on 8/13/11

Stream 12 (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE 20 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0				
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE 6 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0				
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream. SCORE 8 (LB) SCORE 8 (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
Left Bank	10 9 8 7 6 5 4 3 2 1 0	8 7 6 5 4 3 2 1 0	5 4 3 2 1 0	2 1 0
Right Bank	10 9 8 7 6 5 4 3 2 1 0	8 7 6 5 4 3 2 1 0	5 4 3 2 1 0	2 1 0
9. Vegetative Protection (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
Left Bank	10 9 8 7 6 5 4 3 2 1 0	8 7 6 5 4 3 2 1 0	5 4 3 2 1 0	2 1 0
Right Bank	10 9 8 7 6 5 4 3 2 1 0	8 7 6 5 4 3 2 1 0	5 4 3 2 1 0	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
Left Bank	10 9 8 7 6 5 4 3 2 1 0	8 7 6 5 4 3 2 1 0	5 4 3 2 1 0	2 1 0
Right Bank	10 9 8 7 6 5 4 3 2 1 0	8 7 6 5 4 3 2 1 0	5 4 3 2 1 0	2 1 0

Total Score **111**

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 13</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>		
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>ephemeral</u>		
LAT <u>39°49'38.27"N</u> LONG <u>80°46'11.39"W</u>	RIVER BASIN <u>Ohio River</u>		
STORET #	AGENCY		
INVESTIGATORS <u>D. Godtec, G. Gerke</u>			
FORM COMPLETED BY <u>D. Godtec</u>	DATE <u>8/14/11</u> TIME <u>4:30</u> AM <input checked="" type="checkbox"/>	REASON FOR SURVEY <u>AFR Mitchell Landfill Project</u>	

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE <u>13</u>	20 19 18 17 16	15 14 <u>(13)</u> 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE <u>15</u>	20 19 18 <u>17</u> 16	<u>(15)</u> 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-shallow). <u>slow shallow</u>
SCORE <u>5</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	<u>(5)</u> 4 3 2 1 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE <u>13</u>	20 19 18 17 16	15 14 <u>(13)</u> 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <u>7</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 <u>(7)</u> 6	5 4 3 2 1 0

Stream 13 - ephemeral portion (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.					
SCORE 20	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.					Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.					Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.					Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.					
SCORE 6	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.					
Note: determine left or right side by facing downstream.																					
SCORE 8 (LB)	Left Bank 10 9					8 7 6					5 4 3					2 1 0					
SCORE 8 (RB)	Right Bank 10 9					8 7 6					5 4 3					2 1 0					
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.					
SCORE 7 (LB)	Left Bank 10 9					8 7 6					5 4 3					2 1 0					
SCORE 7 (RB)	Right Bank 10 9					8 7 6					5 4 3					2 1 0					
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.					
SCORE 10 (LB)	Left Bank 10 9					8 7 6					5 4 3					2 1 0					
SCORE 10 (RB)	Right Bank 10 9					8 7 6					5 4 3					2 1 0					

Total Score 129

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 13</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>		
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>intermittent</u>		
LAT <u>39°49'38.81"N</u> LONG <u>78°46'10.38"W</u>	RIVER BASIN <u>Ohio River</u>		
STORET #	AGENCY		
INVESTIGATORS <u>D. Godec, G. Gerke</u>			
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/14/11</u> TIME <u>4:15</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>	

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE <u>14</u>	20 19 18 17 16	15 <u>(14)</u> 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
SCORE <u>15</u>	20 19 18 17 16	<u>(15)</u> 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
SCORE <u>1</u>	20 19 18 17 16	15 14 13 12 11	<u>(10)</u> 9 8 7 6	5 4 3 2 <u>(1)</u> 0
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
SCORE <u>13</u>	20 19 18 17 16	15 14 <u>(13)</u> 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
SCORE <u>2</u>	20 19 18 17 16	15 14 13 12 11	<u>(10)</u> 9 8 7 6	5 4 3 <u>(2)</u> 1 0

Parameters to be evaluated in sampling reach

Slight slow shallow flow in some portions of channel (likely due to rainfall previous night)

Stream 13 - intermittent portion (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>20</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE <u>16</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected. Note: determine left or right side by facing downstream.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	
SCORE <u>7</u> (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE <u>7</u> (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
SCORE <u>5</u> (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE <u>5</u> (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
SCORE <u>10</u> (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE <u>10</u> (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 125

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)**

STREAM NAME <u>Stream 13</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>
LAT <u>39°41'38.81"N</u> LONG <u>80°46'10.38"W</u>	RIVER BASIN <u>Ohio River</u>
STORET # _____	AGENCY _____
INVESTIGATORS <u>D. Godec, G. Gerke</u>	
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/14/11</u> TIME <u>4:15</u> AM <input checked="" type="radio"/> PM REASON FOR SURVEY <u>AED Mitchell Landfill Project</u>

WEATHER CONDITIONS	<p>Now</p> <p><input type="checkbox"/> storm (heavy rain)</p> <p><input type="checkbox"/> rain (steady rain)</p> <p><input checked="" type="checkbox"/> showers (intermittent)</p> <p><u>40</u> % <input checked="" type="checkbox"/> %cloud cover</p> <p><input type="checkbox"/> clear/sunny</p> <p>Past 24 hours</p> <p><input checked="" type="checkbox"/> <input checked="" type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> %</p> <p>Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Air Temperature <u>23</u> °C</p> <p>Other _____</p>
SITE LOCATION/MAP	<p>Draw a map of the site and indicate the areas sampled (or attach a photograph)</p> <p align="center">see Photographs + figure 5 of the Jurisdictional Waters delineation report.</p>
STREAM CHARACTERIZATION	<p>Stream Subsystem <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Intermittent <input type="checkbox"/> Tidal</p> <p>Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater</p> <p>Stream Origin <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed</p> <p><input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins</p> <p><input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____</p> <p>Catchment Area _____ km²</p>

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

Stream 13 (cont.)

WATERSHED FEATURES	Predominant Surrounding Landuse <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential	Local Watershed NPS Pollution <input checked="" type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources Local Watershed Erosion <input checked="" type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous dominant species present <i>Sugar maple, white ash, Am. elm, Spicebush, wood nettle, ferns</i>	
INSTREAM FEATURES	Estimated Reach Length <i>30.48 m 100 ft.</i> Canopy Cover <input type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded Estimated Stream Width <i>~1.8 m 6 ft.</i> Sampling Reach Area <i>54.9 m²</i> High Water Mark <i>~1.8 m 6 ft.</i> Area in km² (m²x1000) <i>0.000549 km²</i> Proportion of Reach Represented by Stream Morphology Types <input checked="" type="checkbox"/> Riffle <i>80 %</i> <input checked="" type="checkbox"/> Run <i>10 %</i> <input type="checkbox"/> Pool <i>10 %</i> Estimated Stream Depth <i>0.0254 m 1 inch</i> Surface Velocity <i>0.1 m/sec</i> Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (at thalweg) Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	
LARGE WOODY DEBRIS	LWD <i>4 m²</i> Density of LWD <i>72.597 m²/km² (LWD/ reach area)</i>	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation <i>0 %</i>	
WATER QUALITY	Temperature <i>19.42 °C</i> Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Specific Conductance <i>0.299 mS/cm</i> Dissolved Oxygen <i>6.16 mg/L</i> Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ pH <i>6.87</i> Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input checked="" type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____ Turbidity <i>400</i> WQ Instrument Used <i>Horiba</i>	
SEDIMENT/ SUBSTRATE	Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Deposits <i>None</i> <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Looking at stones which are not deeply embedded, are the undersides black in color? <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition In Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		<i>10%</i>	Detritus	sticks, wood, coarse plant materials (CPOM)	<i>0%</i>
Boulder	> 256 mm (10")	<i>30%</i>			
Cobble	64-256 mm (2.5"-10")	<i>30%</i>	Muck-Mud	black, very fine organic (FPOM)	<i>0%</i>
Gravel	2-64 mm (0.1"-2.5")	<i>25%</i>			
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	<i>0%</i>
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)	<i>5%</i>			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Stream 13</u>	LOCATION <u>Mitchell Landfill, Crossin, Marshall Co., WV</u>	
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'38.81" N</u> LONG <u>80°46'10.28" W</u>	RIVER BASIN <u>Ohio River</u>	
STORET #	AGENCY	
INVESTIGATORS <u>D. Godec, G. Gerke</u>	LOT NUMBER	
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/14/11</u> TIME <u>4:30</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble _____% <input type="checkbox"/> Snags _____% <input type="checkbox"/> Vegetated Banks _____% <input type="checkbox"/> Sand _____% <input type="checkbox"/> Submerged Macrophytes _____% <input type="checkbox"/> Other (<u>rippl</u>) _____%
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input checked="" type="checkbox"/> Other <u>grab sample, aquarium net</u> How were the samples collected? <input checked="" type="checkbox"/> wading <input checked="" type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble _____ <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks _____ <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input type="checkbox"/> Other (<u>rippl</u>) _____
GENERAL COMMENTS	<u>N. dusky salamanders (adults and juveniles)</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	<u>0</u>	1	2	3	4	Slimes	<u>0</u>	1	2	3	4
Filamentous Algae	<u>0</u>	1	2	3	4	Macroinvertebrates	0	1	<u>2</u>	3	4
Macrophytes	<u>0</u>	1	2	3	4	Fish	<u>0</u>	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	<u>2</u>	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	<u>2</u>	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culcidae	0	1	2	3	4						

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 14</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>ephemeral</u>	
LAT <u>39°49'36.14"N</u> LONG <u>80°46'5.38"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Goddec, G. Gerke</u>		
FORM COMPLETED BY <u>D. Goddec</u>	DATE <u>8/14/11</u> TIME <u>6:30</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient). SCORE <u>13</u>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 18 17 16	15 14 <u>13</u> 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>13</u>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	20 19 18 17 16	15 14 <u>13</u> 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) SCORE <u>0</u>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>13</u>	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	20 19 18 17 16	15 14 <u>13</u> 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>0</u>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 <u>0</u>

No flow

No flow or Pools

Stream 14 - ephemeral portion (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>20</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE <u>6</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream. SCORE <u>8</u> (LB) SCORE <u>8</u> (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
Left Bank	10 9	8 7 6	5 4 3	2 1 0
Right Bank	10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) SCORE <u>4</u> (LB) SCORE <u>4</u> (RB)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
Left Bank	10 9	8 7 6	5 4 3	2 1 0
Right Bank	10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE <u>10</u> (LB) SCORE <u>10</u> (RB)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
Left Bank	10 9	8 7 6	5 4 3	2 1 0
Right Bank	10 9	8 7 6	5 4 3	2 1 0

Total Score 109

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 14</u>	LOCATION <u>Mitchell Landfill, Greep, Marshall Co., WV</u>	
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'37.74"N</u> LONG <u>80°42'44.7"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET #	AGENCY	
INVESTIGATORS <u>D. Godec / Greg Gerke</u>		
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/14/11</u> TIME <u>6:30</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). SCORE <u>18</u>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient).	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
	20 19 <u>18</u> 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>16</u>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
	20 19 18 17 <u>16</u>	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) SCORE <u>3</u>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	Dominated by 1 velocity/depth regime (usually slow-deep).
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 <u>3</u> 2 1 0
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>13</u>	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
	20 19 18 17 16	15 14 <u>13</u> 12 11	10 9 8 7 6	5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>6</u>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills >75% of the available channel; or <25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present as standing pools.
	20 19 18 17 16	15 14 13 12 11	10 9 8 7 <u>6</u>	5 4 3 2 1 0

Stream 14 intermittent portion (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>20</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE <u>16</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
8. Bank Stability (score each bank) Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected. Note: determine left or right side by facing downstream.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.	
SCORE <u>8</u> (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE <u>8</u> (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.	
SCORE <u>6</u> (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE <u>6</u> (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.	
SCORE <u>10</u> (LB)	Left Bank 10 9	8 7 6	5 4 3	2 1 0
SCORE <u>10</u> (RB)	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Total Score 140

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)**

STREAM NAME <u>Stream 14</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co, WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>	
LAT <u>31°49'37.74"N</u> LONG <u>80°46'47"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Godec, G. Gerke</u>		
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8-14-11</u> TIME <u>6:30</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>Asp Mitchell Landfill Project</u>

WEATHER CONDITIONS	<p>Now</p> <p><input type="checkbox"/> storm (heavy rain)</p> <p><input type="checkbox"/> rain (steady rain)</p> <p><input checked="" type="checkbox"/> 40% showers (intermittent)</p> <p><input type="checkbox"/> %cloud cover</p> <p><input type="checkbox"/> clear/sunny</p> <p>Past 24 hours</p> <p><input checked="" type="checkbox"/> storm (heavy rain)</p> <p><input checked="" type="checkbox"/> rain (steady rain)</p> <p><input type="checkbox"/> showers (intermittent)</p> <p><input type="checkbox"/> %cloud cover</p> <p><input checked="" type="checkbox"/> clear/sunny</p> <p>Has there been a heavy rain in the last 7 days? <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>Air Temperature <u>20</u> °C</p> <p>Other _____</p>
SITE LOCATION/MAP	<p>Draw a map of the site and indicate the areas sampled (or attach a photograph)</p> <p align="center">see photographs and figure 5 of the Jurisdictional Waters Delineation Report</p>
STREAM CHARACTERIZATION	<p>Stream Subsystem <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Intermittent <input type="checkbox"/> Tidal</p> <p>Stream Type <input checked="" type="checkbox"/> Coldwater <input type="checkbox"/> Warmwater</p> <p>Stream Origin <input type="checkbox"/> Glacial <input checked="" type="checkbox"/> Non-glacial montane <input type="checkbox"/> Swamp and bog</p> <p><input type="checkbox"/> Spring-fed <input checked="" type="checkbox"/> Mixture of origins <input type="checkbox"/> Other _____</p> <p>Catchment Area _____ km²</p>

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

Stream 14 (cont.)

WATERSHED FEATURES	Predominant Surrounding Landuse <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input type="checkbox"/> Other _____ <input type="checkbox"/> Residential		Local Watershed NPS Pollution <input checked="" type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources				
			Local Watershed Erosion <input checked="" type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy				
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous dominant species present <u>Silver maple, Spice bush, Impatiens pallida, wood nettle, basswood</u>						
INSTREAM FEATURES	<table border="0"> <tr> <td> Estimated Reach Length <u>304.8</u> m Estimated Stream Width <u>1.8</u> m Sampling Reach Area <u>54.86</u> m² Area in km² (m² x 1000) <u>0.00548</u> km² Estimated Stream Depth <u>0.1-0.2</u> m Surface Velocity <u>0.1</u> m/sec (at thalweg) </td> <td> Canopy Cover <input checked="" type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark _____ m Proportion of Reach Represented by Stream Morphology Types <input checked="" type="checkbox"/> Riffle <u>95</u> % <input type="checkbox"/> Run _____ % <input checked="" type="checkbox"/> Pool <u>5</u> % Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No </td> </tr> </table>			Estimated Reach Length <u>304.8</u> m Estimated Stream Width <u>1.8</u> m Sampling Reach Area <u>54.86</u> m ² Area in km ² (m ² x 1000) <u>0.00548</u> km ² Estimated Stream Depth <u>0.1-0.2</u> m Surface Velocity <u>0.1</u> m/sec (at thalweg)	Canopy Cover <input checked="" type="checkbox"/> Partly open <input type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded High Water Mark _____ m Proportion of Reach Represented by Stream Morphology Types <input checked="" type="checkbox"/> Riffle <u>95</u> % <input type="checkbox"/> Run _____ % <input checked="" type="checkbox"/> Pool <u>5</u> % Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Dam Present <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		
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LARGE WOODY DEBRIS	LWD <u>3</u> m ² Density of LWD <u>54.86</u> m ² /km ² (LWD/ reach area)						
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present <u>Impatiens pallida</u> Portion of the reach with aquatic vegetation <u>10</u> %						
WATER QUALITY	<table border="0"> <tr> <td> Temperature <u>13.67</u> °C Specific Conductance <u>0.229</u> mS/cm Dissolved Oxygen <u>5.45</u> mg/L pH <u>7.61</u> Turbidity <u>70.3</u> WQ Instrument Used <u>Horiba</u> </td> <td> Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____ </td> </tr> </table>			Temperature <u>13.67</u> °C Specific Conductance <u>0.229</u> mS/cm Dissolved Oxygen <u>5.45</u> mg/L pH <u>7.61</u> Turbidity <u>70.3</u> WQ Instrument Used <u>Horiba</u>	Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____		
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SEDIMENT/SUBSTRATE	<table border="0"> <tr> <td> Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ </td> <td> Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ </td> </tr> <tr> <td> Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse </td> <td> Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No </td> </tr> </table>			Odors <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____	Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____	Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse	Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No
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Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse	Looking at stones which are not deeply embedded, are the undersides black in color? <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No						

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition In Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock		<u>70</u> %	Detritus	sticks, wood, coarse plant materials (CPOM)	<u>45</u> %
Boulder	> 256 mm (10")	<u>10</u> %			
Cobble	64-256 mm (2.5"-10")	<u>10</u> %	Muck-Mud	black, very fine organic (FPOM)	<u>0</u> %
Gravel	2-64 mm (0.1"-2.5")	<u>10</u> %			
Sand	0.06-2mm (gritty)		Marl	grey, shell fragments	<u>0</u> %
Silt	0.004-0.06 mm				
Clay	< 0.004 mm (slick)				

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Stream 14</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>
LAT <u>39°49'31.74"N</u> LONG <u>80°46'4.47"W</u>	RIVER BASIN <u>Ohio River</u>
STORET # _____	AGENCY _____
INVESTIGATORS <u>D. Godec, G. Geike</u>	LOT NUMBER _____
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/14/11</u> TIME <u>6:30</u> AM <input checked="" type="radio"/> PM <input type="radio"/>
	REASON FOR SURVEY <u>AEP Mitchell Landfill</u>

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>20</u> % <input type="checkbox"/> Snags _____ % <input type="checkbox"/> Vegetated Banks _____ % <input type="checkbox"/> Sand _____ % <input type="checkbox"/> Submerged Macrophytes _____ % <input type="checkbox"/> Other (<u>bedrock</u>) <u>70</u> %
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input checked="" type="checkbox"/> Other <u>Grub sample; Aquarium Net</u> How were the samples collected? <input checked="" type="checkbox"/> wading <input checked="" type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble _____ <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks _____ <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input checked="" type="checkbox"/> Other (<u>bedrock & boulders</u>) _____
GENERAL COMMENTS	<u>N. Dusky Salamanders (Adults & Juveniles)</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	0	<u>1</u>	2	3	4	Slimes	<u>0</u>	1	2	3	4
Filamentous Algae	<u>0</u>	1	2	3	4	Macroinvertebrates	0	1	<u>2</u>	3	4
Macrophytes	0	1	<u>2</u>	3	4	Fish	<u>0</u>	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	<u>2</u>	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	<u>2</u>	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
<u>Hirudinea</u>	0	1	<u>2</u>	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culicidae	0	1	2	3	4						

L. pedes

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 15</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>		
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Ephemeral</u>		
LAT <u>39°49'40.47"N</u> LONG <u>80°46'3.47"W</u>	RIVER BASIN <u>Ohio River</u>		
STORET # _____	AGENCY _____		
INVESTIGATORS <u>D. Godec</u>			
FORM COMPLETED BY <u>D. Godec</u>		DATE <u>8/15/11</u> TIME <u>10:30</u> <u>AM</u> <u>PM</u>	REASON FOR SURVEY <u>AFEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). SCORE <u>12</u>	Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are not new fall and not transient). 20 19 18 17 16	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale). 15 14 13 <u>12</u> 11	20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed. 10 9 8 7 6	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking. 5 4 3 2 1 0
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>15</u>	Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. 20 19 18 17 16	Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment. <u>15</u> 14 13 12 11	Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment. 10 9 8 7 6	Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment. 5 4 3 2 1 0
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) SCORE <u>0</u>	All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) 20 19 18 17 16	Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes). 15 14 13 12 11	Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low). 10 9 8 7 6	Dominated by 1 velocity/depth regime (usually slow-deep). 5 4 3 2 1 <u>0</u>
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>13</u>	Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. 20 19 18 17 16	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools. 15 14 <u>13</u> 12 11	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent. 10 9 8 7 6	Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition. 5 4 3 2 1 0
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>0</u>	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. 20 19 18 17 16	Water fills >75% of the available channel; or <25% of channel substrate is exposed. 15 14 13 12 11	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed. 10 9 8 7 6	Very little water in channel and mostly present as standing pools. 5 4 3 2 1 <u>0</u>

Stream 15 (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6. Channel Alteration Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.	
SCORE <u>20</u>	(20) 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
7. Frequency of Riffles (or bends) Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.	
SCORE <u>6</u>	20 19 18 17 16	15 14 13 12 11	10 9 8 7 (6)	5 4 3 2 1 0
8. Bank Stability (score each bank) Note: determine left or right side by facing downstream. SCORE <u>7</u> (LB) SCORE <u>7</u> (RB)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.
Left Bank	10 9	8 (7) 6	5 4 3	2 1 0
Right Bank	10 9	8 (7) 6	5 4 3	2 1 0
9. Vegetative Protection (score each bank) SCORE <u>7</u> (LB) SCORE <u>7</u> (RB)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
Left Bank	10 9	8 (7) 6	5 4 3	2 1 0
Right Bank	10 9	8 (7) 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width (score each bank riparian zone) SCORE <u>10</u> (LB) SCORE <u>8</u> (RB)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.	Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.	Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.
Left Bank	(10) 9	8 7 6	5 4 3	2 1 0
Right Bank	10 9	(8) 7 6	5 4 3	2 1 0

Total Score 112

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (FRONT)

STREAM NAME <u>Stream 16</u>	LOCATION <u>Mitchell Landfill, Orgas, Marshall Co., WV</u>	
STATION # <u>RIVERMILE</u>	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'24.84"N</u> LONG <u>80°46'20.74"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET #	AGENCY	
INVESTIGATORS <u>D. Goddec</u>		
FORM COMPLETED BY <u>D. Goddec</u>	DATE <u>8/15/11</u> TIME <u>2:30</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>AEP Mitchell Landfill Project</u>

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate/ Available Cover Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient). SCORE <u>3</u>	20 19 18 17 16 Greater than 70% of substrate favorable for epifaunal colonization and fish cover; mix of snags, submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e., logs/snags that are <u>not</u> new fall and not transient).	15 14 13 12 11 40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale).	10 9 8 7 6 20-40% mix of stable habitat; habitat availability less than desirable; substrate frequently disturbed or removed.	5 4 3 2 1 0 Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
2. Embeddedness Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space. SCORE <u>11</u>	20 19 18 17 16 Gravel, cobble, and boulder particles are 0-25% surrounded by fine sediment. Layering of cobble provides diversity of niche space.	15 14 13 12 11 Gravel, cobble, and boulder particles are 25-50% surrounded by fine sediment.	10 9 8 7 6 Gravel, cobble, and boulder particles are 50-75% surrounded by fine sediment.	5 4 3 2 1 0 Gravel, cobble, and boulder particles are more than 75% surrounded by fine sediment.
3. Velocity/Depth Regime All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.) SCORE <u>2</u>	20 19 18 17 16 All four velocity/depth regimes present (slow-deep, slow-shallow, fast-deep, fast-shallow). (Slow is < 0.3 m/s, deep is > 0.5 m.)	15 14 13 12 11 Only 3 of the 4 regimes present (if fast-shallow is missing, score lower than if missing other regimes).	10 9 8 7 6 Only 2 of the 4 habitat regimes present (if fast-shallow or slow-shallow are missing, score low).	5 4 3 2 1 0 Dominated by 1 velocity/depth regime (usually slow-deep). <u>slow shallow</u>
4. Sediment Deposition Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition. SCORE <u>9</u>	20 19 18 17 16 Little or no enlargement of islands or point bars and less than 5% of the bottom affected by sediment deposition.	15 14 13 12 11 Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5-30% of the bottom affected; slight deposition in pools.	10 9 8 7 6 Moderate deposition of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected; sediment deposits at obstructions, constrictions, and bends; moderate deposition of pools prevalent.	5 4 3 2 1 0 Heavy deposits of fine material, increased bar development; more than 50% of the bottom changing frequently; pools almost absent due to substantial sediment deposition.
5. Channel Flow Status Water reaches base of both lower banks, and minimal amount of channel substrate is exposed. SCORE <u>8</u>	20 19 18 17 16 Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	15 14 13 12 11 Water fills >75% of the available channel; or <25% of channel substrate is exposed.	10 9 8 7 6 Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	5 4 3 2 1 0 Very little water in channel and mostly present as standing pools.

Stream 16 (cont.)

HABITAT ASSESSMENT FIELD DATA SHEET—HIGH GRADIENT STREAMS (BACK)

Habitat Parameter	Condition Category																				
	Optimal					Suboptimal					Marginal					Poor					
6. Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern.					Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e., dredging, (greater than past 20 yr) may be present, but recent channelization is not present.					Channelization may be extensive; embankments or shoring structures present on both banks; and 40 to 80% of stream reach channelized and disrupted.					Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted. Instream habitat greatly altered or removed entirely.					
SCORE 18	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream <7:1 (generally 5 to 7); variety of habitat is key. In streams where riffles are continuous, placement of boulders or other large, natural obstruction is important.					Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.					Occasional riffle or bend; bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 to 25.					Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of >25.					
SCORE 6	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
8. Bank Stability (score each bank)	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. <5% of bank affected.					Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.					Moderately unstable; 30-60% of bank in reach has areas of erosion; high erosion potential during floods.					Unstable; many eroded areas; "raw" areas frequent along straight sections and bends; obvious bank sloughing; 60-100% of bank has erosional scars.					
Note: determine left or right side by facing downstream.																					
SCORE 4 (LB)	Left Bank	10	9			8	7	6			5	4	3			2	1	0			
SCORE 4 (RB)	Right Bank	10	9			8	7	6			5	4	3			2	1	0			
9. Vegetative Protection (score each bank)	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or nonwoody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.					70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well-represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.					50-70% of the streambank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.					Less than 50% of the streambank surfaces covered by vegetation; disruption of streambank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.					
SCORE 4 (LB)	Left Bank	10	9			8	7	6			5	4	3			2	1	0			
SCORE 4 (RB)	Right Bank	10	9			8	7	6			5	4	3			2	1	0			
10. Riparian Vegetative Zone Width (score each bank riparian zone)	Width of riparian zone >18 meters; human activities (i.e., parking lots, roadbeds, clear-cuts, lawns, or crops) have not impacted zone.					Width of riparian zone 12-18 meters; human activities have impacted zone only minimally.					Width of riparian zone 6-12 meters; human activities have impacted zone a great deal.					Width of riparian zone <6 meters; little or no riparian vegetation due to human activities.					
SCORE 9 (LB)	Left Bank	10	9			8	7	6			5	4	3			2	1	0			
SCORE 9 (RB)	Right Bank	10	9			8	7	6			5	4	3			2	1	0			

Total Score 91

**PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET
(FRONT)**

STREAM NAME <u>Stream 16</u>	LOCATION	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'24.84"N</u> LONG <u>80°46'20.74"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>P. Godec</u>		
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/15/11</u> TIME <u>2:30</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>AEPMitchell Landfill Project</u>

WEATHER CONDITIONS	<div> <div>Now</div> <div> <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input checked="" type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover <input type="checkbox"/> clear/sunny </div> </div> <div> <div>Past 24 hours</div> <div> <input type="checkbox"/> storm (heavy rain) <input type="checkbox"/> rain (steady rain) <input checked="" type="checkbox"/> showers (intermittent) <input type="checkbox"/> %cloud cover <input checked="" type="checkbox"/> clear/sunny </div> </div> <div> <div>Has there been a heavy rain in the last 7 days?</div> <div> <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No Air Temperature <u>21</u> °C Other _____ </div> </div>
SITE LOCATION/MAP	<p>Draw a map of the site and indicate the areas sampled (or attach a photograph)</p> <p align="center"><i>see photographs to figure 5 of the Jurisdictional Waters Delineation Report</i></p>
STREAM CHARACTERIZATION	<div> <div>Stream Subsystem</div> <div> <input type="checkbox"/> Perennial <input checked="" type="checkbox"/> Intermittent <input type="checkbox"/> Tidal </div> </div> <div> <div>Stream Type</div> <div> <input type="checkbox"/> Coldwater <input checked="" type="checkbox"/> Warmwater </div> </div> <div> <div>Stream Origin</div> <div> <input type="checkbox"/> Glacial <input type="checkbox"/> Spring-fed <input type="checkbox"/> Non-glacial montane <input type="checkbox"/> Mixture of origins <input type="checkbox"/> Swamp and bog <input type="checkbox"/> Other _____ </div> </div> <div> <div>Catchment Area</div> <div>_____ km²</div> </div>

PHYSICAL CHARACTERIZATION/WATER QUALITY FIELD DATA SHEET (BACK)

Stream 16 (cont.)

WATERSHED FEATURES	Predominant Surrounding Landuse <input checked="" type="checkbox"/> Forest <input type="checkbox"/> Commercial <input type="checkbox"/> Field/Pasture <input type="checkbox"/> Industrial <input type="checkbox"/> Agricultural <input checked="" type="checkbox"/> Other <u>pipelike ROW</u> <input type="checkbox"/> Residential	Local Watershed NPS Pollution <input checked="" type="checkbox"/> No evidence <input type="checkbox"/> Some potential sources <input type="checkbox"/> Obvious sources Local Watershed Erosion <input checked="" type="checkbox"/> None <input type="checkbox"/> Moderate <input type="checkbox"/> Heavy
RIPARIAN VEGETATION (18 meter buffer)	Indicate the dominant type and record the dominant species present <input checked="" type="checkbox"/> Trees <input checked="" type="checkbox"/> Shrubs <input type="checkbox"/> Grasses <input checked="" type="checkbox"/> Herbaceous dominant species present <u>multiflora rose, boxelder, white oak, Aronia honeysuckle, virginiana</u>	
INSTREAM FEATURES	Estimated Reach Length <u>30.48 m 100 ft.</u> Canopy Cover <input type="checkbox"/> Partly open <input checked="" type="checkbox"/> Partly shaded <input type="checkbox"/> Shaded Estimated Stream Width <u>0.91 m 3 ft.</u> High Water Mark <u>0.61 m 2 ft.</u> Sampling Reach Area <u>27.74 m²</u> Proportion of Reach Represented by Stream Area in km² (m²x1000) <u>0.00028 km²</u> Morphology Types <input checked="" type="checkbox"/> Riffle <u>100</u> % <input type="checkbox"/> Run <u>0</u> % <input type="checkbox"/> Pool <u>0</u> % Estimated Stream Depth <u>0.0127 m 0.5 in.</u> Surface Velocity <u>0.05 m/sec</u> Channelized <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No (at thalweg) Dam Present <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <u>(Impounded)</u>	
LARGE WOODY DEBRIS	LWD <u>2 m²</u> Density of LWD <u>71428.6 m²/km²</u> (LWD/ reach area)	
AQUATIC VEGETATION	Indicate the dominant type and record the dominant species present <input type="checkbox"/> Rooted emergent <input type="checkbox"/> Rooted submergent <input type="checkbox"/> Rooted floating <input type="checkbox"/> Free floating <input type="checkbox"/> Floating Algae <input type="checkbox"/> Attached Algae dominant species present _____ Portion of the reach with aquatic vegetation <u>0</u> %	
WATER QUALITY	Temperature <u>20.56 °C</u> Water Odors <input checked="" type="checkbox"/> Normal/None <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Fishy <input type="checkbox"/> Other _____ Specific Conductance <u>0.343 mS/cm</u> Water Surface Oils <input type="checkbox"/> Slick <input type="checkbox"/> Sheen <input type="checkbox"/> Globbs <input type="checkbox"/> Flecks <input checked="" type="checkbox"/> None <input type="checkbox"/> Other _____ Dissolved Oxygen <u>6.30 mg/L</u> Turbidity (if not measured) <input checked="" type="checkbox"/> Clear <input type="checkbox"/> Slightly turbid <input type="checkbox"/> Turbid <input checked="" type="checkbox"/> Opaque <input type="checkbox"/> Stained <input type="checkbox"/> Other _____ pH <u>7.23</u> WQ Instrument Used <u>Horiba</u>	
SEDIMENT/SUBSTRATE	Odors <u>None</u> <input checked="" type="checkbox"/> Normal <input type="checkbox"/> Sewage <input type="checkbox"/> Petroleum <input type="checkbox"/> Chemical <input type="checkbox"/> Anaerobic <input type="checkbox"/> None <input type="checkbox"/> Other _____ Deposits <input type="checkbox"/> Sludge <input type="checkbox"/> Sawdust <input type="checkbox"/> Paper fiber <input type="checkbox"/> Sand <input type="checkbox"/> Relict shells <input type="checkbox"/> Other _____ Oils <input checked="" type="checkbox"/> Absent <input type="checkbox"/> Slight <input type="checkbox"/> Moderate <input type="checkbox"/> Profuse Looking at stones which are not deeply embedded, are the undersides black in color? <input checked="" type="checkbox"/> Yes <input checked="" type="checkbox"/> No	

INORGANIC SUBSTRATE COMPONENTS (should add up to 100%)			ORGANIC SUBSTRATE COMPONENTS (does not necessarily add up to 100%)		
Substrate Type	Diameter	% Composition in Sampling Reach	Substrate Type	Characteristic	% Composition in Sampling Area
Bedrock			Detritus	sticks, wood, coarse plant materials (CPOM)	<u><5%</u>
Boulder	> 256 mm (10")	<u>5%</u>	Muck-Mud	black, very fine organic (FPOM)	<u>0%</u>
Cobble	64-256 mm (2.5"-10")	<u>15%</u>			
Gravel	2-64 mm (0.1"-2.5")	<u>10%</u>			
Sand	0.06-2mm (gritty)				
Silt	0.004-0.06 mm	<u>35%</u>	Marl	grey, shell fragments	<u>0%</u>
Clay	< 0.004 mm (slick)	<u>35%</u>			

BENTHIC MACROINVERTEBRATE FIELD DATA SHEET

STREAM NAME <u>Stream 16</u>	LOCATION <u>Mitchell Landfill, Cresap, Marshall Co., WV</u>	
STATION # _____ RIVERMILE _____	STREAM CLASS <u>Intermittent</u>	
LAT <u>39°49'24.84"N</u> LONG <u>80°46'20.74"W</u>	RIVER BASIN <u>Ohio River</u>	
STORET # _____	AGENCY _____	
INVESTIGATORS <u>D. Godec</u>	LOT NUMBER _____	
FORM COMPLETED BY <u>D. Godec</u>	DATE <u>8/15/11</u> TIME <u>2:30</u> AM <input checked="" type="radio"/> PM	REASON FOR SURVEY <u>AFP Mitchell Landfill Project</u>

HABITAT TYPES	Indicate the percentage of each habitat type present <input checked="" type="checkbox"/> Cobble <u>15</u> % <input type="checkbox"/> Snags _____ % <input type="checkbox"/> Vegetated Banks _____ % <input type="checkbox"/> Sand _____ % <input type="checkbox"/> Submerged Macrophytes _____ % <input checked="" type="checkbox"/> Other (<u>boulders</u>) <u>5</u> %
SAMPLE COLLECTION	Gear used <input type="checkbox"/> D-frame <input type="checkbox"/> kick-net <input checked="" type="checkbox"/> Other <u>Grab sample, Aquarium net</u> How were the samples collected? <input checked="" type="checkbox"/> wading <input type="checkbox"/> from bank <input type="checkbox"/> from boat Indicate the number of jabs/kicks taken in each habitat type. <input checked="" type="checkbox"/> Cobble <u>20</u> <input type="checkbox"/> Snags _____ <input type="checkbox"/> Vegetated Banks _____ <input type="checkbox"/> Sand _____ <input type="checkbox"/> Submerged Macrophytes _____ <input checked="" type="checkbox"/> Other (<u>boulders</u>) <u>15</u>
GENERAL COMMENTS	<u>Macroinvertebrates scarce; only Trichoptera observed</u>

QUALITATIVE LISTING OF AQUATIC BIOTA

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare, 2 = Common, 3 = Abundant, 4 = Dominant

Periphyton	<u>0</u>	1	2	3	4	Slimes	<u>0</u>	1	2	3	4
Filamentous Algae	<u>0</u>	1	2	3	4	Macroinvertebrates	<u>0</u>	<u>1</u>	2	3	4
Macrophytes	<u>0</u>	1	2	3	4	Fish	<u>0</u>	1	2	3	4

FIELD OBSERVATIONS OF MACROBENTHOS

Indicate estimated abundance: 0 = Absent/Not Observed, 1 = Rare (1-3 organisms), 2 = Common (3-9 organisms), 3 = Abundant (>10 organisms), 4 = Dominant (>50 organisms)

Porifera	0	1	2	3	4	Anisoptera	0	1	2	3	4	Chironomidae	0	1	2	3	4
Hydrozoa	0	1	2	3	4	Zygoptera	0	1	2	3	4	Ephemeroptera	0	1	2	3	4
Platyhelminthes	0	1	2	3	4	Hemiptera	0	1	2	3	4	Trichoptera	0	1	<u>2</u>	3	4
Turbellaria	0	1	2	3	4	Coleoptera	0	1	2	3	4	Other	0	1	2	3	4
Hirudinea	0	1	2	3	4	Lepidoptera	0	1	2	3	4						
Oligochaeta	0	1	2	3	4	Sialidae	0	1	2	3	4						
Isopoda	0	1	2	3	4	Corydalidae	0	1	2	3	4						
Amphipoda	0	1	2	3	4	Tipulidae	0	1	2	3	4						
Decapoda	0	1	2	3	4	Empididae	0	1	2	3	4						
Gastropoda	0	1	2	3	4	Simuliidae	0	1	2	3	4						
Bivalvia	0	1	2	3	4	Tabinidae	0	1	2	3	4						
						Culicidae	0	1	2	3	4						



APPENDIX D

USACE HIGH-GRADIENT HEADWATER STREAM DATA FORMS

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Stream 1 Ephemeral Portion, Cresap, Marshall Co., WV

Sampling Date: 27 Sept 2011

Project Site Before Project

Subclass for this SAR:

Ephemeral Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 1 Eph

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.93
Biogeochemical Cycling	0.85
Habitat	0.74

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	59.00	0.62
V_{EMBED}	Average embeddedness of channel.	2.77	0.74
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	4.00	1.00
V_{BERO}	Total percent of eroded stream channel bank.	5.00	1.00
V_{LWD}	Number of down woody stems per 100 feet of stream.	12.00	1.00
V_{TDBH}	Average dbh of trees.	11.25	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	0.00	0.10
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	0.00	0.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	73.13	0.89
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: Dawn York and Mary Gilmore	Latitude/UTM Northing: 39.829327
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: 80.776429
Location: Stream 1 Ephemeral Portion, Cresap, Marshall Co., WV	Sampling Date: 27 Sept 2011
SAR Number: 1 Eph	Reach Length (ft): 100
Stream Type: Ephemeral Stream	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site	Before Project

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 59.0 %

List the percent cover measurements at each point below:

10	15	85	100	95	5	10	80	100	90

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 2.8

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

2	3	1	5	4	3				
5	2	1	3	3	3				
3	1	2	3	3	3				
4	4	3	4	1	2				
1	2	4	3	2	3				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 4.00 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

0.50	8.00	7.00	3.50	10.50	99.00				
2.50	4.40	2.10	99.00	4.50	0.50				
16.00	1.00	7.10	7.00	4.00	10.00				
0.50	0.70	11.10	2.10	3.50	5.10				
4.00	2.00	0.50	7.00	1.50	1.00				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 5 %

Left Bank: 0 ft

Right Bank: 5 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.	12.0																																																																																																				
Number of downed woody stems: 12																																																																																																							
6	V_{TDBH}	Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:	11.3																																																																																																				
<table border="1" style="width:100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="5" style="text-align: center;">Left Side</th> <th colspan="5" style="text-align: center;">Right Side</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">13</td><td></td><td></td><td></td><td></td><td style="text-align: center;">22</td><td></td><td></td><td></td><td></td></tr> <tr><td style="text-align: center;">5</td><td></td><td></td><td></td><td></td><td style="text-align: center;">9</td><td></td><td></td><td></td><td></td></tr> <tr><td style="text-align: center;">5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td style="text-align: center;">21</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td style="text-align: center;">13</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td style="text-align: center;">7.5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td style="text-align: center;">4</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td style="text-align: center;">13</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>				Left Side					Right Side					13					22					5					9					5										21										13										7.5										4										13																			
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7	V_{SNAG}	Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.	0.0																																																																																																				
Left Side: 0 Right Side: 0																																																																																																							
8	V_{SSD}	Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.	Not Used																																																																																																				
Left Side: 28 Right Side: 25																																																																																																							
9	V_{SRICH}	Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.	0.00																																																																																																				
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Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V_{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	73.13 %																								
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11	V_{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
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Sample Variable 12 within the entire catchment of the stream.

12	V_{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																								
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1 Eph			Notes:	
Variable	Value	VSI		
V_{CCANOPY}	59 %	0.62		
V_{EMBED}	2.8	0.74		
$V_{\text{SUBSTRATE}}$	4.00 in	1.00		
V_{BERO}	5 %	1.00		
V_{LWD}	12.0	1.00		
V_{TDBH}	11.3	1.00		
V_{SNAG}	0.0	0.10		
V_{SSD}	Not Used	Not Used		
V_{SRICH}	0.00	0.00		
V_{DETRITUS}	73.1 %	0.89		
V_{HERB}	Not Used	Not Used		
V_{WLUSE}	1	1.00		

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Stream 1 Lower Sample Reach, Cresap, Marshall Co, WV

Sampling Date: 8/13/11

Project Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 1

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.98
Biogeochemical Cycling	0.93
Habitat	0.94

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	87.00	0.99
V_{EMBED}	Average embeddedness of channel.	4.17	0.92
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	3.95	1.00
V_{BERO}	Total percent of eroded stream channel bank.	15.00	0.99
V_{LWD}	Number of down woody stems per 100 feet of stream.	20.00	1.00
V_{TDBH}	Average dbh of trees.	9.45	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	3.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	3.60	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	55.31	0.67
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: D. Godec, G. Gerke	Latitude/UTM Northing: 39°49'13.90"N
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: 80°46'35.08"W
Location: Stream 1 Lower Sample Reach, Cresap, Marshall Co, WV	Sampling Date: 8/13/11
SAR Number: 1	Reach Length (ft): 100
Stream Type: Intermittent Stream	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site	Before Project

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 87.0 %

List the percent cover measurements at each point below:

80	70	90	95	100	100	90	80	90	75

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 4.2

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

4	4	4	4	5	4				
4	4	4	5	5	4				
4	4	4	5	4	4				
5	4	4	4	4	4				
4	3	4	4	4	5				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 3.95 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

1.20	12.20	1.20	3.10	18.10	0.40				
3.90	10.10	5.10	28.40	6.10	5.30				
4.80	8.10	2.10	24.50	2.80	3.50				
36.20	0.50	1.10	0.30	3.90	1.50				
24.10	0.80	4.00	0.40	5.10	41.30				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 15 %

Left Bank: **0 ft**

Right Bank: **15 ft**

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.	20.0
Number of downed woody stems: 20			

6	V_{TDBH}	Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:	9.4																																																																																																														
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7	V_{SNAG}	Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.	3.0
Left Side: 0 Right Side: 3			

8	V_{SSD}	Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.	Not Used
Left Side: Right Side: 			

9	V_{SRICH}	Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.	3.60
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Group 1 = 1.0			Group 2 (-1.0)		
<input type="checkbox"/> <i>Acer rubrum</i>	<input type="checkbox"/> <i>Magnolia tripetala</i>	<input type="checkbox"/> <i>Ailanthus altissima</i>	<input type="checkbox"/> <i>Lonicera japonica</i>		
<input checked="" type="checkbox"/> <i>Acer saccharum</i>	<input type="checkbox"/> <i>Nyssa sylvatica</i>	<input type="checkbox"/> <i>Albizia julibrissin</i>	<input type="checkbox"/> <i>Lonicera tatarica</i>		
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<input checked="" type="checkbox"/> <i>Asimina triloba</i>	<input type="checkbox"/> <i>Prunus serotina</i>	<input type="checkbox"/> <i>Alternanthera philoxeroides</i>	<input type="checkbox"/> <i>Lythrum salicaria</i>		
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<input type="checkbox"/> <i>Carya alba</i>	<input type="checkbox"/> <i>Quercus imbricaria</i>	<input type="checkbox"/> <i>Coronilla varia</i>	<input type="checkbox"/> <i>Polygonum cuspidatum</i>		
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<input type="checkbox"/> <i>Carya ovalis</i>	<input type="checkbox"/> <i>Quercus rubra</i>	<input type="checkbox"/> <i>Lespedeza bicolor</i>	<input type="checkbox"/> <i>Rosa multiflora</i>		
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<input type="checkbox"/> <i>Fraxinus americana</i>	<input type="checkbox"/> <i>Tsuga canadensis</i>				
<input checked="" type="checkbox"/> <i>Liriodendron tulipifera</i>	<input checked="" type="checkbox"/> <i>Ulmus americana</i>				
<input type="checkbox"/> <i>Magnolia acuminata</i>					
5 Species in Group 1		1 Species in Group 2			

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V _{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	55.31 %																								
<table border="1"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td>60</td> <td>50</td> <td>60</td> <td>60</td> <td>50</td> <td>40</td> <td>40</td> <td>50</td> </tr> <tr> <td>70</td> <td>60</td> <td>75</td> <td>60</td> <td>60</td> <td>50</td> <td>50</td> <td>50</td> </tr> </table>				Left Side				Right Side				60	50	60	60	50	40	40	50	70	60	75	60	60	50	50	50
Left Side				Right Side																							
60	50	60	60	50	40	40	50																				
70	60	75	60	60	50	50	50																				
11	V _{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
<table border="1"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> </tr> </table>				Left Side				Right Side																			
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Sample Variable 12 within the entire catchment of the stream.

12	V _{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																				
<table border="1"> <tr> <th>Land Use (Choose From Drop List)</th> <th>Runoff Score</th> <th>% in Catchment</th> <th>Running Percent (not >100)</th> </tr> <tr> <td>Forest and native range (>75% ground cover) ▼</td> <td>1</td> <td>100</td> <td>100</td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> </table>				Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)	Forest and native range (>75% ground cover) ▼	1	100	100	▼				▼				▼				▼				▼				▼				▼			
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Summary: SAA Number 1			Notes:
Variable	Value	VSI	
V _{CCANOPY}	87 %	0.99	
V _{EMBED}	4.2	0.92	
V _{SUBSTRATE}	3.95 in	1.00	
V _{BERO}	15 %	0.99	
V _{LWD}	20.0	1.00	
V _{TDBH}	9.4	1.00	
V _{SNAG}	3.0	1.00	
V _{SSD}	Not Used	Not Used	
V _{SRICH}	3.60	1.00	
V _{DETRITUS}	55.3 %	0.67	
V _{HERB}	Not Used	Not Used	
V _{WLUSE}	1	1.00	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Stream 1 Middle Sample Reach Cresap, Marshall Co, WV

Sampling Date: 8/12/11

Project Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 1

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.95
Biogeochemical Cycling	0.90
Habitat	0.89

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	93.50	1.00
V_{EMBED}	Average embeddedness of channel.	4.13	0.93
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	4.55	1.00
V_{BERO}	Total percent of eroded stream channel bank.	10.00	1.00
V_{LWD}	Number of down woody stems per 100 feet of stream.	7.00	0.88
V_{TDBH}	Average dbh of trees.	8.75	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	3.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	5.00	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	30.94	0.38
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: D. Godec, G. Gerke	Latitude/UTM Northing: 39°49'30.21"N
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: 80°46'32.40"W
Location: Stream 1 Middle Sample Reach Cresap, Marshall Co, WV	Sampling Date: 8/12/11
SAR Number: 1	Reach Length (ft): 100
Stream Type: Intermittent Stream ▼	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site ▼	Before Project ▼

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 93.5 %

List the percent cover measurements at each point below:

100	90	100	100	85	100	90	100	70	100

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 4.1

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

5	4	4	4	4	5				
5	4	4	4	4	5				
3	4	4	4	4	5				
3	4	4	4	3	5				
4	4	4	4	4	5				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 4.55 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

99.00	1.50	4.80	2.90	4.10	99.00				
99.00	2.40	8.50	3.80	3.40	99.00				
3.50	6.40	3.40	5.10	2.80	99.00				
4.30	5.10	11.10	11.00	2.10	99.00				
0.50	7.00	3.20	0.90	2.10	10.10				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 10 %

Left Bank: 5 ft

Right Bank: 5 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	<p>Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.</p> <p style="text-align: right;">Number of downed woody stems: 7</p>	7.0																																																																																																														
6	V_{TDBH}	<p>Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.</p> <p>List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="5" style="text-align: center;">Left Side</th> <th colspan="5" style="text-align: center;">Right Side</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">9</td> <td style="text-align: center;">5</td> <td style="text-align: center;">5</td> <td style="text-align: center;"></td> <td style="text-align: center;"></td> <td style="text-align: center;">12</td> <td style="text-align: center;">12</td> <td style="text-align: center;">12</td> <td style="text-align: center;">10</td> <td style="text-align: center;">5</td> </tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>	Left Side					Right Side					9	5	5			12	12	12	10	5																																																																																											8.8
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7	V_{SNAG}	<p>Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.</p> <p style="text-align: right;">Left Side: 3 Right Side: 0</p>	3.0																																																																																																														
8	V_{SSD}	<p>Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.</p> <p style="text-align: right;">Left Side: Right Side: </p>	Not Used																																																																																																														
9	V_{SRICH}	<p>Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="2" style="text-align: center;">Group 1 = 1.0</th> <th colspan="2" style="text-align: center;">Group 2 (-1.0)</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/> <i>Acer rubrum</i></td> <td><input type="checkbox"/> <i>Magnolia tripetala</i></td> <td><input type="checkbox"/> <i>Ailanthus altissima</i></td> <td><input type="checkbox"/> <i>Lonicera japonica</i></td> </tr> <tr> <td><input checked="" type="checkbox"/> <i>Acer saccharum</i></td> <td><input type="checkbox"/> <i>Nyssa sylvatica</i></td> <td><input type="checkbox"/> <i>Albizia julibrissin</i></td> <td><input type="checkbox"/> <i>Lonicera tatarica</i></td> </tr> <tr> <td><input type="checkbox"/> <i>Aesculus flava</i></td> <td><input type="checkbox"/> <i>Oxydendrum arboreum</i></td> <td><input type="checkbox"/> <i>Alliaria 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Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V _{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	30.94 %																								
<table><tr><th colspan="4">Left Side</th><th colspan="4">Right Side</th></tr><tr><td>40</td><td>30</td><td>20</td><td>30</td><td>10</td><td>10</td><td>20</td><td>20</td></tr><tr><td>50</td><td>25</td><td>60</td><td>60</td><td>25</td><td>25</td><td>40</td><td>30</td></tr></table>				Left Side				Right Side				40	30	20	30	10	10	20	20	50	25	60	60	25	25	40	30
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40	30	20	30	10	10	20	20																				
50	25	60	60	25	25	40	30																				
11	V _{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
<table><tr><th colspan="4">Left Side</th><th colspan="4">Right Side</th></tr><tr><td>60</td><td></td><td></td><td></td><td>60</td><td></td><td></td><td></td></tr><tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr></table>				Left Side				Right Side				60				60											
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Sample Variable 12 within the entire catchment of the stream.

12	V _{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																								
<table> <tr> <th>Land Use (Choose From Drop List)</th><th>Runoff Score</th><th>% in Catchment</th><th>Running Percent (not >100)</th></tr> <tr> <td>Forest and native range (>75% ground cover)</td><td>1</td><td>100</td><td>100</td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> </table>				Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)	Forest and native range (>75% ground cover)	1	100	100																																
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Summary: SAA Number 1			Notes:
Variable	Value	VSI	
V _{CCANOPY}	94 %	1.00	
V _{EMBED}	4.1	0.93	
V _{SUBSTRATE}	4.55 in	1.00	
V _{BERO}	10 %	1.00	
V _{LWD}	7.0	0.88	
V _{TDBH}	8.8	1.00	
V _{SNAG}	3.0	1.00	
V _{SSD}	Not Used	Not Used	
V _{SRICH}	5.00	1.00	
V _{DETRITUS}	30.9 %	0.38	
V _{HERB}	Not Used	Not Used	
V _{WLUSE}	1	1.00	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Stream 1 Upper Sample Reach, Cresap, Marshall Co, WV

Sampling Date: 8/12/2011

Project Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 1

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.97
Biogeochemical Cycling	0.93
Habitat	0.88

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	88.50	1.00
V_{EMBED}	Average embeddedness of channel.	3.53	1.00
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	3.15	1.00
V_{BERO}	Total percent of eroded stream channel bank.	35.00	0.89
V_{LWD}	Number of down woody stems per 100 feet of stream.	15.00	1.00
V_{TDBH}	Average dbh of trees.	8.87	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	7.00	0.60
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	5.40	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	19.38	0.24
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: D. Godec, G. Gerke	Latitude/UTM Northing: 39°49'36.46"N
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: 80°46'32.43"W
Location: Stream 1 Upper Sample Reach, Cresap, Marshall Co, WV	Sampling Date: 8/12/2011
SAR Number: 1	Reach Length (ft): 100
Stream Type: Intermittent Stream	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site	Before Project

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 88.5 %

List the percent cover measurements at each point below:

80	95	100	100	100	100	25	100	95	90

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 3.5

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

3	4	4	4	5	4				
4	4	5	3	4	3				
2	3	4	1	3	4				
4	4	5	3	4	3				
1	3	4	4	3	4				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 3.15 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

4.10	5.40	6.30	5.00	99.00	5.10				
12.20	6.00	2.80	2.50	0.80	4.00				
3.10	2.80	12.50	0.50	4.20	3.10				
0.50	0.50	3.20	3.50	1.90	0.80				
2.50	1.20	6.40	1.50	4.00	2.60				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 35 %

Left Bank: **25 ft**

Right Bank: **10 ft**

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated. Number of downed woody stems: 15	15.0																																																																																																														
6	V_{TDBH}	Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:	8.9																																																																																																														
<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th colspan="5">Left Side</th> <th colspan="5">Right Side</th> </tr> </thead> <tbody> <tr> <td>10</td><td>16</td><td>5</td><td>4</td><td>16</td> <td>9</td><td>11</td><td>6</td><td>6</td><td>9</td> </tr> <tr> <td>8</td><td></td><td></td><td></td><td></td> <td>10</td><td>7</td><td>6</td><td>10</td><td></td> </tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>				Left Side					Right Side					10	16	5	4	16	9	11	6	6	9	8					10	7	6	10																																																																																	
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7	V_{SNAG}	Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated. Left Side: 4 Right Side: 3	7.0																																																																																																														
8	V_{SSD}	Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated. Left Side: Right Side: 	Not Used																																																																																																														
9	V_{SRICH}	Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.	5.40																																																																																																														
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Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V _{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	19.38 %																								
<table border="1"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td>15</td> <td>20</td> <td>10</td> <td>10</td> <td>40</td> <td>20</td> <td>25</td> <td>30</td> </tr> <tr> <td>20</td> <td>5</td> <td>10</td> <td>20</td> <td>10</td> <td>20</td> <td>15</td> <td>40</td> </tr> </table>				Left Side				Right Side				15	20	10	10	40	20	25	30	20	5	10	20	10	20	15	40
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20	5	10	20	10	20	15	40																				
11	V _{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
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Sample Variable 12 within the entire catchment of the stream.

12	V _{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																				
<table border="1"> <tr> <th>Land Use (Choose From Drop List)</th> <th>Runoff Score</th> <th>% in Catchment</th> <th>Running Percent (not >100)</th> </tr> <tr> <td>Forest and native range (>75% ground cover) ▼</td> <td>1</td> <td>100</td> <td>100</td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> </table>				Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)	Forest and native range (>75% ground cover) ▼	1	100	100	▼				▼				▼				▼				▼				▼				▼			
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Summary: SAA Number 1			Notes:	
Variable	Value	VSI		
V _{CCANOPY}	89 %	1.00		
V _{EMBED}	3.5	1.00		
V _{SUBSTRATE}	3.15 in	1.00		
V _{BERO}	35 %	0.89		
V _{LWD}	15.0	1.00		
V _{TDBH}	8.9	1.00		
V _{SNAG}	7.0	0.60		
V _{SSD}	Not Used	Not Used		
V _{SRICH}	5.40	1.00		
V _{DETRITUS}	19.4 %	0.24		
V _{HERB}	Not Used	Not Used		
V _{WLUSE}	1	1.00		

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Stream 1a. Cresap, Marshall Co., WV

Sampling Date: 27 Sept 2011

Project Site Before Project

Subclass for this SAR:

Ephemeral Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 1a

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.98
Biogeochemical Cycling	0.96
Habitat	0.97

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	87.50	0.99
V_{EMBED}	Average embeddedness of channel.	3.30	0.93
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	7.20	0.92
V_{BERO}	Total percent of eroded stream channel bank.	26.00	0.94
V_{LWD}	Number of down woody stems per 100 feet of stream.	15.00	1.00
V_{TDBH}	Average dbh of trees.	9.93	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	2.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	2.70	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	78.75	0.96
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: Dawn York and Mary Gilmore	Latitude/UTM Northing: 39.828573
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: -80.776043
Location: Stream 1a. Cresap, Marshall Co., WV	Sampling Date: 27 Sept 2011
SAR Number: 1a	Reach Length (ft): 100
Stream Type: Ephemeral Stream ▼	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site ▼	Before Project ▼

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 87.5 %

List the percent cover measurements at each point below:

50	100	100	80	75					
100	100	100	90	80					

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 3.3

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

5	4	3	1	5	5				
4	3	4	2	5	4				
3	3	2	5	4	3				
4	4	3	3	1	1				
3	4	2	3	5	1				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 7.20 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

16.30	9.10	10.50	0.70	11.00	2.60				
12.00	99.00	16.80	8.50	5.50	1.75				
99.00	22.50	2.00	5.50	99.00	2.30				
2.90	10.50	2.20	5.40	2.20	13.50				
5.50	99.00	0.10	5.00	7.20	7.20				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 26 %

Left Bank: 14 ft

Right Bank: 12 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated. Number of downed woody stems: 15	15.0																																																																																																				
6	V_{TDBH}	Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:	9.9																																																																																																				
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7	V_{SNAG}	Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated. Left Side: Right Side: 2	2.0																																																																																																				
8	V_{SSD}	Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated. Left Side: 42 Right Side: 14	Not Used																																																																																																				
9	V_{SRICH}	Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.	2.70																																																																																																				
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4 Species in Group 1		1 Species in Group 2																																																																																																					

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V_{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	78.75 %																																
<table border="1" style="width:100%; border-collapse: collapse; margin-top: 10px;"> <tr> <th colspan="4" style="text-align: center;">Left Side</th> <th colspan="4" style="text-align: center;">Right Side</th> </tr> <tr> <td style="text-align: center;">75</td> <td style="text-align: center;">85</td> <td></td> <td></td> <td style="text-align: center;">100</td> <td style="text-align: center;">40</td> <td></td> <td></td> </tr> <tr> <td style="text-align: center;">90</td> <td style="text-align: center;">95</td> <td></td> <td></td> <td style="text-align: center;">65</td> <td style="text-align: center;">80</td> <td></td> <td></td> </tr> </table>				Left Side				Right Side				75	85			100	40			90	95			65	80										
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11	V_{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																																
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Sample Variable 12 within the entire catchment of the stream.

12	V_{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																																		
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1a			Notes:
Variable	Value	VSI	
V_{CCANOPY}	88 %	0.99	
V_{EMBED}	3.3	0.93	
$V_{\text{SUBSTRATE}}$	7.20 in	0.92	
V_{BERO}	26 %	0.94	
V_{LWD}	15.0	1.00	
V_{TDBH}	9.9	1.00	
V_{SNAG}	2.0	1.00	
V_{SSD}	Not Used	Not Used	
V_{SRICH}	2.70	1.00	
V_{DETRITUS}	78.8 %	0.96	
V_{HERB}	Not Used	Not Used	
V_{WLUSE}	1	1.00	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Stream 1b. Cresap, Marshall Co., WV

Sampling Date: 27 Sept 2011

Project Site Before Project

Subclass for this SAR:

Ephemeral Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 1b

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.94
Biogeochemical Cycling	0.85
Habitat	0.61

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	21.00	0.11
V_{EMBED}	Average embeddedness of channel.	2.80	0.75
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	3.40	1.00
V_{BERO}	Total percent of eroded stream channel bank.	32.00	0.90
V_{LWD}	Number of down woody stems per 100 feet of stream.	20.00	1.00
V_{TDBH}	Average dbh of trees.	8.25	0.91
V_{SNAG}	Number of snags per 100 feet of stream.	4.00	0.90
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	0.00	0.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	74.38	0.91
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: Dawn York and Mary Gilmore	Latitude/UTM Northing: 39.828573
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: -80.776341
Location: Stream 1b. Cresap, Marshall Co., WV	Sampling Date: 27 Sept 2011
SAR Number: 1b	Reach Length (ft): 50
Stream Type: Ephemeral Stream ▼	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site ▼	Before Project ▼

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 21.0 %

List the percent cover measurements at each point below:

0	10	50	40	0	0	50	20	10	30

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 2.8

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

3	4	1	3	2	1				
4	3	1	2	5	4				
5	3	1	3	4	3				
3	3	2	3	1	1				
5	5	3	3	2	1				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 3.40 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

6.70	0.60	0.50	15.00	4.00	8.00				
7.50	4.00	2.20	99.00	2.90	3.00				
5.10	0.90	0.80	3.00	3.20	8.50				
4.90	0.90	2.90	11.00	6.50	3.00				
6.90	2.70	3.10	4.00	3.60	0.10				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 32 %

Left Bank: 6 ft

Right Bank: 10 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	<p>Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.</p> <p style="text-align: right;">Number of downed woody stems: 10</p>	20.0																																																																																																														
6	V_{TDBH}	<p>Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.</p> <p>List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="5" style="text-align: center;">Left Side</th> <th colspan="5" style="text-align: center;">Right Side</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">8.9</td><td></td><td></td><td></td><td></td> <td style="text-align: center;">9</td><td></td><td></td><td></td><td></td> </tr> <tr> <td style="text-align: center;">8.2</td><td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td><td></td> </tr> <tr> <td style="text-align: center;">6.9</td><td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td><td></td> </tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>	Left Side					Right Side					8.9					9					8.2										6.9																																																																																8.3
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8	V_{SSD}	<p>Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.</p> <p style="text-align: right;">Left Side: 3 Right Side: 5</p>	Not Used																																																																																																														
9	V_{SRICH}	<p>Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="2" style="text-align: center;">Group 1 = 1.0</th> <th colspan="2" style="text-align: center;">Group 2 (-1.0)</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/> <i>Acer rubrum</i></td> <td><input type="checkbox"/> <i>Magnolia tripetala</i></td> <td><input type="checkbox"/> <i>Ailanthus altissima</i></td> <td><input type="checkbox"/> <i>Lonicera japonica</i></td> </tr> <tr> <td><input checked="" type="checkbox"/> <i>Acer saccharum</i></td> <td><input type="checkbox"/> <i>Nyssa sylvatica</i></td> <td><input type="checkbox"/> <i>Albizia julibrissin</i></td> <td><input type="checkbox"/> <i>Lonicera tatarica</i></td> </tr> <tr> <td><input type="checkbox"/> <i>Aesculus flava</i></td> <td><input type="checkbox"/> <i>Oxydendrum arboreum</i></td> <td><input type="checkbox"/> <i>Alliaria 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<input type="checkbox"/> <i>Carya alba</i>	<input type="checkbox"/> <i>Quercus imbricaria</i>	<input type="checkbox"/> <i>Coronilla varia</i>	<input type="checkbox"/> <i>Polygonum cuspidatum</i>																																																																																																														
<input type="checkbox"/> <i>Carya glabra</i>	<input type="checkbox"/> <i>Quercus prinus</i>	<input type="checkbox"/> <i>Elaeagnus umbellata</i>	<input checked="" type="checkbox"/> <i>Rosa multiflora</i>																																																																																																														
<input type="checkbox"/> <i>Carya ovalis</i>	<input type="checkbox"/> <i>Quercus rubra</i>	<input type="checkbox"/> <i>Lespedeza bicolor</i>	<input type="checkbox"/> <i>Sorghum halepense</i>																																																																																																														
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<input type="checkbox"/> <i>Cornus florida</i>	<input type="checkbox"/> <i>Sassafras albidum</i>	<input type="checkbox"/> <i>Ligustrum obtusifolium</i>																																																																																																															
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1 Species in Group 1		1 Species in Group 2																																																																																																															

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V _{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.						74.38 %
Left Side				Right Side				
10	75			100	100			
80	50			80	100			

11	V _{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.						Not Used
Left Side				Right Side				
10	80			100	20			
40	45			50	50			

Sample Variable 12 within the entire catchment of the stream.

12	V _{WLUSE}	Weighted Average of Runoff Score for watershed:			1.00
		Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)
		Forest and native range (>75% ground cover)	1	100	100

1b			Notes:
Variable	Value	VSI	Very large trees down and across stream.
V _{CCANOPY}	21 %	0.11	
V _{EMBED}	2.8	0.75	
V _{SUBSTRATE}	3.40 in	1.00	
V _{BERO}	32 %	0.90	
V _{LWD}	20.0	1.00	
V _{TDBH}	8.3	0.91	
V _{SNAG}	4.0	0.90	
V _{SSD}	Not Used	Not Used	
V _{SRICH}	0.00	0.00	
V _{DETRITUS}	74.4 %	0.91	
V _{HERB}	Not Used	Not Used	
V _{WLUSE}	1	1.00	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location:

Sampling Date: 27 Sept 2011

Project Site Before Project

Subclass for this SAR:

Ephemeral Stream

Uppermost stratum present at this SAR:

Shrub/Herb Strata

SAR number: 1c

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.67
Biogeochemical Cycling	0.48
Habitat	0.42

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	Not Used, <20%	Not Used
V_{EMBED}	Average embeddedness of channel.	2.60	0.68
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	3.50	1.00
V_{BERO}	Total percent of eroded stream channel bank.	0.00	1.00
V_{LWD}	Number of down woody stems per 100 feet of stream.	0.00	0.00
V_{TDBH}	Average dbh of trees.	Not Used	Not Used
V_{SNAG}	Number of snags per 100 feet of stream.	0.00	0.10
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	1.43	0.02
V_{SRICH}	Riparian vegetation species richness.	0.00	0.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	38.75	0.47
V_{HERB}	Average percent cover of herbaceous vegetation.	90.00	1.00
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: Dawn York and Mary Gilmore	Latitude/UTM Northing: 39.828561
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: -80.776612
Location:	Sampling Date: 27 Sept 2011
SAR Number: 1c	Reach Length (ft): 70
Stream Type: Ephemeral Stream ▼	
Top Strata: Shrub/Herb Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site ▼	Before Project ▼

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) Not Used, <20%

List the percent cover measurements at each point below:

10	5	0	10	10	5	0	0	25	15

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 2.6

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

5	4	3	3	1	4	3	2	2	3
2	3	4	2	3	3	1	3	2	2
3	4	3	2	2	2	1	2	3	1

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 3.50 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

2.30	1.50	6.50	3.50	3.00	13.00	5.50	9.50	3.00	3.00
4.00	4.00	6.00	9.50	19.00	3.50	3.00	2.50	0.50	0.50
0.50	0.70	5.50	12.00	0.50	1.50	3.00	4.50	3.50	10.00

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 0 %

Left Bank: 0 ft

Right Bank: 0 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.	0.0
Number of downed woody stems: 0			

6	V_{TDBH}	Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:	Not Used																																																																																																														
<table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="5" style="text-align: center;">Left Side</th> <th colspan="5" style="text-align: center;">Right Side</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">4</td> <td style="text-align: center;">5</td> <td style="text-align: center;">4.5</td> <td></td> <td></td> <td style="text-align: center;">8.9</td> <td style="text-align: center;">20</td> <td></td> <td></td> <td></td> </tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>				Left Side					Right Side					4	5	4.5			8.9	20																																																																																													
Left Side					Right Side																																																																																																												
4	5	4.5			8.9	20																																																																																																											

7	V_{SNAG}	Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.	0.0
Left Side: 0 Right Side: 0			

8	V_{SSD}	Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.	1.4
Left Side: 1 Right Side: 			

9	V_{SRICH}	Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.	0.00
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Group 1 = 1.0				Group 2 (-1.0)			
<input type="checkbox"/> <i>Acer rubrum</i>	<input type="checkbox"/> <i>Magnolia tripetala</i>	<input type="checkbox"/> <i>Ailanthus altissima</i>	<input type="checkbox"/> <i>Lonicera japonica</i>				
<input type="checkbox"/> <i>Acer saccharum</i>	<input type="checkbox"/> <i>Nyssa sylvatica</i>	<input type="checkbox"/> <i>Albizia julibrissin</i>	<input type="checkbox"/> <i>Lonicera tatarica</i>				
<input type="checkbox"/> <i>Aesculus flava</i>	<input type="checkbox"/> <i>Oxydendrum arboreum</i>	<input type="checkbox"/> <i>Alliaria petiolata</i>	<input type="checkbox"/> <i>Lotus corniculatus</i>				
<input type="checkbox"/> <i>Asimina triloba</i>	<input type="checkbox"/> <i>Prunus serotina</i>	<input type="checkbox"/> <i>Alternanthera philoxeroides</i>	<input type="checkbox"/> <i>Lythrum salicaria</i>				
<input type="checkbox"/> <i>Betula alleghaniensis</i>	<input type="checkbox"/> <i>Quercus alba</i>	<input type="checkbox"/> <i>Aster tataricus</i>	<input type="checkbox"/> <i>Microstegium vimineum</i>				
<input type="checkbox"/> <i>Betula lenta</i>	<input type="checkbox"/> <i>Quercus coccinea</i>	<input type="checkbox"/> <i>Cerastium fontanum</i>	<input type="checkbox"/> <i>Paulownia tomentosa</i>				
<input type="checkbox"/> <i>Carya alba</i>	<input type="checkbox"/> <i>Quercus imbricaria</i>	<input type="checkbox"/> <i>Coronilla varia</i>	<input type="checkbox"/> <i>Polygonum cuspidatum</i>				
<input type="checkbox"/> <i>Carya glabra</i>	<input type="checkbox"/> <i>Quercus prinus</i>	<input type="checkbox"/> <i>Elaeagnus umbellata</i>	<input checked="" type="checkbox"/> <i>Rosa multiflora</i>				
<input type="checkbox"/> <i>Carya ovalis</i>	<input type="checkbox"/> <i>Quercus rubra</i>	<input type="checkbox"/> <i>Lespedeza bicolor</i>	<input type="checkbox"/> <i>Sorghum halepense</i>				
<input type="checkbox"/> <i>Carya ovata</i>	<input type="checkbox"/> <i>Quercus velutina</i>	<input type="checkbox"/> <i>Lespedeza cuneata</i>	<input type="checkbox"/> <i>Verbena brasiliensis</i>				
<input type="checkbox"/> <i>Cornus florida</i>	<input type="checkbox"/> <i>Sassafras albidum</i>	<input type="checkbox"/> <i>Ligustrum obtusifolium</i>					
<input type="checkbox"/> <i>Fagus grandifolia</i>	<input type="checkbox"/> <i>Tilia americana</i>	<input type="checkbox"/> <i>Ligustrum sinense</i>					
<input type="checkbox"/> <i>Fraxinus americana</i>	<input type="checkbox"/> <i>Tsuga canadensis</i>						
<input type="checkbox"/> <i>Liriodendron tulipifera</i>	<input checked="" type="checkbox"/> <i>Ulmus americana</i>						
<input type="checkbox"/> <i>Magnolia acuminata</i>							
1 Species in Group 1		1 Species in Group 2					

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V_{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	38.75 %																								
<table border="1" style="width: 100%; border-collapse: collapse; margin: 5px;"> <tr> <th colspan="4" style="text-align: center;">Left Side</th> <th colspan="4" style="text-align: center;">Right Side</th> </tr> <tr> <td style="text-align: center;">10</td> <td style="text-align: center;">30</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;">60</td> <td style="text-align: center;">50</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> <tr> <td style="text-align: center;">40</td> <td style="text-align: center;">20</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;">60</td> <td style="text-align: center;">40</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> </table>				Left Side				Right Side				10	30			60	50			40	20			60	40		
Left Side				Right Side																							
10	30			60	50																						
40	20			60	40																						
11	V_{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	90 %																								
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Left Side				Right Side																							
100	60			100	90																						
90	90			90	100																						

Sample Variable 12 within the entire catchment of the stream.

12	V_{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																								
<table border="1" style="width: 100%; border-collapse: collapse; margin: 5px;"> <tr> <th style="width: 65%;">Land Use (Choose From Drop List)</th> <th style="width: 5%;">Runoff Score</th> <th style="width: 10%;">% in Catchment</th> <th style="width: 20%;">Running Percent (not >100)</th> </tr> <tr> <td>Forest and native range (>75% ground cover) ▼</td> <td style="text-align: center;">1</td> <td style="text-align: center;">100</td> <td style="text-align: center;">100</td> </tr> <tr><td> ▼</td><td> </td><td> </td><td> </td></tr> <tr><td> ▼</td><td> </td><td> </td><td> </td></tr> <tr><td> ▼</td><td> </td><td> </td><td> </td></tr> <tr><td> ▼</td><td> </td><td> </td><td> </td></tr> <tr><td> ▼</td><td> </td><td> </td><td> </td></tr> <tr><td> ▼</td><td> </td><td> </td><td> </td></tr> <tr><td> ▼</td><td> </td><td> </td><td> </td></tr> <tr><td> ▼</td><td> </td><td> </td><td> </td></tr> </table>				Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)	Forest and native range (>75% ground cover) ▼	1	100	100	▼				▼				▼				▼				▼				▼				▼				▼			
Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)																																								
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1c			Notes:
Variable	Value	VSI	Stream reach riparian - dominant forb, Verbisina alternifolia. Very little shrub layer.
V_{CCANOPY}	Not Used, <20%	Not Used	
V_{EMBED}	2.6	0.68	
$V_{\text{SUBSTRATE}}$	3.50 in	1.00	
V_{BERO}	0 %	1.00	
V_{LWD}	0.0	0.00	
V_{TDBH}	Not Used	Not Used	
V_{SNAG}	0.0	0.10	
V_{SSD}	1.4	0.02	
V_{SRICH}	0.00	0.00	
V_{DETRITUS}	38.8 %	0.47	
V_{HERB}	90 %	1.00	
V_{WLUSE}	1	1.00	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Stream 1d, Cresap, Marshall Co., WV

Sampling Date: 27 Sept 2011

Project Site Before Project

Subclass for this SAR:

Ephemeral Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 1d

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.93
Biogeochemical Cycling	0.92
Habitat	0.73

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	54.50	0.56
V_{EMBED}	Average embeddedness of channel.	3.27	0.92
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	8.15	0.86
V_{BERO}	Total percent of eroded stream channel bank.	65.00	0.73
V_{LWD}	Number of down woody stems per 100 feet of stream.	12.00	1.00
V_{TDBH}	Average dbh of trees.	11.79	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	27.00	0.50
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	0.00	0.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	42.50	0.52
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: Dawn York and Mary Gilmore	Latitude/UTM Northing: 39.829293
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: -80.776827
Location: Stream 1d, Cresap, Marshall Co., WV	Sampling Date: 27 Sept 2011
SAR Number: 1d	Reach Length (ft): 100
Stream Type: Ephemeral Stream ▼	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site ▼	Before Project ▼

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 54.5 %

List the percent cover measurements at each point below:

50	50	85	50	40	40	60	80	50	40

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 3.3

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

4	3	4	2	3	3				
4	3	4	1	4	4				
5	3	3	3	4	4				
3	2	1	4	3	4				
5	3	1	5	3	3				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 8.15 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

9.00	0.50	14.00	1.00	8.00	99.00				
4.50	99.00	15.00	0.20	22.00	8.90				
12.00	7.00	6.50	9.00	9.00	8.10				
8.50	13.00	0.10	5.00	2.00	4.00				
14.00	4.00	2.00	99.00	8.20	5.50				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 65 %

Left Bank: 20 ft

Right Bank: 45 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	<p>Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.</p> <p style="text-align: right;">Number of downed woody stems: 12</p>	12.0																																																																																																														
6	V_{TDBH}	<p>Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.</p> <p>List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="5" style="text-align: center;">Left Side</th> <th colspan="5" style="text-align: center;">Right Side</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">18.5</td><td></td><td></td><td></td><td></td><td style="text-align: center;">13.5</td><td></td><td></td><td></td><td></td></tr> <tr><td style="text-align: center;">9.8</td><td></td><td></td><td></td><td></td><td style="text-align: center;">6.9</td><td></td><td></td><td></td><td></td></tr> <tr><td style="text-align: center;">7.8</td><td></td><td></td><td></td><td></td><td style="text-align: center;">9</td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td style="text-align: center;">17</td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>	Left Side					Right Side					18.5					13.5					9.8					6.9					7.8					9										17																																																																	11.8
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7	V_{SNAG}	<p>Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.</p> <p style="text-align: right;">Left Side: Right Side: 27</p>	27.0																																																																																																														
8	V_{SSD}	<p>Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.</p> <p style="text-align: right;">Left Side: 26 Right Side: 27</p>	Not Used																																																																																																														
9	V_{SRICH}	<p>Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="2" style="text-align: center;">Group 1 = 1.0</th> <th colspan="2" style="text-align: center;">Group 2 (-1.0)</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/> <i>Acer rubrum</i></td> <td><input type="checkbox"/> <i>Magnolia tripetala</i></td> <td><input type="checkbox"/> <i>Ailanthus altissima</i></td> <td><input checked="" type="checkbox"/> <i>Lonicera japonica</i></td> </tr> <tr> <td><input checked="" type="checkbox"/> <i>Acer saccharum</i></td> <td><input type="checkbox"/> <i>Nyssa sylvatica</i></td> <td><input type="checkbox"/> <i>Albizia julibrissin</i></td> <td><input checked="" type="checkbox"/> <i>Lonicera tatarica</i></td> </tr> <tr> <td><input type="checkbox"/> <i>Aesculus flava</i></td> <td><input type="checkbox"/> <i>Oxydendrum arboreum</i></td> <td><input 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1 Species in Group 1		3 Species in Group 2																																																																																																															

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V_{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	42.50 %																								
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11	V_{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
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Sample Variable 12 within the entire catchment of the stream.

12	V_{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																																		
<table border="1" style="width: 100%; border-collapse: collapse; margin: 5px 0;"> <tr> <th style="width: 65%;">Land Use (Choose From Drop List)</th> <th style="width: 5%;"></th> <th style="width: 10%;">Runoff Score</th> <th style="width: 10%;">% in Catchment</th> <th style="width: 10%;">Running Percent (not >100)</th> </tr> <tr> <td>Forest and native range (>75% ground cover)</td> <td style="text-align: center;">▼</td> <td style="text-align: center;">1</td> <td style="text-align: center;">100</td> <td style="text-align: center;">100</td> </tr> <tr><td> </td><td style="text-align: center;">▼</td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td style="text-align: center;">▼</td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td style="text-align: center;">▼</td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td style="text-align: center;">▼</td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td style="text-align: center;">▼</td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td style="text-align: center;">▼</td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td style="text-align: center;">▼</td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td style="text-align: center;">▼</td><td> </td><td> </td><td> </td></tr> </table>				Land Use (Choose From Drop List)		Runoff Score	% in Catchment	Running Percent (not >100)	Forest and native range (>75% ground cover)	▼	1	100	100		▼					▼					▼					▼					▼					▼					▼					▼			
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1d			Notes:
Variable	Value	VSI	
V_{CCANOPY}	55 %	0.56	
V_{EMBED}	3.3	0.92	
$V_{\text{SUBSTRATE}}$	8.15 in	0.86	
V_{BERO}	65 %	0.73	
V_{LWD}	12.0	1.00	
V_{TDBH}	11.8	1.00	
V_{SNAG}	27.0	0.50	
V_{SSD}	Not Used	Not Used	
V_{SRICH}	0.00	0.00	
V_{DETRITUS}	42.5 %	0.52	
V_{HERB}	Not Used	Not Used	
V_{WLUSE}	1	1.00	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Cresap, Marshall County, WV

Sampling Date: 8/12/11

Project Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 2

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.98
Biogeochemical Cycling	0.94
Habitat	0.89

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	83.00	0.93
V_{EMBED}	Average embeddedness of channel.	3.80	1.00
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	3.15	1.00
V_{BERO}	Total percent of eroded stream channel bank.	30.00	0.91
V_{LWD}	Number of down woody stems per 100 feet of stream.	10.00	1.00
V_{TDBH}	Average dbh of trees.	10.23	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	3.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	5.40	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	22.81	0.28
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: D. Godec, . G. Gerke	Latitude/UTM Northing: 39°49'37.36"N
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: 80°46'32.37"W
Location: Cresap, Marshall County, WV	Sampling Date: 8/12/11
SAR Number: 2	Reach Length (ft): 100
Stream Type: Intermittent Stream ▼	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site ▼	Before Project ▼

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 83.0 %

List the percent cover measurements at each point below:

10	90	100	80	90	100	80	90	100	90

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 3.8

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

4	4	4	4	3	4				
4	4	5	4	4	4				
4	3	4	4	4	3				
3	4	4	4	5	4				
3	3	3	3	4	4				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 3.15 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

2.20	2.20	1.50	12.50	4.50	8.00				
3.10	99.00	2.50	2.00	2.50	5.50				
1.00	16.00	5.40	8.50	3.50	1.50				
14.50	32.00	3.20	0.50	1.00	1.00				
3.50	0.50	2.40	0.80	5.50	99.00				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 30 %

Left Bank: 10 ft

Right Bank: 20 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	<p>Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.</p> <p style="text-align: right;">Number of downed woody stems: 10</p>	10.0																																																																																																														
6	V_{TDBH}	<p>Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.</p> <p>List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="5" style="text-align: center;">Left Side</th> <th colspan="5" style="text-align: center;">Right Side</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">10</td><td style="text-align: center;">14</td><td style="text-align: center;">10</td><td style="text-align: center;">6</td><td style="text-align: center;">6</td> <td style="text-align: center;">23</td><td style="text-align: center;">6</td><td style="text-align: center;">13</td><td style="text-align: center;">13</td><td style="text-align: center;">5</td> </tr> <tr> <td style="text-align: center;">8</td><td style="text-align: center;">7</td><td></td><td></td><td></td> <td style="text-align: center;">12</td><td></td><td></td><td></td><td></td> </tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>	Left Side					Right Side					10	14	10	6	6	23	6	13	13	5	8	7				12																																																																																					10.2
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7	V_{SNAG}	<p>Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.</p> <p style="text-align: right;">Left Side: 3 Right Side: 0</p>	3.0																																																																																																														
8	V_{SSD}	<p>Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.</p> <p style="text-align: right;">Left Side: Right Side: </p>	Not Used																																																																																																														
9	V_{SRICH}	<p>Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="2" style="text-align: center;">Group 1 = 1.0</th> <th colspan="2" style="text-align: center;">Group 2 (-1.0)</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/> <i>Acer rubrum</i></td> <td><input type="checkbox"/> <i>Magnolia tripetala</i></td> <td><input checked="" type="checkbox"/> <i>Ailanthus altissima</i></td> <td><input type="checkbox"/> <i>Lonicera japonica</i></td> </tr> <tr> <td><input checked="" type="checkbox"/> <i>Acer saccharum</i></td> <td><input type="checkbox"/> <i>Nyssa sylvatica</i></td> <td><input type="checkbox"/> <i>Albizia julibrissin</i></td> <td><input type="checkbox"/> <i>Lonicera tatarica</i></td> </tr> <tr> <td><input type="checkbox"/> <i>Aesculus flava</i></td> <td><input type="checkbox"/> <i>Oxydendrum arboreum</i></td> <td><input type="checkbox"/> 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Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V _{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.								22.81 %								
											Left Side				Right Side			
											30	20	20	30	30	20	25	30
											25	10	25	25	20	10	20	25
11	V _{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.								Not Used								
											Left Side				Right Side			

Sample Variable 12 within the entire catchment of the stream.

12	V _{WLUSE}	Weighted Average of Runoff Score for watershed:			1.00	
		Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)	
		Forest and native range (>75% ground cover)	▼	1	100	100
			▼			
			▼			
			▼			
			▼			
			▼			
			▼			
			▼			

Summary: SAA Number 2			Notes:	
Variable	Value	VSI		
V _{CCANOPY}	83 %	0.93		
V _{EMBED}	3.8	1.00		
V _{SUBSTRATE}	3.15 in	1.00		
V _{BERO}	30 %	0.91		
V _{LWD}	10.0	1.00		
V _{TDBH}	10.2	1.00		
V _{SNAG}	3.0	1.00		
V _{SSD}	Not Used	Not Used		
V _{SRICH}	5.40	1.00		
V _{DETRITUS}	22.8 %	0.28		
V _{HERB}	Not Used	Not Used		
V _{WLUSE}	1	1.00		

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Stream 2a Ephemeral Portion, Cresap, Marshall Co., WV

Sampling Date: 27 Sept 2011

Project Site Before Project

Subclass for this SAR:

Ephemeral Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 2a Eph

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.92
Biogeochemical Cycling	0.88
Habitat	0.71

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	33.50	0.28
V_{EMBED}	Average embeddedness of channel.	3.00	0.82
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	6.00	1.00
V_{BERO}	Total percent of eroded stream channel bank.	5.00	1.00
V_{LWD}	Number of down woody stems per 100 feet of stream.	7.00	0.88
V_{TDBH}	Average dbh of trees.	13.25	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	3.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	1.80	0.86
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	66.25	0.81
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: Dawn York and Mary Gilmore	Latitude/UTM Northing: 39.828091
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: -80.774447
Location: Stream 2a Ephemeral Portion, Cresap, Marshall Co., WV	Sampling Date: 27 Sept 2011
SAR Number: 2a Eph	Reach Length (ft): 100
Stream Type: Ephemeral Stream	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site	Before Project

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 33.5 %

List the percent cover measurements at each point below:

5	5	50	60	50	5	20	50	50	40

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 3.0

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

5	3	1	2	4	4				
5	3	2	4	2	2				
5	3	4	1	3	4				
3	2	1	2	4	4				
4	2	2	3	3	3				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 6.00 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

25.20	33.00	0.70	0.90	8.90	0.60				
4.10	99.00	6.00	3.30	4.50	0.70				
8.00	5.40	7.50	6.90	14.00	2.70				
6.50	7.90	5.40	6.00	4.40	6.90				
11.90	2.90	4.00	10.90	1.00	8.00				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 5 %

Left Bank: Right Bank: 5 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	<p>Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.</p> <p style="text-align: right;">Number of downed woody stems: 7</p>	7.0																																																																																																														
6	V_{TDBH}	<p>Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.</p> <p>List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="5" style="text-align: center;">Left Side</th> <th colspan="5" style="text-align: center;">Right Side</th> </tr> </thead> <tbody> <tr><td style="text-align: center;">4</td><td></td><td></td><td></td><td></td><td style="text-align: center;">11</td><td></td><td></td><td></td><td></td></tr> <tr><td style="text-align: center;">13</td><td></td><td></td><td></td><td></td><td style="text-align: center;">22</td><td></td><td></td><td></td><td></td></tr> <tr><td style="text-align: center;">14</td><td></td><td></td><td></td><td></td><td style="text-align: center;">12</td><td></td><td></td><td></td><td></td></tr> <tr><td style="text-align: center;">25</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td style="text-align: center;">5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>	Left Side					Right Side					4					11					13					22					14					12					25										5																																																												13.3
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7	V_{SNAG}	<p>Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.</p> <p style="text-align: right;">Left Side: 1 Right Side: 2</p>	3.0																																																																																																														
8	V_{SSD}	<p>Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.</p> <p style="text-align: right;">Left Side: 29 Right Side: 31</p>	Not Used																																																																																																														
9	V_{SRICH}	<p>Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="2" style="text-align: center;">Group 1 = 1.0</th> <th colspan="2" style="text-align: center;">Group 2 (-1.0)</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/> <i>Acer rubrum</i></td> <td><input type="checkbox"/> <i>Magnolia tripetala</i></td> <td><input type="checkbox"/> <i>Ailanthus altissima</i></td> <td><input type="checkbox"/> <i>Lonicera japonica</i></td> </tr> <tr> <td><input type="checkbox"/> <i>Acer saccharum</i></td> <td><input type="checkbox"/> <i>Nyssa sylvatica</i></td> <td><input type="checkbox"/> <i>Albizia julibrissin</i></td> <td><input type="checkbox"/> <i>Lonicera tatarica</i></td> </tr> <tr> <td><input type="checkbox"/> <i>Aesculus flava</i></td> <td><input type="checkbox"/> <i>Oxydendrum arboreum</i></td> <td><input type="checkbox"/> <i>Alliaria 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Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V _{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.								66.25 %
		Left Side				Right Side				
		100	60			60	50			
		80	100			10	70			

11	V _{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.								Not Used
		Left Side				Right Side				
		100				90				

Sample Variable 12 within the entire catchment of the stream.

12	V _{WLUSE}	Weighted Average of Runoff Score for watershed:			1.00
		Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)
		Forest and native range (>75% ground cover)	1	100	100

2a Eph			Notes:
Variable	Value	VSI	
V _{CCANOPY}	34 %	0.28	
V _{EMBED}	3.0	0.82	
V _{SUBSTRATE}	6.00 in	1.00	
V _{BERO}	5 %	1.00	
V _{LWD}	7.0	0.88	
V _{TDBH}	13.3	1.00	
V _{SNAG}	3.0	1.00	
V _{SSD}	Not Used	Not Used	
V _{SRICH}	1.80	0.86	
V _{DETRITUS}	66.3 %	0.81	
V _{HERB}	Not Used	Not Used	
V _{WLUSE}	1	1.00	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Cresap, Marshall County, WV

Sampling Date: 8/11/2011

Project Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 2A

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.93
Biogeochemical Cycling	0.80
Habitat	0.61

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	30.00	0.23
V_{EMBED}	Average embeddedness of channel.	2.77	0.74
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	1.50	0.75
V_{BERO}	Total percent of eroded stream channel bank.	60.00	0.75
V_{LWD}	Number of down woody stems per 100 feet of stream.	12.00	1.00
V_{TDBH}	Average dbh of trees.	9.54	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	5.00	0.80
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	1.80	0.86
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	17.19	0.21
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: D. Godec, G. Gerke	Latitude/UTM Northing: 39°49'39.73"N
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: 80°46'27.49"W
Location: Cresap, Marshall County, WV	Sampling Date: 8/11/2011
SAR Number: 2A	Reach Length (ft): 100
Stream Type: Intermittent Stream	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site	Before Project

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 30.0 %

List the percent cover measurements at each point below:

0	25	90	100	10	0	25	50	0	0

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 2.8

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

2	3	3	3	2	3				
2	3	3	3	2	3				
3	3	3	3	3	3				
2	2	2	2	3	2				
4	3	4	3	3	3				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 1.50 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

2.10	3.00	1.10	0.10	2.10	2.00				
2.20	0.10	1.10	0.50	2.00	1.20				
3.30	1.00	2.00	4.10	1.50	1.50				
2.10	0.10	2.10	0.60	1.30	2.00				
3.10	1.00	0.10	4.10	0.10	0.50				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 60 %

Left Bank: **30 ft**

Right Bank: **30 ft**

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	<p>Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.</p> <p style="text-align: right;">Number of downed woody stems: 12</p>	12.0																																																																																																				
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Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V _{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.									17.19 %	
			Left Side				Right Side					
			10	25	20	40	10	5	10	5		
			25	40	10	30	5	20	10	10		

11	V _{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.									Not Used	
			Left Side				Right Side					

Sample Variable 12 within the entire catchment of the stream.

12	V _{WLUSE}	Weighted Average of Runoff Score for watershed:				1.00		
			Land Use (Choose From Drop List)	Runoff Score	% in Catchment		Running Percent (not >100)	
			Forest and native range (>75% ground cover)	▼	1		100	100
				▼				
				▼				
				▼				
				▼				
				▼				
				▼				

2A			Notes:	
Variable	Value	VSI		
V _{CCANOPY}	30 %	0.23		
V _{EMBED}	2.8	0.74		
V _{SUBSTRATE}	1.50 in	0.75		
V _{BERO}	60 %	0.75		
V _{LWD}	12.0	1.00		
V _{TDBH}	9.5	1.00		
V _{SNAG}	5.0	0.80		
V _{SSD}	Not Used	Not Used		
V _{SRICH}	1.80	0.86		
V _{DETRITUS}	17.2 %	0.21		
V _{HERB}	Not Used	Not Used		
V _{WLUSE}	1	1.00		

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Stream 2a-1, Cresap, Marshall Co., WV

Sampling Date: 27 Sept 2011

Project Site Before Project

Subclass for this SAR:

Ephemeral Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 2a-1

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.98
Biogeochemical Cycling	0.91
Habitat	0.74

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	43.00	0.40
V_{EMBED}	Average embeddedness of channel.	3.23	0.90
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	2.35	1.00
V_{BERO}	Total percent of eroded stream channel bank.	7.00	1.00
V_{LWD}	Number of down woody stems per 100 feet of stream.	9.00	1.00
V_{TDBH}	Average dbh of trees.	8.69	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	7.00	0.60
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	1.80	0.86
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	40.00	0.49
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: Dawn York and Mary Gilmore	Latitude/UTM Northing: 39.828239
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: -80.774231
Location: Stream 2a-1, Cresap, Marshall Co., WV	Sampling Date: 27 Sept 2011
SAR Number: 2a-1	Reach Length (ft): 100
Stream Type: Ephemeral Stream ▼	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site ▼	Before Project ▼

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 43.0 %

List the percent cover measurements at each point below:

50	80	50	20	40	45	85	10	0	50

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 3.2

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

2	4	5	3	4	1				
4	5	3	3	3	1				
5	5	5	1	3	1				
3	5	4	3	3	1				
2	5	5	4	3	1				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 2.35 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

1.00	4.50	5.50	6.00	1.80	2.50				
0.90	7.40	0.30	2.30	1.60	1.30				
5.60	2.70	2.90	1.90	1.20	0.40				
2.40	5.70	2.20	3.00	0.20	0.50				
3.10	3.30	2.90	1.50	4.50	0.80				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 7 %

Left Bank: 2 ft

Right Bank: 5 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated. Number of downed woody stems: 9	9.0																																																																																																				
6	V_{TDBH}	Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:	8.7																																																																																																				
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Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V_{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	40.00 %																																
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11	V_{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																																
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Sample Variable 12 within the entire catchment of the stream.

12	V_{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																								
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2a-1			Notes:
Variable	Value	VSI	Lots of multiflora rose and snags. Heavy shrub/sapling layer
V_{CCANOPY}	43 %	0.40	
V_{EMBED}	3.2	0.90	
$V_{\text{SUBSTRATE}}$	2.35 in	1.00	
V_{BERO}	7 %	1.00	
V_{LWD}	9.0	1.00	
V_{TDBH}	8.7	1.00	
V_{SNAG}	7.0	0.60	
V_{SSD}	Not Used	Not Used	
V_{SRICH}	1.80	0.86	
V_{DETRITUS}	40.0 %	0.49	
V_{HERB}	Not Used	Not Used	
V_{WLUSE}	1	1.00	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Stream 2a-2/ Cresap, Marshall Co., WV

Sampling Date: 27 Sept 2011

Project Site Before Project

Subclass for this SAR:

Ephemeral Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 2a-2

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.66
Biogeochemical Cycling	0.63
Habitat	0.63

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	64.00	0.68
V_{EMBED}	Average embeddedness of channel.	1.97	0.45
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	0.75	0.38
V_{BERO}	Total percent of eroded stream channel bank.	0.00	1.00
V_{LWD}	Number of down woody stems per 100 feet of stream.	2.00	0.25
V_{TDBH}	Average dbh of trees.	9.29	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	4.00	0.90
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	0.90	0.43
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	86.88	1.00
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: Dawn York and Mary Gilmore	Latitude/UTM Northing: 39.827737
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: -80.774394
Location: Stream 2a-2/ Cresap, Marshall Co., WV	Sampling Date: 27 Sept 2011
SAR Number: 2a-2	Reach Length (ft): 100
Stream Type: Ephemeral Stream ▼	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site ▼	Before Project ▼

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 64.0 %

List the percent cover measurements at each point below:

50	80	85	50	60	30	80	90	45	70

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 2.0

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

1	3	4	1	3	2				
1	1	2	3	2	2				
1	1	2	2	1	3				
1	1	2	1	2	1				
3	4	3	2	2	2				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 0.75 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

0.03	0.40	0.90	0.40	0.80	0.50				
0.50	0.60	0.90	2.50	0.30	7.80				
0.01	0.09	1.30	0.90	0.50	5.50				
1.00	1.20	1.00	0.60	0.20	7.50				
0.70	1.50	4.10	0.70	12.80	0.45				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 0 %

Left Bank: 0 ft

Right Bank: 0 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated. Number of downed woody stems: 2	2.0																																																																																																				
6	V_{TDBH}	Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:	9.3																																																																																																				
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7	V_{SNAG}	Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated. Left Side: 3 Right Side: 1	4.0																																																																																																				
8	V_{SSD}	Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated. Left Side: 30 Right Side: 26	Not Used																																																																																																				
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Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V _{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	86.88 %																								
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11	V _{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
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Sample Variable 12 within the entire catchment of the stream.

12	V _{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																				
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2a-2			Notes:
Variable	Value	VSI	
V _{CCANOPY}	64 %	0.68	
V _{EMBED}	2.0	0.45	
V _{SUBSTRATE}	0.75 in	0.38	
V _{BERO}	0 %	1.00	
V _{LWD}	2.0	0.25	
V _{TDBH}	9.3	1.00	
V _{SNAG}	4.0	0.90	
V _{SSD}	Not Used	Not Used	
V _{SRICH}	0.90	0.43	
V _{DETRITUS}	86.9 %	1.00	
V _{HERB}	Not Used	Not Used	
V _{WLUSE}	1	1.00	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Stream 2a3. Cresap, Marshall Co., WV

Sampling Date: 27 Sept 2011

Project Site Before Project

Subclass for this SAR:

Ephemeral Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 2a-3

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.74
Biogeochemical Cycling	0.84
Habitat	0.81

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	85.00	0.96
V_{EMBED}	Average embeddedness of channel.	3.00	0.82
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	3.20	1.00
V_{BERO}	Total percent of eroded stream channel bank.	26.00	0.94
V_{LWD}	Number of down woody stems per 100 feet of stream.	1.00	0.13
V_{TDBH}	Average dbh of trees.	9.64	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	3.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	0.90	0.43
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	87.50	1.00
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: Dawn York and Mary Gilmore	Latitude/UTM Northing: 39.827892
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: -80.774219
Location: Stream 2a3. Cresap, Marshall Co., WV	Sampling Date: 27 Sept 2011
SAR Number: 2a-3	Reach Length (ft): 100
Stream Type: Ephemeral Stream ▼	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site ▼	Before Project ▼

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 85.0 %

List the percent cover measurements at each point below:

100	100	50	85	85	100	100	75	95	60

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 3.0

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

2	4	4	4	4	2				
3	3	2	2	4	2				
4	3	1	3	2	2				
4	3	4	4	1	2				
3	2	3	4	4	5				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 3.20 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

5.20	3.80	0.90	3.20	3.80	4.20				
8.10	1.20	8.10	2.50	3.90	3.10				
3.50	6.20	2.10	3.00	2.00	4.60				
4.10	2.50	3.20	1.50	3.10	2.50				
3.50	0.40	6.20	1.50	2.90	9.40				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 26 %

Left Bank: 6 ft

Right Bank: 20 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated. Number of downed woody stems: 1	1.0																																																																																																				
6	V_{TDBH}	Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:	9.6																																																																																																				
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8	V_{SSD}	Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated. Left Side: 27 Right Side: 22	Not Used																																																																																																				
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Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V_{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	87.50 %																								
<table border="1" style="width: 100%; border-collapse: collapse; margin: 5px 0;"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td style="text-align: center;">100</td> <td style="text-align: center;">75</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;">75</td> <td style="text-align: center;">100</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> <tr> <td style="text-align: center;">60</td> <td style="text-align: center;">100</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> <td style="text-align: center;">90</td> <td style="text-align: center;">100</td> <td style="text-align: center;"> </td> <td style="text-align: center;"> </td> </tr> </table>				Left Side				Right Side				100	75			75	100			60	100			90	100		
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11	V_{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
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Sample Variable 12 within the entire catchment of the stream.

12	V_{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																								
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2a-3			Notes:
Variable	Value	VSI	
V_{CCANOPY}	85 %	0.96	
V_{EMBED}	3.0	0.82	
$V_{\text{SUBSTRATE}}$	3.20 in	1.00	
V_{BERO}	26 %	0.94	
V_{LWD}	1.0	0.13	
V_{TDBH}	9.6	1.00	
V_{SNAG}	3.0	1.00	
V_{SSD}	Not Used	Not Used	
V_{SRICH}	0.90	0.43	
V_{DETRITUS}	87.5 %	1.00	
V_{HERB}	Not Used	Not Used	
V_{WLUSE}	1	1.00	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Stream 2b. Cresap, Marshall Co., WV

Sampling Date: 27 Sept 2011

Project Site Before Project

Subclass for this SAR:

Ephemeral Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 2b

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.94
Biogeochemical Cycling	0.85
Habitat	0.75

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	45.42	0.44
V_{EMBED}	Average embeddedness of channel.	2.80	0.75
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	6.50	0.97
V_{BERO}	Total percent of eroded stream channel bank.	18.00	0.98
V_{LWD}	Number of down woody stems per 100 feet of stream.	13.00	1.00
V_{TDBH}	Average dbh of trees.	9.73	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	4.00	0.90
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	4.50	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	65.63	0.80
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: Dawn York and Mary Gilmore	Latitude/UTM Northing: 39.827034
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: -80.774362
Location: Stream 2b. Cresap, Marshall Co., WV	Sampling Date: 27 Sept 2011
SAR Number: 2b	Reach Length (ft): 100
Stream Type: Ephemeral Stream ▼	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site ▼	Before Project ▼

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 45.4 %

List the percent cover measurements at each point below:

0	0	20	50	100	60	20	70	50	40
45	90								

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 2.8

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

2	1	4	3	3	4				
4	1	4	3	2	3				
1	3	4	3	4	4				
1	4	2	2	2	1				
3	3	5	4	3	1				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 6.50 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

5.80	8.00	13.60	3.50	2.80	1.00				
17.20	0.30	99.00	4.70	1.50	0.50				
99.00	2.20	14.90	13.50	14.00	4.50				
14.50	1.30	4.50	9.90	2.60	99.00				
8.50	6.50	7.00	6.50	3.20	99.00				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 18 %

Left Bank: 12 ft

Right Bank: 6 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated. Number of downed woody stems: 13	13.0																																																																																																				
6	V_{TDBH}	Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:	9.7																																																																																																				
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Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V _{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	65.63 %																								
<table><tr><th colspan="4">Left Side</th><th colspan="4">Right Side</th></tr><tr><td>20</td><td>90</td><td></td><td></td><td>20</td><td>60</td><td></td><td></td></tr><tr><td>80</td><td>90</td><td></td><td></td><td>75</td><td>90</td><td></td><td></td></tr></table>				Left Side				Right Side				20	90			20	60			80	90			75	90		
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11	V _{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
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Sample Variable 12 within the entire catchment of the stream.

12	V _{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																				
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2b			Notes:
Variable	Value	VSI	
V _{CCANOPY}	45 %	0.44	
V _{EMBED}	2.8	0.75	
V _{SUBSTRATE}	6.50 in	0.97	
V _{BERO}	18 %	0.98	
V _{LWD}	13.0	1.00	
V _{TDBH}	9.7	1.00	
V _{SNAG}	4.0	0.90	
V _{SSD}	Not Used	Not Used	
V _{SRICH}	4.50	1.00	
V _{DETRITUS}	65.6 %	0.80	
V _{HERB}	Not Used	Not Used	
V _{WLUSE}	1	1.00	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Stream 3 Ephemeral Portion, Cresap, Marshall Co., WV

Sampling Date: 28 Sept 2011

Project Site Before Project

Subclass for this SAR:

Ephemeral Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 3 Eph

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.94
Biogeochemical Cycling	0.85
Habitat	0.84

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	70.00	0.76
V_{EMBED}	Average embeddedness of channel.	2.80	0.75
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	2.23	1.00
V_{BERO}	Total percent of eroded stream channel bank.	23.00	0.95
V_{LWD}	Number of down woody stems per 100 feet of stream.	9.00	1.00
V_{TDBH}	Average dbh of trees.	11.67	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	1.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	1.80	0.86
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	65.63	0.80
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: Dawn York and Mary Gilmore	Latitude/UTM Northing: 39.82696
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: -80.777663
Location: Stream 3 Ephemeral Portion, Cresap, Marshall Co., WV	Sampling Date: 28 Sept 2011
SAR Number: 3 Eph	Reach Length (ft): 100
Stream Type: Ephemeral Stream	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site	Before Project

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 70.0 %

List the percent cover measurements at each point below:

60	80	75	90	70	50	60	65	75	75

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 2.8

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

3	4	2	2	1	4				
2	2	1	3	3	1				
2	4	2	5	3	5				
2	3	3	2	2	5				
3	2	2	5	4	2				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 2.23 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

99.00	14.00	0.70	2.00	7.50	6.25				
1.00	22.50	9.50	1.50	2.00	2.20				
2.25	13.00	1.50	1.20	1.25	4.75				
0.60	7.00	1.50	1.50	8.75	3.10				
26.75	0.60	1.00	0.50	2.50	22.00				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 23 %

Left Bank: 5 ft

Right Bank: 18 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.	9.0
Number of downed woody stems: 9			

6	V_{TDBH}	Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:	11.7																																																																																																														
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7	V_{SNAG}	Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.	1.0
Left Side: 1 Right Side: 0			

8	V_{SSD}	Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.	Not Used
Left Side: 41 Right Side: 27			

9	V_{SRICH}	Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.	1.80
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Group 1 = 1.0				Group 2 (-1.0)			
<input type="checkbox"/> <i>Acer rubrum</i>	<input type="checkbox"/> <i>Magnolia tripetala</i>	<input type="checkbox"/> <i>Ailanthus altissima</i>	<input type="checkbox"/> <i>Lonicera japonica</i>				
<input type="checkbox"/> <i>Acer saccharum</i>	<input type="checkbox"/> <i>Nyssa sylvatica</i>	<input type="checkbox"/> <i>Albizia julibrissin</i>	<input type="checkbox"/> <i>Lonicera tatarica</i>				
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<input type="checkbox"/> <i>Cornus florida</i>	<input type="checkbox"/> <i>Sassafras albidum</i>	<input type="checkbox"/> <i>Ligustrum obtusifolium</i>	<input type="checkbox"/> <i>Verbena brasiliensis</i>				
<input type="checkbox"/> <i>Fagus grandifolia</i>	<input type="checkbox"/> <i>Tilia americana</i>	<input type="checkbox"/> <i>Ligustrum sinense</i>					
<input type="checkbox"/> <i>Fraxinus americana</i>	<input type="checkbox"/> <i>Tsuga canadensis</i>						
<input type="checkbox"/> <i>Liriodendron tulipifera</i>	<input type="checkbox"/> <i>Ulmus americana</i>						
<input type="checkbox"/> <i>Magnolia acuminata</i>							
3 Species in Group 1		1 Species in Group 2					

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V _{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	65.63 %																								
<table border="1"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td>90</td> <td>100</td> <td>75</td> <td>30</td> <td>50</td> <td>80</td> <td>40</td> <td>60</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>				Left Side				Right Side				90	100	75	30	50	80	40	60								
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90	100	75	30	50	80	40	60																				
11	V _{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
<table border="1"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>				Left Side				Right Side																			
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Sample Variable 12 within the entire catchment of the stream.

12	V _{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																				
<table border="1"> <tr> <th>Land Use (Choose From Drop List)</th> <th>Runoff Score</th> <th>% in Catchment</th> <th>Running Percent (not >100)</th> </tr> <tr> <td>Forest and native range (>75% ground cover) ▼</td> <td>1</td> <td>100</td> <td>100</td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> </table>				Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)	Forest and native range (>75% ground cover) ▼	1	100	100	▼				▼				▼				▼				▼				▼				▼			
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3 Eph			Notes:	
Variable	Value	VSI		
V _{CCANOPY}	70 %	0.76		
V _{EMBED}	2.8	0.75		
V _{SUBSTRATE}	2.23 in	1.00		
V _{BERO}	23 %	0.95		
V _{LWD}	9.0	1.00		
V _{TDBH}	11.7	1.00		
V _{SNAG}	1.0	1.00		
V _{SSD}	Not Used	Not Used		
V _{SRICH}	1.80	0.86		
V _{DETRITUS}	65.6 %	0.80		
V _{HERB}	Not Used	Not Used		
V _{WLUSE}	1	1.00		

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Cresap, Marshall County, WV

Sampling Date: 8/12/11

Project Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 3

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	1.00
Biogeochemical Cycling	0.94
Habitat	0.82

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	65.63	0.70
V_{EMBED}	Average embeddedness of channel.	4.00	1.00
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	3.35	1.00
V_{BERO}	Total percent of eroded stream channel bank.	15.00	0.99
V_{LWD}	Number of down woody stems per 100 feet of stream.	12.00	1.00
V_{TDBH}	Average dbh of trees.	9.86	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	2.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	1.40	0.67
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	22.81	0.28
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: D. Godec, G. Gerke	Latitude/UTM Northing: 39°49'34.80"N
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: 80°46'34.80"W
Location: Cresap, Marshall County, WV	Sampling Date: 8/12/11
SAR Number: 3	Reach Length (ft): 100
Stream Type: Intermittent Stream ▼	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site ▼	Before Project ▼

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 65.6 %

List the percent cover measurements at each point below:

0	20	80	100	80	90	80	100	10	10
80	90	80	60	80	90				

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 4.0

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

4	4	4	4	4	4				
4	5	3	4	3	4				
4	5	4	4	4	4				
4	4	4	4	4	4				
4	4	4	4	4	4				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 3.35 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

1.10	3.20	3.00	0.40	10.40	6.20				
2.50	99.00	2.50	2.20	4.30	3.30				
4.40	99.00	14.30	3.40	6.10	2.40				
6.00	12.40	15.10	5.00	2.00	2.10				
2.20	6.50	0.50	12.10	1.10	0.50				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 15 %

Left Bank: 5 ft

Right Bank: 10 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	<p>Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.</p> <p style="text-align: right;">Number of downed woody stems: 12</p>	12.0																																																																																																														
6	V_{TDBH}	<p>Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.</p> <p>List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="5" style="text-align: center;">Left Side</th> <th colspan="5" style="text-align: center;">Right Side</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">6</td> <td style="text-align: center;">13</td> <td style="text-align: center;">7</td> <td></td> <td></td> <td style="text-align: center;">10</td> <td style="text-align: center;">6</td> <td style="text-align: center;">17</td> <td style="text-align: center;">10</td> <td></td> </tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>	Left Side					Right Side					6	13	7			10	6	17	10																																																																																												9.9
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7	V_{SNAG}	<p>Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.</p> <p style="text-align: right;">Left Side: 2 Right Side: 0</p>	2.0																																																																																																														
8	V_{SSD}	<p>Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.</p> <p style="text-align: right;">Left Side: Right Side: </p>	Not Used																																																																																																														
9	V_{SRICH}	<p>Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="4" style="text-align: center;">Group 1 = 1.0</th> <th colspan="4" style="text-align: center;">Group 2 (-1.0)</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/> <i>Acer rubrum</i></td> <td><input type="checkbox"/> <i>Magnolia tripetala</i></td> <td><input checked="" type="checkbox"/> <i>Ailanthus altissima</i></td> <td><input type="checkbox"/> <i>Lonicera japonica</i></td> </tr> <tr> <td><input checked="" type="checkbox"/> <i>Acer saccharum</i></td> <td><input type="checkbox"/> <i>Nyssa sylvatica</i></td> <td><input type="checkbox"/> <i>Albizia julibrissin</i></td> <td><input type="checkbox"/> <i>Lonicera tatarica</i></td> </tr> <tr> <td><input type="checkbox"/> <i>Aesculus flava</i></td> <td><input type="checkbox"/> <i>Oxydendrum arboreum</i></td> <td><input type="checkbox"/> 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<input type="checkbox"/> <i>Betula lenta</i>	<input type="checkbox"/> <i>Quercus coccinea</i>	<input type="checkbox"/> <i>Cerastium fontanum</i>	<input type="checkbox"/> <i>Paulownia tomentosa</i>																																																																																																														
<input type="checkbox"/> <i>Carya alba</i>	<input type="checkbox"/> <i>Quercus imbricaria</i>	<input type="checkbox"/> <i>Coronilla varia</i>	<input type="checkbox"/> <i>Polygonum cuspidatum</i>																																																																																																														
<input type="checkbox"/> <i>Carya glabra</i>	<input type="checkbox"/> <i>Quercus prinus</i>	<input type="checkbox"/> <i>Elaeagnus umbellata</i>	<input type="checkbox"/> <i>Pueraria montana</i>																																																																																																														
<input type="checkbox"/> <i>Carya ovalis</i>	<input type="checkbox"/> <i>Quercus rubra</i>	<input type="checkbox"/> <i>Lespedeza bicolor</i>	<input checked="" type="checkbox"/> <i>Rosa multiflora</i>																																																																																																														
<input checked="" type="checkbox"/> <i>Carya ovata</i>	<input type="checkbox"/> <i>Quercus velutina</i>	<input type="checkbox"/> <i>Lespedeza cuneata</i>	<input type="checkbox"/> <i>Sorghum halepense</i>																																																																																																														
<input type="checkbox"/> <i>Cornus florida</i>	<input type="checkbox"/> <i>Sassafras albidum</i>	<input type="checkbox"/> <i>Ligustrum obtusifolium</i>	<input type="checkbox"/> <i>Verbena brasiliensis</i>																																																																																																														
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5 Species in Group 1		3 Species in Group 2																																																																																																															

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V _{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	22.81 %																								
<table border="1"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td>20</td> <td>25</td> <td>10</td> <td>40</td> <td>20</td> <td>30</td> <td>10</td> <td>40</td> </tr> <tr> <td>10</td> <td>20</td> <td>30</td> <td>25</td> <td>25</td> <td>20</td> <td>10</td> <td>30</td> </tr> </table>				Left Side				Right Side				20	25	10	40	20	30	10	40	10	20	30	25	25	20	10	30
Left Side				Right Side																							
20	25	10	40	20	30	10	40																				
10	20	30	25	25	20	10	30																				
11	V _{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
<table border="1"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> </tr> <tr> <td></td><td></td><td></td><td></td> <td></td><td></td><td></td><td></td> </tr> </table>				Left Side				Right Side																			
Left Side				Right Side																							

Sample Variable 12 within the entire catchment of the stream.

12	V _{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																				
<table border="1"> <tr> <th>Land Use (Choose From Drop List)</th> <th>Runoff Score</th> <th>% in Catchment</th> <th>Running Percent (not >100)</th> </tr> <tr> <td>Forest and native range (>75% ground cover) ▼</td> <td>1</td> <td>100</td> <td>100</td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> <tr> <td>▼</td> <td></td> <td></td> <td></td> </tr> </table>				Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)	Forest and native range (>75% ground cover) ▼	1	100	100	▼				▼				▼				▼				▼				▼				▼			
Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)																																				
Forest and native range (>75% ground cover) ▼	1	100	100																																				
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Summary: SAA Number 3			Notes:
Variable	Value	VSI	
V _{CCANOPY}	66 %	0.70	
V _{EMBED}	4.0	1.00	
V _{SUBSTRATE}	3.35 in	1.00	
V _{BERO}	15 %	0.99	
V _{LWD}	12.0	1.00	
V _{TDBH}	9.9	1.00	
V _{SNAG}	2.0	1.00	
V _{SSD}	Not Used	Not Used	
V _{SRICH}	1.40	0.67	
V _{DETRITUS}	22.8 %	0.28	
V _{HERB}	Not Used	Not Used	
V _{WLUSE}	1	1.00	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Stream 3a. Cresap, Marshall Co., WV

Sampling Date: 28 Sept 2011

Project Site Before Project

Subclass for this SAR:

Ephemeral Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 3A

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.89
Biogeochemical Cycling	0.85
Habitat	0.77

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	54.00	0.55
V_{EMBED}	Average embeddedness of channel.	2.83	0.76
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	4.85	1.00
V_{BERO}	Total percent of eroded stream channel bank.	27.00	0.93
V_{LWD}	Number of down woody stems per 100 feet of stream.	35.00	0.81
V_{TDBH}	Average dbh of trees.	11.29	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	5.00	0.80
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	1.60	0.76
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	78.13	0.95
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: Dawn York and Mary Gilmore	Latitude/UTM Northing: 39 48 26.52.617N
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: 80 51 25.673W
Location: Stream 3a. Cresap, Marshall Co., WV	Sampling Date: 28 Sept 2011
SAR Number: 3A	Reach Length (ft): 100
Stream Type: Ephemeral Stream ▼	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site ▼	Before Project ▼

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 54.0 %

List the percent cover measurements at each point below:

40	40	60	75	40	35	60	90	60	40

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 2.8

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

2	2	3	4	3	3				
3	3	3	3	3	3				
3	5	2	2	3	4				
1	3	3	2	4	2				
4	2	1	2	4	3				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 4.85 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

9.20	99.00	20.00	5.80	0.80	5.00				
4.50	2.90	4.30	8.50	0.60	12.25				
7.00	6.30	3.20	5.50	3.20	12.20				
10.10	2.50	1.10	10.10	4.20	2.80				
1.70	4.70	14.70	0.75	1.20	99.00				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 27 %

Left Bank: 6 ft

Right Bank: 21 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.	35.0
Number of downed woody stems: 35			

6	V_{TDBH}	Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:	11.3
---	------------	---	------

Left Side					Right Side				
6.5	15	8	16	14	17	9	8.5	5.5	4
15.5	10				7.5	13	12.5	12	18

7	V_{SNAG}	Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.	5.0
Left Side: 2 Right Side: 3			

8	V_{SSD}	Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.	Not Used
Left Side: 49 Right Side: 41			

9	V_{SRICH}	Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.	1.60
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Group 1 = 1.0		Group 2 (-1.0)	
<input type="checkbox"/> <i>Acer rubrum</i>	<input type="checkbox"/> <i>Magnolia tripetala</i>	<input checked="" type="checkbox"/> <i>Ailanthus altissima</i>	<input type="checkbox"/> <i>Lonicera japonica</i>
<input checked="" type="checkbox"/> <i>Acer saccharum</i>	<input type="checkbox"/> <i>Nyssa sylvatica</i>	<input type="checkbox"/> <i>Albizia julibrissin</i>	<input type="checkbox"/> <i>Lonicera tatarica</i>
<input type="checkbox"/> <i>Aesculus flava</i>	<input type="checkbox"/> <i>Oxydendrum arboreum</i>	<input type="checkbox"/> <i>Alliaria petiolata</i>	<input type="checkbox"/> <i>Lotus corniculatus</i>
<input type="checkbox"/> <i>Asimina triloba</i>	<input type="checkbox"/> <i>Prunus serotina</i>	<input type="checkbox"/> <i>Alternanthera philoxeroides</i>	<input type="checkbox"/> <i>Lythrum salicaria</i>
<input type="checkbox"/> <i>Betula alleghaniensis</i>	<input type="checkbox"/> <i>Quercus alba</i>	<input type="checkbox"/> <i>Aster tataricus</i>	<input type="checkbox"/> <i>Microstegium vimineum</i>
<input type="checkbox"/> <i>Betula lenta</i>	<input type="checkbox"/> <i>Quercus coccinea</i>	<input type="checkbox"/> <i>Cerastium fontanum</i>	<input type="checkbox"/> <i>Paulownia tomentosa</i>
<input type="checkbox"/> <i>Carya alba</i>	<input type="checkbox"/> <i>Quercus imbricaria</i>	<input type="checkbox"/> <i>Coronilla varia</i>	<input type="checkbox"/> <i>Polygonum cuspidatum</i>
<input type="checkbox"/> <i>Carya glabra</i>	<input type="checkbox"/> <i>Quercus prinus</i>	<input type="checkbox"/> <i>Elaeagnus umbellata</i>	<input checked="" type="checkbox"/> <i>Rosa multiflora</i>
<input type="checkbox"/> <i>Carya ovalis</i>	<input type="checkbox"/> <i>Quercus rubra</i>	<input type="checkbox"/> <i>Lespedeza bicolor</i>	<input type="checkbox"/> <i>Sorghum halepense</i>
<input checked="" type="checkbox"/> <i>Carya ovata</i>	<input type="checkbox"/> <i>Quercus velutina</i>	<input type="checkbox"/> <i>Lespedeza cuneata</i>	<input type="checkbox"/> <i>Verbena brasiliensis</i>
<input type="checkbox"/> <i>Cornus florida</i>	<input type="checkbox"/> <i>Sassafras albidum</i>	<input type="checkbox"/> <i>Ligustrum obtusifolium</i>	
<input type="checkbox"/> <i>Fagus grandifolia</i>	<input type="checkbox"/> <i>Tilia americana</i>	<input type="checkbox"/> <i>Ligustrum sinense</i>	
<input checked="" type="checkbox"/> <i>Fraxinus americana</i>	<input type="checkbox"/> <i>Tsuga canadensis</i>		
<input checked="" type="checkbox"/> <i>Liriodendron tulipifera</i>	<input type="checkbox"/> <i>Ulmus americana</i>		
<input type="checkbox"/> <i>Magnolia acuminata</i>			
4	Species in Group 1	2	Species in Group 2

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V_{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	78.13 %																								
<table border="1" style="width:100%; border-collapse: collapse; margin-top: 10px;"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td style="text-align: center;">75</td> <td style="text-align: center;">50</td> <td style="text-align: center;">90</td> <td style="text-align: center;">100</td> <td style="text-align: center;">50</td> <td style="text-align: center;">100</td> <td style="text-align: center;">100</td> <td style="text-align: center;">60</td> </tr> <tr> <td style="height: 20px;"></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>				Left Side				Right Side				75	50	90	100	50	100	100	60								
Left Side				Right Side																							
75	50	90	100	50	100	100	60																				
11	V_{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
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Left Side				Right Side																							

Sample Variable 12 within the entire catchment of the stream.

12	V_{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																													
<table border="1" style="width:100%; border-collapse: collapse; margin-top: 10px;"> <tr> <th style="width:70%;">Land Use (Choose From Drop List)</th> <th style="width:5%;"></th> <th style="width:10%;">Runoff Score</th> <th style="width:10%;">% in Catchment</th> <th style="width:5%;">Running Percent (not >100)</th> </tr> <tr> <td>Forest and native range (>75% ground cover)</td> <td style="text-align: center;">▼</td> <td style="text-align: center;">1</td> <td style="text-align: center;">100</td> <td style="text-align: center;">100</td> </tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> </table>				Land Use (Choose From Drop List)		Runoff Score	% in Catchment	Running Percent (not >100)	Forest and native range (>75% ground cover)	▼	1	100	100		▼					▼					▼					▼					▼					▼					▼			
Land Use (Choose From Drop List)		Runoff Score	% in Catchment	Running Percent (not >100)																																												
Forest and native range (>75% ground cover)	▼	1	100	100																																												
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3A			Notes:
Variable	Value	VSI	
V_{CCANOPY}	54 %	0.55	
V_{EMBED}	2.8	0.76	
$V_{\text{SUBSTRATE}}$	4.85 in	1.00	
V_{BERO}	27 %	0.93	
V_{LWD}	35.0	0.81	
V_{TDBH}	11.3	1.00	
V_{SNAG}	5.0	0.80	
V_{SSD}	Not Used	Not Used	
V_{SRICH}	1.60	0.76	
V_{DETRITUS}	78.1 %	0.95	
V_{HERB}	Not Used	Not Used	
V_{WLUSE}	1	1.00	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Stream 3b. Cresap, Marshall Co., WV

Sampling Date: 28 Sept 2011

Project Site Before Project

Subclass for this SAR:

Ephemeral Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 3B

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.93
Biogeochemical Cycling	0.81
Habitat	0.79

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	64.50	0.69
V_{EMBED}	Average embeddedness of channel.	2.77	0.74
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	6.10	0.99
V_{BERO}	Total percent of eroded stream channel bank.	0.00	1.00
V_{LWD}	Number of down woody stems per 100 feet of stream.	13.00	1.00
V_{TDBH}	Average dbh of trees.	6.50	0.58
V_{SNAG}	Number of snags per 100 feet of stream.	3.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	1.60	0.76
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	60.00	0.73
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: Dawn York and Mary Gilmore	Latitude/UTM Northing: 39 49 26.37.1461N
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: 80 46 38.220W
Location: Stream 3b. Cresap, Marshall Co., WV	Sampling Date: 28 Sept 2011
SAR Number: 3B	Reach Length (ft): 100
Stream Type: Ephemeral Stream ▼	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site ▼	Before Project ▼

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 64.5 %

List the percent cover measurements at each point below:

100	100	95	95	80	75	60	30	5	5

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 2.8

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

5	2	3	3	3	2				
3	2	4	2	3	2				
3	2	4	1	3	2				
4	4	3	2	3	3				
2	3	2	2	3	3				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 6.10 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

11.50	3.00	11.50	10.50	4.40	13.50				
7.25	1.50	12.00	7.00	11.25	3.00				
3.00	4.20	1.25	8.50	10.50	1.00				
2.50	2.00	2.50	0.70	9.40	99.00				
5.20	3.52	7.00	1.00	16.00	13.50				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 0 %

Left Bank: 0 ft

Right Bank: 0 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.	13.0
Number of downed woody stems: 13			

6	V_{TDBH}	Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:	6.5
---	------------	---	-----

Left Side					Right Side				
9	5.5	6	5.5		6	5	8	7	

7	V_{SNAG}	Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.	3.0
Left Side: 3 Right Side: 0			

8	V_{SSD}	Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.	Not Used
Left Side: 98 Right Side: 76			

9	V_{SRICH}	Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.	1.60
---	-------------	---	------

Group 1 = 1.0				Group 2 (-1.0)			
<input type="checkbox"/> <i>Acer rubrum</i>	<input type="checkbox"/> <i>Magnolia tripetala</i>	<input checked="" type="checkbox"/> <i>Ailanthus altissima</i>	<input type="checkbox"/> <i>Lonicera japonica</i>				
<input checked="" type="checkbox"/> <i>Acer saccharum</i>	<input type="checkbox"/> <i>Nyssa sylvatica</i>	<input type="checkbox"/> <i>Albizia julibrissin</i>	<input type="checkbox"/> <i>Lonicera tatarica</i>				
<input type="checkbox"/> <i>Aesculus flava</i>	<input type="checkbox"/> <i>Oxydendrum arboreum</i>	<input type="checkbox"/> <i>Alliaria petiolata</i>	<input type="checkbox"/> <i>Lotus corniculatus</i>				
<input type="checkbox"/> <i>Asimina triloba</i>	<input type="checkbox"/> <i>Prunus serotina</i>	<input type="checkbox"/> <i>Alternanthera philoxeroides</i>	<input type="checkbox"/> <i>Lythrum salicaria</i>				
<input type="checkbox"/> <i>Betula alleghaniensis</i>	<input type="checkbox"/> <i>Quercus alba</i>	<input type="checkbox"/> <i>Aster tataricus</i>	<input type="checkbox"/> <i>Microstegium vimineum</i>				
<input type="checkbox"/> <i>Betula lenta</i>	<input type="checkbox"/> <i>Quercus coccinea</i>	<input type="checkbox"/> <i>Cerastium fontanum</i>	<input type="checkbox"/> <i>Paulownia tomentosa</i>				
<input type="checkbox"/> <i>Carya alba</i>	<input type="checkbox"/> <i>Quercus imbricaria</i>	<input type="checkbox"/> <i>Coronilla varia</i>	<input type="checkbox"/> <i>Polygonum cuspidatum</i>				
<input type="checkbox"/> <i>Carya glabra</i>	<input type="checkbox"/> <i>Quercus prinus</i>	<input type="checkbox"/> <i>Elaeagnus umbellata</i>	<input checked="" type="checkbox"/> <i>Rosa multiflora</i>				
<input type="checkbox"/> <i>Carya ovalis</i>	<input type="checkbox"/> <i>Quercus rubra</i>	<input type="checkbox"/> <i>Lespedeza bicolor</i>	<input type="checkbox"/> <i>Sorghum halepense</i>				
<input checked="" type="checkbox"/> <i>Carya ovata</i>	<input type="checkbox"/> <i>Quercus velutina</i>	<input type="checkbox"/> <i>Lespedeza cuneata</i>	<input type="checkbox"/> <i>Verbena brasiliensis</i>				
<input type="checkbox"/> <i>Cornus florida</i>	<input type="checkbox"/> <i>Sassafras albidum</i>	<input type="checkbox"/> <i>Ligustrum obtusifolium</i>					
<input type="checkbox"/> <i>Fagus grandifolia</i>	<input type="checkbox"/> <i>Tilia americana</i>	<input type="checkbox"/> <i>Ligustrum sinense</i>					
<input checked="" type="checkbox"/> <i>Fraxinus americana</i>	<input type="checkbox"/> <i>Tsuga canadensis</i>						
<input checked="" type="checkbox"/> <i>Liriodendron tulipifera</i>	<input type="checkbox"/> <i>Ulmus americana</i>						
<input type="checkbox"/> <i>Magnolia acuminata</i>							
4 Species in Group 1		2 Species in Group 2					

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V_{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	60.00 %																								
<table border="1" style="width: 100%; border-collapse: collapse; margin: 5px 0;"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td style="text-align: center;">20</td> <td style="text-align: center;">20</td> <td style="text-align: center;">90</td> <td style="text-align: center;">95</td> <td style="text-align: center;">40</td> <td style="text-align: center;">40</td> <td style="text-align: center;">100</td> <td style="text-align: center;">75</td> </tr> <tr> <td style="height: 20px;"></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>				Left Side				Right Side				20	20	90	95	40	40	100	75								
Left Side				Right Side																							
20	20	90	95	40	40	100	75																				
11	V_{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
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Left Side				Right Side																							

Sample Variable 12 within the entire catchment of the stream.

12	V_{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																													
<table border="1" style="width: 100%; border-collapse: collapse; margin: 5px 0;"> <tr> <th style="width: 70%;">Land Use (Choose From Drop List)</th> <th style="width: 5%;"></th> <th style="width: 10%;">Runoff Score</th> <th style="width: 10%;">% in Catchment</th> <th style="width: 5%;">Running Percent (not >100)</th> </tr> <tr> <td>Forest and native range (>75% ground cover)</td> <td style="text-align: center;">▼</td> <td style="text-align: center;">1</td> <td style="text-align: center;">100</td> <td style="text-align: center;">100</td> </tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> </table>				Land Use (Choose From Drop List)		Runoff Score	% in Catchment	Running Percent (not >100)	Forest and native range (>75% ground cover)	▼	1	100	100		▼					▼					▼					▼					▼					▼					▼			
Land Use (Choose From Drop List)		Runoff Score	% in Catchment	Running Percent (not >100)																																												
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3B			Notes:
Variable	Value	VSI	
V_{CCANOPY}	65 %	0.69	
V_{EMBED}	2.8	0.74	
$V_{\text{SUBSTRATE}}$	6.10 in	0.99	
V_{BERO}	0 %	1.00	
V_{LWD}	13.0	1.00	
V_{TDBH}	6.5	0.58	
V_{SNAG}	3.0	1.00	
V_{SSD}	Not Used	Not Used	
V_{SRICH}	1.60	0.76	
V_{DETRITUS}	60.0 %	0.73	
V_{HERB}	Not Used	Not Used	
V_{WLUSE}	1	1.00	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Stream 4. Cresap, Marshall Co., WV

Sampling Date: 27 Sept 2011

Project Site Before Project

Subclass for this SAR:

Ephemeral Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 4

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.91
Biogeochemical Cycling	0.78
Habitat	0.85

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	83.50	0.94
V_{EMBED}	Average embeddedness of channel.	2.50	0.64
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	8.90	0.81
V_{BERO}	Total percent of eroded stream channel bank.	22.00	0.96
V_{LWD}	Number of down woody stems per 100 feet of stream.	9.00	1.00
V_{TDBH}	Average dbh of trees.	9.09	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	2.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	1.80	0.86
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	61.25	0.75
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: Dawn York and Mary Gilmore	Latitude/UTM Northing: 39.825074
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: -80.774334
Location: Stream 4. Cresap, Marshall Co., WV	Sampling Date: 27 Sept 2011
SAR Number: 4	Reach Length (ft): 100
Stream Type: Ephemeral Stream ▼	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site ▼	Before Project ▼

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 83.5 %

List the percent cover measurements at each point below:

80	70	100	50	70	100	95	90	90	90

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 2.5

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

2	1	2	2	2	4				
2	1	2	2	3	4				
3	1	3	2	2	3				
1	3	3	3	3	4				
2	2	3	4	2	4				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 8.90 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

99.00	0.05	4.70	17.00	23.30	15.50				
19.50	1.30	7.30	9.80	1.50	16.00				
1.10	17.10	10.80	0.50	0.50	9.30				
2.20	9.90	3.50	4.90	11.40	8.50				
99.00	99.00	8.10	7.10	10.00	3.50				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 22 %

Left Bank: 8 ft

Right Bank: 14 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.	9.0
Number of downed woody stems: 9			

6	V_{TDBH}	Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:	9.1
---	------------	---	-----

Left Side					Right Side				
6	6				15	7			
14	5				11	4.5			
8	6				4	7			
8.5	9				10	11.5			
13	9				11	5			
6	8				10.5	17			
6	11				6				
14	10				9				
10	10				12				

7	V_{SNAG}	Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.	2.0
Left Side: 1 Right Side: 1			

8	V_{SSD}	Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.	Not Used
Left Side: 13 Right Side: 14			

9	V_{SRICH}	Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.	1.80
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Group 1 = 1.0				Group 2 (-1.0)			
<input type="checkbox"/> <i>Acer rubrum</i>	<input type="checkbox"/> <i>Magnolia tripetala</i>	<input type="checkbox"/> <i>Ailanthus altissima</i>	<input type="checkbox"/> <i>Lonicera japonica</i>				
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<input type="checkbox"/> <i>Carya glabra</i>	<input type="checkbox"/> <i>Quercus prinus</i>	<input type="checkbox"/> <i>Elaeagnus umbellata</i>	<input checked="" type="checkbox"/> <i>Rosa multiflora</i>				
<input type="checkbox"/> <i>Carya ovalis</i>	<input type="checkbox"/> <i>Quercus rubra</i>	<input type="checkbox"/> <i>Lespedeza bicolor</i>	<input type="checkbox"/> <i>Sorghum halepense</i>				
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<input type="checkbox"/> <i>Fraxinus americana</i>	<input type="checkbox"/> <i>Tsuga canadensis</i>						
<input type="checkbox"/> <i>Liriodendron tulipifera</i>	<input checked="" type="checkbox"/> <i>Ulmus americana</i>						
<input type="checkbox"/> <i>Magnolia acuminata</i>							
3 Species in Group 1		1 Species in Group 2					

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V_{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	61.25 %																								
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Left Side				Right Side																							
60	50			60	90																						
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Left Side				Right Side																							

Sample Variable 12 within the entire catchment of the stream.

12	V_{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																																		
<table border="1" style="width:100%; border-collapse: collapse; margin-top: 10px;"> <tr> <th style="width:65%;">Land Use (Choose From Drop List)</th> <th style="width:5%;"></th> <th style="width:10%;">Runoff Score</th> <th style="width:10%;">% in Catchment</th> <th style="width:10%;">Running Percent (not >100)</th> </tr> <tr> <td>Forest and native range (>75% ground cover)</td> <td style="text-align: center;">▼</td> <td style="text-align: center;">1</td> <td style="text-align: center;">100</td> <td style="text-align: center;">100</td> </tr> <tr><td> </td><td style="text-align: center;">▼</td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td style="text-align: center;">▼</td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td style="text-align: center;">▼</td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td style="text-align: center;">▼</td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td style="text-align: center;">▼</td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td style="text-align: center;">▼</td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td style="text-align: center;">▼</td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td style="text-align: center;">▼</td><td> </td><td> </td><td> </td></tr> </table>				Land Use (Choose From Drop List)		Runoff Score	% in Catchment	Running Percent (not >100)	Forest and native range (>75% ground cover)	▼	1	100	100		▼					▼					▼					▼					▼					▼					▼					▼			
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Summary: SAA Number 4			Notes:	
Variable	Value	VSI		
V_{CCANOPY}	84 %	0.94		
V_{EMBED}	2.5	0.64		
$V_{\text{SUBSTRATE}}$	8.90 in	0.81		
V_{BERO}	22 %	0.96		
V_{LWD}	9.0	1.00		
V_{TDBH}	9.1	1.00		
V_{SNAG}	2.0	1.00		
V_{SSD}	Not Used	Not Used		
V_{SRICH}	1.80	0.86		
V_{DETRITUS}	61.3 %	0.75		
V_{HERB}	Not Used	Not Used		
V_{WLUSE}	1	1.00		

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Stream 5. Cresap, Marshall Co., WV

Sampling Date: 28 Sept 2011

Project Site Before Project

Subclass for this SAR:

Ephemeral Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 5

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.87
Biogeochemical Cycling	0.89
Habitat	0.78

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	91.00	1.00
V_{EMBED}	Average embeddedness of channel.	3.37	0.95
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	9.25	0.79
V_{BERO}	Total percent of eroded stream channel bank.	85.00	0.62
V_{LWD}	Number of down woody stems per 100 feet of stream.	7.00	0.88
V_{TDBH}	Average dbh of trees.	11.38	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	6.00	0.70
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	0.90	0.43
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	8.13	0.10
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: Dawn York and Mary Gilmore	Latitude/UTM Northing: 39 49 26.351N
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: 80 46 32.107W
Location: Stream 5. Cresap, Marshall Co., WV	Sampling Date: 28 Sept 2011
SAR Number: 5	Reach Length (ft): 100
Stream Type: Ephemeral Stream ▼	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site ▼	Before Project ▼

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 91.0 %

List the percent cover measurements at each point below:

90	90	90	100	90	80	90	100	90	90

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 3.4

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

4	2	3	3	3	2				
2	4	2	5	3	4				
3	2	3	2	2	5				
4	4	5	4	3	3				
4	3	5	5	3	4				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 9.25 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

19.10	5.50	5.25	4.30	4.80	99.00				
11.00	10.00	5.50	7.50	4.50	34.25				
13.75	18.00	16.50	5.25	20.20	99.00				
2.00	5.50	15.00	12.00	8.50	8.00				
26.50	2.25	36.50	21.00	6.50	2.20				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 85 %

Left Bank: 35 ft

Right Bank: 50 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	<p>Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.</p> <p style="text-align: right;">Number of downed woody stems: 7</p>	7.0																																																																																																														
6	V_{TDBH}	<p>Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.</p> <p>List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="5">Left Side</th> <th colspan="5">Right Side</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">8</td><td style="text-align: center;">8</td><td style="text-align: center;">19.5</td><td style="text-align: center;">5</td><td style="text-align: center;">7.5</td> <td style="text-align: center;">8.5</td><td style="text-align: center;">5.5</td><td style="text-align: center;">9.5</td><td style="text-align: center;">8</td><td style="text-align: center;">6.5</td> </tr> <tr> <td style="text-align: center;">33</td><td style="text-align: center;">9.5</td><td style="text-align: center;">10</td><td style="text-align: center;">11.5</td><td style="text-align: center;">22</td> <td style="text-align: center;">15</td><td style="text-align: center;">7</td><td style="text-align: center;">7.5</td><td style="text-align: center;">5</td><td style="text-align: center;">16.5</td> </tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td style="text-align: center;">9.5</td><td style="text-align: center;">20</td><td style="text-align: center;">8.5</td><td style="text-align: center;">5</td><td style="text-align: center;">10</td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td style="text-align: center;">20</td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table>	Left Side					Right Side					8	8	19.5	5	7.5	8.5	5.5	9.5	8	6.5	33	9.5	10	11.5	22	15	7	7.5	5	16.5						9.5	20	8.5	5	10						20																																																																	11.4
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7	V_{SNAG}	<p>Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.</p> <p style="text-align: right;">Left Side: 4 Right Side: 2</p>	6.0																																																																																																														
8	V_{SSD}	<p>Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.</p> <p style="text-align: right;">Left Side: 18 Right Side: 16</p>	Not Used																																																																																																														
9	V_{SRICH}	<p>Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="2">Group 1 = 1.0</th> <th colspan="2">Group 2 (-1.0)</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/> <i>Acer rubrum</i></td> <td><input type="checkbox"/> <i>Magnolia tripetala</i></td> <td><input type="checkbox"/> <i>Ailanthus altissima</i></td> <td><input type="checkbox"/> <i>Lonicera japonica</i></td> </tr> <tr> <td><input checked="" type="checkbox"/> <i>Acer saccharum</i></td> <td><input type="checkbox"/> <i>Nyssa sylvatica</i></td> <td><input type="checkbox"/> <i>Albizia julibrissin</i></td> <td><input type="checkbox"/> <i>Lonicera tatarica</i></td> </tr> <tr> <td><input type="checkbox"/> <i>Aesculus flava</i></td> <td><input type="checkbox"/> <i>Oxydendrum arboreum</i></td> <td><input type="checkbox"/> <i>Alliaria petiolata</i></td> <td><input type="checkbox"/> <i>Lotus 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Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V_{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	8.13 %																								
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11	V_{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
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Sample Variable 12 within the entire catchment of the stream.

12	V_{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																													
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Summary: SAA Number 5			Notes:	
Variable	Value	VSI		
V_{CCANOPY}	91 %	1.00		
V_{EMBED}	3.4	0.95		
$V_{\text{SUBSTRATE}}$	9.25 in	0.79		
V_{BERO}	85 %	0.62		
V_{LWD}	7.0	0.88		
V_{TDBH}	11.4	1.00		
V_{SNAG}	6.0	0.70		
V_{SSD}	Not Used	Not Used		
V_{SRICH}	0.90	0.43		
V_{DETRITUS}	8.1 %	0.10		
V_{HERB}	Not Used	Not Used		
V_{WLUSE}	1	1.00		

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Stream 6 Ephemeral Portion, Cresap, Marshall Co., WV

Sampling Date: 28 Sept 2011

Project Site Before Project

Subclass for this SAR:

Ephemeral Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 6 EPH

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.79
Biogeochemical Cycling	0.89
Habitat	0.92

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	84.50	0.95
V_{EMBED}	Average embeddedness of channel.	3.03	0.83
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	6.63	0.96
V_{BERO}	Total percent of eroded stream channel bank.	145.00	0.30
V_{LWD}	Number of down woody stems per 100 feet of stream.	7.00	0.88
V_{TDBH}	Average dbh of trees.	10.24	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	1.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	2.70	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	71.88	0.88
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: Dawn York and Mary Gilmore	Latitude/UTM Northing: 39 49 22.12N
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: 80 46 27. 591W
Location: Stream 6 Ephemeral Portion, Cresap, Marshall Co., WV	Sampling Date: 28 Sept 2011
SAR Number: 6 EPH	Reach Length (ft): 100
Stream Type: Ephemeral Stream ▼	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site ▼	Before Project ▼

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 84.5 %

List the percent cover measurements at each point below:

90	95	60	95	100	95	90	90	70	60

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 3.0

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

2	3	2	5	5	2				
5	4	3	5	2	3				
1	4	2	5	3	1				
2	3	3	2	2	2				
5	2	3	4	3	3				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 6.63 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

4.20	8.50	42.00	5.75	4.20	6.75				
8.50	3.00	6.00	12.50	5.10	4.25				
12.75	6.23	15.50	14.50	3.50	23.75				
36.50	19.50	3.52	99.00	9.50	2.51				
99.00	13.00	4.75	5.25	6.50	3.00				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 145 %

Left Bank: 70 ft

Right Bank: 75 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	<p>Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.</p> <p style="text-align: right;">Number of downed woody stems: 7</p>	7.0																																																																																																																								
6	V_{TDBH}	<p>Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.</p> <p>List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="5" style="text-align: center;">Left Side</th> <th colspan="5" style="text-align: center;">Right Side</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">17.5</td><td style="text-align: center;">10</td><td style="text-align: center;">7.5</td><td style="text-align: center;">15</td><td style="text-align: center;">10</td> <td style="text-align: center;">14</td><td style="text-align: center;">6</td><td style="text-align: center;">4.5</td><td style="text-align: center;">6</td><td style="text-align: center;">5.5</td> </tr> <tr> <td style="text-align: center;">7</td><td style="text-align: center;">9</td><td></td><td></td><td></td> <td style="text-align: center;">5.5</td><td style="text-align: center;">5</td><td style="text-align: center;">6</td><td style="text-align: center;">19</td><td style="text-align: center;">18</td> </tr> <tr><td></td><td></td><td></td><td></td><td></td><td style="text-align: center;">10</td><td style="text-align: center;">6.5</td><td style="text-align: center;">20.5</td><td style="text-align: center;">12.5</td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>	Left Side					Right Side					17.5	10	7.5	15	10	14	6	4.5	6	5.5	7	9				5.5	5	6	19	18						10	6.5	20.5	12.5																																																																																		10.2
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8	V_{SSD}	<p>Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.</p> <p style="text-align: right;">Left Side: 14 Right Side: 20</p>	Not Used																																																																																																																								
9	V_{SRICH}	<p>Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. 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<input checked="" type="checkbox"/> <i>Fagus grandifolia</i>	<input type="checkbox"/> <i>Tilia americana</i>	<input type="checkbox"/> <i>Ligustrum sinense</i>																																																																																																																									
<input checked="" type="checkbox"/> <i>Fraxinus americana</i>	<input type="checkbox"/> <i>Tsuga canadensis</i>																																																																																																																										
<input type="checkbox"/> <i>Liriodendron tulipifera</i>	<input checked="" type="checkbox"/> <i>Ulmus americana</i>																																																																																																																										
<input type="checkbox"/> <i>Magnolia acuminata</i>																																																																																																																											
4	Species in Group 1	1	Species in Group 2																																																																																																																								

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V_{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	71.88 %																								
<table border="1" style="width: 100%; border-collapse: collapse; margin: 5px;"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td style="text-align: center;">80</td> <td style="text-align: center;">90</td> <td style="text-align: center;">95</td> <td style="text-align: center;">60</td> <td style="text-align: center;">60</td> <td style="text-align: center;">70</td> <td style="text-align: center;">90</td> <td style="text-align: center;">30</td> </tr> <tr> <td style="height: 20px;"></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>				Left Side				Right Side				80	90	95	60	60	70	90	30								
Left Side				Right Side																							
80	90	95	60	60	70	90	30																				
11	V_{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
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Sample Variable 12 within the entire catchment of the stream.

12	V_{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																													
<table border="1" style="width: 100%; border-collapse: collapse; margin: 5px;"> <tr> <th style="width: 65%;">Land Use (Choose From Drop List)</th> <th style="width: 5%;"></th> <th style="width: 10%;">Runoff Score</th> <th style="width: 10%;">% in Catchment</th> <th style="width: 10%;">Running Percent (not >100)</th> </tr> <tr> <td>Forest and native range (>75% ground cover)</td> <td style="text-align: center;">▼</td> <td style="text-align: center;">1</td> <td style="text-align: center;">100</td> <td style="text-align: center;">100</td> </tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> </table>				Land Use (Choose From Drop List)		Runoff Score	% in Catchment	Running Percent (not >100)	Forest and native range (>75% ground cover)	▼	1	100	100		▼					▼					▼					▼					▼					▼					▼			
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6 EPH			Notes:
Variable	Value	VSI	
V_{CCANOPY}	85 %	0.95	
V_{EMBED}	3.0	0.83	
$V_{\text{SUBSTRATE}}$	6.63 in	0.96	
V_{BERO}	145 %	0.30	
V_{LWD}	7.0	0.88	
V_{TDBH}	10.2	1.00	
V_{SNAG}	1.0	1.00	
V_{SSD}	Not Used	Not Used	
V_{SRICH}	2.70	1.00	
V_{DETRITUS}	71.9 %	0.88	
V_{HERB}	Not Used	Not Used	
V_{WLUSE}	1	1.00	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Cresap, Marshall County, WV

Sampling Date: 8/13/2011

Project Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 6

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.92
Biogeochemical Cycling	0.90
Habitat	0.87

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	89.50	1.00
V_{EMBED}	Average embeddedness of channel.	4.20	0.90
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	5.65	1.00
V_{BERO}	Total percent of eroded stream channel bank.	50.00	0.81
V_{LWD}	Number of down woody stems per 100 feet of stream.	7.00	0.88
V_{TDBH}	Average dbh of trees.	8.08	0.88
V_{SNAG}	Number of snags per 100 feet of stream.	0.00	0.10
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	4.00	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	51.88	0.63
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team:	D. Godec, G. Gerke	Latitude/UTM Northing:	39°49'22.02"N
Project Name:	AEP Mitchell Landfill Project	Longitude/UTM Easting:	80°46'29.45"W
Location:	Cresap, Marshall County, WV	Sampling Date:	8/13/2011
SAR Number:	6	Reach Length (ft):	100
		Stream Type:	Intermittent Stream ▼
Top Strata:	Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)		
Site and Timing:	Project Site ▼	Before Project ▼	

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 89.5 %

List the percent cover measurements at each point below:

100	90	90	80	100	100	90	80	75	90

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 4.2

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

5	4	4	5	5	3				
5	4	5	4	4	4				
4	4	4	5	4	4				
4	3	4	5	4	4				
4	4	4	4	4	5				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 5.65 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

99.00	8.40	6.20	2.20	3.10	1.20				
99.00	9.50	6.00	5.50	5.90	2.40				
3.40	1.00	4.10	8.30	12.20	0.50				
1.50	1.50	3.00	10.00	10.90	1.50				
5.80	8.20	1.10	3.20	8.90	99.00				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 50 %

Left Bank: 25 ft

Right Bank: 25 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.	7.0
Number of downed woody stems: 7			

6	V_{TDBH}	Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:	8.1																																																																																																														
<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr> <th colspan="5">Left Side</th> <th colspan="5">Right Side</th> </tr> </thead> <tbody> <tr><td>7</td><td>4</td><td>10</td><td>4</td><td>15</td><td>6</td><td>7</td><td>4</td><td>6</td><td>4</td></tr> <tr><td>13</td><td>12</td><td>14</td><td>9</td><td>12</td><td>9</td><td>11</td><td>5</td><td>12</td><td>6</td></tr> <tr><td>10</td><td>6</td><td></td><td></td><td></td><td>5</td><td>5</td><td>9</td><td>5</td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>				Left Side					Right Side					7	4	10	4	15	6	7	4	6	4	13	12	14	9	12	9	11	5	12	6	10	6				5	5	9	5																																																																							
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10	6				5	5	9	5																																																																																																									

7	V_{SNAG}	Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.	0.0
Left Side: 0 Right Side: 0			

8	V_{SSD}	Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.	Not Used
Left Side: Right Side: 			

9	V_{SRICH}	Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.	4.00
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Group 1 = 1.0			Group 2 (-1.0)		
<input type="checkbox"/> <i>Acer rubrum</i>	<input type="checkbox"/> <i>Magnolia tripetala</i>	<input type="checkbox"/> <i>Ailanthus altissima</i>	<input type="checkbox"/> <i>Lonicera japonica</i>		
<input checked="" type="checkbox"/> <i>Acer saccharum</i>	<input type="checkbox"/> <i>Nyssa sylvatica</i>	<input type="checkbox"/> <i>Albizia julibrissin</i>	<input type="checkbox"/> <i>Lonicera tatarica</i>		
<input type="checkbox"/> <i>Aesculus flava</i>	<input type="checkbox"/> <i>Oxydendrum arboreum</i>	<input checked="" type="checkbox"/> <i>Alliaria petiolata</i>	<input type="checkbox"/> <i>Lotus corniculatus</i>		
<input type="checkbox"/> <i>Asimina triloba</i>	<input type="checkbox"/> <i>Prunus serotina</i>	<input type="checkbox"/> <i>Alternanthera philoxeroides</i>	<input type="checkbox"/> <i>Lythrum salicaria</i>		
<input type="checkbox"/> <i>Betula alleghaniensis</i>	<input type="checkbox"/> <i>Quercus alba</i>	<input type="checkbox"/> <i>Aster tataricus</i>	<input type="checkbox"/> <i>Microstegium vimineum</i>		
<input type="checkbox"/> <i>Betula lenta</i>	<input type="checkbox"/> <i>Quercus coccinea</i>	<input type="checkbox"/> <i>Cerastium fontanum</i>	<input type="checkbox"/> <i>Paulownia tomentosa</i>		
<input type="checkbox"/> <i>Carya alba</i>	<input type="checkbox"/> <i>Quercus imbricaria</i>	<input type="checkbox"/> <i>Coronilla varia</i>	<input type="checkbox"/> <i>Polygonum cuspidatum</i>		
<input type="checkbox"/> <i>Carya glabra</i>	<input checked="" type="checkbox"/> <i>Quercus prinus</i>	<input type="checkbox"/> <i>Elaeagnus umbellata</i>	<input type="checkbox"/> <i>Pueraria montana</i>		
<input type="checkbox"/> <i>Carya ovalis</i>	<input type="checkbox"/> <i>Quercus rubra</i>	<input type="checkbox"/> <i>Lespedeza bicolor</i>	<input type="checkbox"/> <i>Rosa multiflora</i>		
<input checked="" type="checkbox"/> <i>Carya ovata</i>	<input checked="" type="checkbox"/> <i>Quercus velutina</i>	<input type="checkbox"/> <i>Lespedeza cuneata</i>	<input type="checkbox"/> <i>Sorghum halepense</i>		
<input type="checkbox"/> <i>Cornus florida</i>	<input type="checkbox"/> <i>Sassafras albidum</i>	<input type="checkbox"/> <i>Ligustrum obtusifolium</i>	<input type="checkbox"/> <i>Verbena brasiliensis</i>		
<input checked="" type="checkbox"/> <i>Fagus grandifolia</i>	<input checked="" type="checkbox"/> <i>Tilia americana</i>	<input checked="" type="checkbox"/> <i>Ligustrum sinense</i>			
<input checked="" type="checkbox"/> <i>Fraxinus americana</i>	<input type="checkbox"/> <i>Tsuga canadensis</i>				
<input type="checkbox"/> <i>Liriodendron tulipifera</i>	<input type="checkbox"/> <i>Ulmus americana</i>				
<input type="checkbox"/> <i>Magnolia acuminata</i>					
7 Species in Group 1		2 Species in Group 2			

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V _{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	51.88 %																								
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75	80	75	100	20	15	20	20																				
80	70	80	90	30	30	25	20																				
11	V _{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
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Left Side				Right Side																							

Sample Variable 12 within the entire catchment of the stream.

12	V _{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																				
<table border="1"> <thead> <tr> <th>Land Use (Choose From Drop List)</th><th>Runoff Score</th><th>% in Catchment</th><th>Running Percent (not >100)</th></tr> </thead> <tbody> <tr> <td>Forest and native range (>75% ground cover) ▼</td><td>1</td><td>100</td><td>100</td></tr> <tr> <td>▼</td><td></td><td></td><td></td></tr> <tr> <td>▼</td><td></td><td></td><td></td></tr> <tr> <td>▼</td><td></td><td></td><td></td></tr> <tr> <td>▼</td><td></td><td></td><td></td></tr> <tr> <td>▼</td><td></td><td></td><td></td></tr> <tr> <td>▼</td><td></td><td></td><td></td></tr> <tr> <td>▼</td><td></td><td></td><td></td></tr> </tbody> </table>				Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)	Forest and native range (>75% ground cover) ▼	1	100	100	▼				▼				▼				▼				▼				▼				▼			
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Summary: SAA Number 6			Notes:
Variable	Value	VSI	
V _{CCANOPY}	90 %	1.00	
V _{EMBED}	4.2	0.90	
V _{SUBSTRATE}	5.65 in	1.00	
V _{BERO}	50 %	0.81	
V _{LWD}	7.0	0.88	
V _{TDBH}	8.1	0.88	
V _{SNAG}	0.0	0.10	
V _{SSD}	Not Used	Not Used	
V _{SRICH}	4.00	1.00	
V _{DETRITUS}	51.9 %	0.63	
V _{HERB}	Not Used	Not Used	
V _{WLUSE}	1	1.00	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Stream 7. Cresap, Marshall Co., WV

Sampling Date: 28 Sept 2011

Project Site Before Project

Subclass for this SAR:

Ephemeral Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 7

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.94
Biogeochemical Cycling	0.84
Habitat	0.72

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	41.50	0.38
V_{EMBED}	Average embeddedness of channel.	2.80	0.75
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	6.98	0.94
V_{BERO}	Total percent of eroded stream channel bank.	10.00	1.00
V_{LWD}	Number of down woody stems per 100 feet of stream.	17.00	1.00
V_{TDBH}	Average dbh of trees.	9.45	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	2.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	3.60	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	56.88	0.69
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team:	Dawn York and Mary Gilmore	Latitude/UTM Northing:	39 49 26.32.8871N
Project Name:	AEP Mitchell Landfill Project	Longitude/UTM Easting:	80 46 33.353W
Location:	Stream 7. Cresap, Marshall Co., WV	Sampling Date:	28 Sept 2011
SAR Number:	7	Reach Length (ft):	100
		Stream Type:	Ephemeral Stream ▼
Top Strata:	Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)		
Site and Timing:	Project Site ▼	Before Project ▼	

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 41.5 %

List the percent cover measurements at each point below:

5	0	0	5	5	50	80	90	90	90

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 2.8

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

3	1	5	2	3	3				
5	5	4	2	3	2				
1	1	3	2	4	2				
3	1	2	2	3	3				
4	4	3	3	2	3				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 6.98 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

9.75	0.80	10.50	1.00	7.20	2.40				
5.00	3.50	27.50	16.00	7.80	7.50				
99.00	0.50	7.50	8.00	1.10	1.20				
6.75	1.00	8.00	1.75	8.50	99.00				
2.70	11.00	12.50	5.00	6.00	5.75				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 10 %

Left Bank: 0 ft

Right Bank: 10 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.	17.0
Number of downed woody stems: 17			

6	V_{TDBH}	Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:	9.5
---	------------	---	-----

Left Side					Right Side				
7	9.5	11	4	12	13.5	15	5	15	5
					7				

7	V_{SNAG}	Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.	2.0
Left Side: 1 Right Side: 1			

8	V_{SSD}	Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.	Not Used
Left Side: 77 Right Side: 97			

9	V_{SRICH}	Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.	3.60
---	-------------	---	------

Group 1 = 1.0			Group 2 (-1.0)		
<input type="checkbox"/> <i>Acer rubrum</i>	<input type="checkbox"/> <i>Magnolia tripetala</i>	<input type="checkbox"/> <i>Ailanthus altissima</i>	<input type="checkbox"/> <i>Lonicera japonica</i>		
<input checked="" type="checkbox"/> <i>Acer saccharum</i>	<input type="checkbox"/> <i>Nyssa sylvatica</i>	<input type="checkbox"/> <i>Albizia julibrissin</i>	<input type="checkbox"/> <i>Lonicera tatarica</i>		
<input type="checkbox"/> <i>Aesculus flava</i>	<input type="checkbox"/> <i>Oxydendrum arboreum</i>	<input type="checkbox"/> <i>Alliaria petiolata</i>	<input type="checkbox"/> <i>Lotus corniculatus</i>		
<input type="checkbox"/> <i>Asimina triloba</i>	<input type="checkbox"/> <i>Prunus serotina</i>	<input type="checkbox"/> <i>Alternanthera philoxeroides</i>	<input type="checkbox"/> <i>Lythrum salicaria</i>		
<input type="checkbox"/> <i>Betula alleghaniensis</i>	<input type="checkbox"/> <i>Quercus alba</i>	<input type="checkbox"/> <i>Aster tataricus</i>	<input type="checkbox"/> <i>Microstegium vimineum</i>		
<input type="checkbox"/> <i>Betula lenta</i>	<input type="checkbox"/> <i>Quercus coccinea</i>	<input type="checkbox"/> <i>Cerastium fontanum</i>	<input type="checkbox"/> <i>Paulownia tomentosa</i>		
<input type="checkbox"/> <i>Carya alba</i>	<input type="checkbox"/> <i>Quercus imbricaria</i>	<input type="checkbox"/> <i>Coronilla varia</i>	<input type="checkbox"/> <i>Polygonum cuspidatum</i>		
<input type="checkbox"/> <i>Carya glabra</i>	<input type="checkbox"/> <i>Quercus prinus</i>	<input type="checkbox"/> <i>Elaeagnus umbellata</i>	<input checked="" type="checkbox"/> <i>Rosa multiflora</i>		
<input type="checkbox"/> <i>Carya ovalis</i>	<input type="checkbox"/> <i>Quercus rubra</i>	<input type="checkbox"/> <i>Lespedeza bicolor</i>	<input type="checkbox"/> <i>Sorghum halepense</i>		
<input checked="" type="checkbox"/> <i>Carya ovata</i>	<input type="checkbox"/> <i>Quercus velutina</i>	<input type="checkbox"/> <i>Lespedeza cuneata</i>	<input type="checkbox"/> <i>Verbena brasiliensis</i>		
<input type="checkbox"/> <i>Cornus florida</i>	<input type="checkbox"/> <i>Sassafras albidum</i>	<input type="checkbox"/> <i>Ligustrum obtusifolium</i>			
<input type="checkbox"/> <i>Fagus grandifolia</i>	<input checked="" type="checkbox"/> <i>Tilia americana</i>	<input type="checkbox"/> <i>Ligustrum sinense</i>			
<input checked="" type="checkbox"/> <i>Fraxinus americana</i>	<input type="checkbox"/> <i>Tsuga canadensis</i>				
<input checked="" type="checkbox"/> <i>Liriodendron tulipifera</i>	<input type="checkbox"/> <i>Ulmus americana</i>				
<input type="checkbox"/> <i>Magnolia acuminata</i>					
5 Species in Group 1		1 Species in Group 2			

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V_{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	56.88 %																																
<table border="1" style="width: 100%; border-collapse: collapse; margin: 5px;"> <tr> <th colspan="4" style="text-align: center;">Left Side</th> <th colspan="4" style="text-align: center;">Right Side</th> </tr> <tr> <td style="text-align: center;">60</td> <td style="text-align: center;">90</td> <td style="text-align: center;">25</td> <td style="text-align: center;">60</td> <td style="text-align: center;">80</td> <td style="text-align: center;">100</td> <td style="text-align: center;">20</td> <td style="text-align: center;">20</td> </tr> <tr> <td style="height: 20px;"></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>				Left Side				Right Side				60	90	25	60	80	100	20	20																
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60	90	25	60	80	100	20	20																												
11	V_{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																																
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Sample Variable 12 within the entire catchment of the stream.

12	V_{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																								
<table border="1" style="width: 100%; border-collapse: collapse; margin: 5px;"> <thead> <tr> <th style="width: 70%;">Land Use (Choose From Drop List)</th> <th style="width: 5%;">Runoff Score</th> <th style="width: 10%;">% in Catchment</th> <th style="width: 15%;">Running Percent (not >100)</th> </tr> </thead> <tbody> <tr> <td>Forest and native range (>75% ground cover) ▼</td> <td style="text-align: center;">1</td> <td style="text-align: center;">100</td> <td style="text-align: center;">100</td> </tr> <tr><td>▼</td><td></td><td></td><td></td></tr> <tr><td>▼</td><td></td><td></td><td></td></tr> <tr><td>▼</td><td></td><td></td><td></td></tr> <tr><td>▼</td><td></td><td></td><td></td></tr> <tr><td>▼</td><td></td><td></td><td></td></tr> <tr><td>▼</td><td></td><td></td><td></td></tr> <tr><td>▼</td><td></td><td></td><td></td></tr> <tr><td>▼</td><td></td><td></td><td></td></tr> </tbody> </table>				Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)	Forest and native range (>75% ground cover) ▼	1	100	100	▼				▼				▼				▼				▼				▼				▼				▼			
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Summary: SAA Number 7			Notes:	
Variable	Value	VSI	Approx 70% of the stream reach was covered with downed trees.	
V_{CCANOPY}	42 %	0.38		
V_{EMBED}	2.8	0.75		
$V_{\text{SUBSTRATE}}$	6.98 in	0.94		
V_{BERO}	10 %	1.00		
V_{LWD}	17.0	1.00		
V_{TDBH}	9.5	1.00		
V_{SNAG}	2.0	1.00		
V_{SSD}	Not Used	Not Used		
V_{SRICH}	3.60	1.00		
V_{DETRITUS}	56.9 %	0.69		
V_{HERB}	Not Used	Not Used		
V_{WLUSE}	1	1.00		

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill

Location: Stream 8 Lower Sample Reach, Cresap, Marshall Co, WV

Sampling Date: 8/14/2011

Project Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 8

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.91
Biogeochemical Cycling	0.75
Habitat	0.79

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	82.50	0.93
V_{EMBED}	Average embeddedness of channel.	4.70	0.65
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	2.50	1.00
V_{BERO}	Total percent of eroded stream channel bank.	20.00	0.97
V_{LWD}	Number of down woody stems per 100 feet of stream.	20.00	1.00
V_{TDBH}	Average dbh of trees.	12.00	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	2.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	6.00	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	13.13	0.16
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: D. Godec, G. Gerke	Latitude/UTM Northing: 39°49'36.74"N
Project Name: AEP Mitchell Landfill	Longitude/UTM Easting: 80°46'0.51"W
Location: Stream 8 Lower Sample Reach, Cresap, Marshall Co, WV	Sampling Date: 8/14/2011
SAR Number: 8	Reach Length (ft): 100
Stream Type: Intermittent Stream	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site	Before Project

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 82.5 %

List the percent cover measurements at each point below:

80	90	70	90	80	80	90	75	90	80

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 4.7

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

5	5	5	4	4	5				
5	5	5	5	5	5				
4	4	5	5	4	5				
4	4	5	5	5	5				
5	5	4	5	5	4				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 2.50 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

18.10	1.30	6.20	1.10	10.10	0.50				
5.30	24.90	8.30	36.30	1.30	1.20				
0.90	1.80	1.20	30.10	1.80	9.30				
0.80	0.50	0.90	6.10	4.90	6.10				
1.30	0.50	3.20	8.30	5.30	0.90				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 20 %

Left Bank: 5 ft

Right Bank: 15 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	<p>Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.</p> <p style="text-align: right;">Number of downed woody stems: 20</p>	20.0																																																																																																														
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Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V_{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	13.13 %																								
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11	V_{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
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Sample Variable 12 within the entire catchment of the stream.

12	V_{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																																		
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Summary: SAA Number 8			Notes:	
Variable	Value	VSI		
V_{CCANOPY}	83 %	0.93		
V_{EMBED}	4.7	0.65		
$V_{\text{SUBSTRATE}}$	2.50 in	1.00		
V_{BERO}	20 %	0.97		
V_{LWD}	20.0	1.00		
V_{TDBH}	12.0	1.00		
V_{SNAG}	2.0	1.00		
V_{SSD}	Not Used	Not Used		
V_{SRICH}	6.00	1.00		
V_{DETRITUS}	13.1 %	0.16		
V_{HERB}	Not Used	Not Used		
V_{WLUSE}	1	1.00		

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Stream 8 Upper Sample Reach, Cresap, Marshall Co, WV

Sampling Date: 8/14/2011

Project Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 8

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.97
Biogeochemical Cycling	0.94
Habitat	0.96

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	86.50	0.98
V_{EMBED}	Average embeddedness of channel.	4.20	0.90
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	3.65	1.00
V_{BERO}	Total percent of eroded stream channel bank.	40.00	0.86
V_{LWD}	Number of down woody stems per 100 feet of stream.	13.00	1.00
V_{TDBH}	Average dbh of trees.	9.50	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	2.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	6.00	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	77.19	0.94
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: D. Godec, G. Gerke	Latitude/UTM Northing: 39°49'47.75"N
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: 80°46'12.75"W
Location: Stream 8 Upper Sample Reach, Cresap, Marshall Co, WV	Sampling Date: 8/14/2011
SAR Number: 8	Reach Length (ft): 100
Stream Type: Intermittent Stream ▼	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site ▼	Before Project ▼

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 86.5 %

List the percent cover measurements at each point below:

80	90	90	80	100	80	80	75	100	90

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 4.2

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

4	4	5	4	5	5				
4	4	4	3	4	5				
4	4	4	4	4	4				
5	4	5	4	4	4				
4	4	5	4	4	4				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 3.65 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

21.50	0.50	1.30	0.50	12.30	1.20				
10.40	4.20	3.40	0.90	18.10	3.40				
8.20	3.10	0.80	1.50	5.30	3.90				
0.90	4.40	7.10	8.40	1.50	40.10				
1.50	1.20	4.30	6.20	0.60	6.30				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 40 %

Left Bank: 20 ft

Right Bank: 20 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	<p>Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.</p> <p style="text-align: right;">Number of downed woody stems: 13</p>	13.0																																																																																																														
6	V_{TDBH}	<p>Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.</p> <p>List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="5">Left Side</th> <th colspan="5">Right Side</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">6</td><td style="text-align: center;">14</td><td style="text-align: center;">15</td><td style="text-align: center;">7</td><td style="text-align: center;">7</td> <td style="text-align: center;">13</td><td style="text-align: center;">4</td><td style="text-align: center;">9</td><td style="text-align: center;">4</td><td style="text-align: center;">6</td> </tr> <tr> <td style="text-align: center;">6</td><td style="text-align: center;">7</td><td style="text-align: center;">11</td><td style="text-align: center;">8</td><td></td> <td style="text-align: center;">12</td><td style="text-align: center;">9</td><td style="text-align: center;">25</td><td style="text-align: center;">8</td><td></td> </tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>	Left Side					Right Side					6	14	15	7	7	13	4	9	4	6	6	7	11	8		12	9	25	8																																																																																		9.5
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8	V_{SSD}	<p>Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.</p> <p style="text-align: right;">Left Side: Right Side: </p>	Not Used																																																																																																														
9	V_{SRICH}	<p>Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. 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Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V _{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	77.19 %																								
<table><tr><th colspan="4">Left Side</th><th colspan="4">Right Side</th></tr><tr><td>80</td><td>100</td><td>90</td><td>100</td><td>60</td><td>80</td><td>75</td><td>50</td></tr><tr><td>90</td><td>100</td><td>90</td><td>90</td><td>70</td><td>60</td><td>60</td><td>40</td></tr></table>				Left Side				Right Side				80	100	90	100	60	80	75	50	90	100	90	90	70	60	60	40
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11	V _{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do not include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
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Sample Variable 12 within the entire catchment of the stream.

12	V _{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																								
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Summary: SAA Number 8			Notes:
Variable	Value	VSI	
V _{CCANOPY}	87 %	0.98	
V _{EMBED}	4.2	0.90	
V _{SUBSTRATE}	3.65 in	1.00	
V _{BERO}	40 %	0.86	
V _{LWD}	13.0	1.00	
V _{TDBH}	9.5	1.00	
V _{SNAG}	2.0	1.00	
V _{SSD}	Not Used	Not Used	
V _{SRICH}	6.00	1.00	
V _{DETRITUS}	77.2 %	0.94	
V _{HERB}	Not Used	Not Used	
V _{WLUSE}	1	1.00	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Cresap, Marshall County, WV

Sampling Date: 8/13/2011

Project Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 8A

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.65
Biogeochemical Cycling	0.58
Habitat	0.62

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	66.50	0.72
V_{EMBED}	Average embeddedness of channel.	4.93	0.53
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	13.25	0.53
V_{BERO}	Total percent of eroded stream channel bank.	10.00	1.00
V_{LWD}	Number of down woody stems per 100 feet of stream.	12.00	1.00
V_{TDBH}	Average dbh of trees.	10.50	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	0.00	0.10
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	3.60	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	17.81	0.22
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.50	0.53

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: D. Godec, G. Gerke	Latitude/UTM Northing: 39°49'53.42"N
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: 80°46'12.70"W
Location: Cresap, Marshall County, WV	Sampling Date: 8/13/2011
SAR Number: 8A	Reach Length (ft): 100
Stream Type: Intermittent Stream	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site	Before Project

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 66.5 %

List the percent cover measurements at each point below:

25	25	50	100	25	90	90	90	90	80

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 4.9

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

5	5	5	5	5	5				
5	5	5	5	4	5				
5	5	5	5	5	5				
5	5	5	5	5	4				
5	5	5	5	5	5				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 13.25 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

12.10	10.10	99.00	99.00	99.00	14.50				
4.20	1.50	99.00	99.00	12.20	8.20				
99.00	0.50	99.00	99.00	14.30	9.10				
5.60	1.10	99.00	99.00	4.10	4.30				
5.60	99.00	99.00	99.00	1.20	5.20				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 10 %

Left Bank: **5 ft**

Right Bank: **5 ft**

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	<p>Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.</p> <p style="text-align: right;">Number of downed woody stems: 12</p>	12.0																																																																																																														
6	V_{TDBH}	<p>Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.</p> <p>List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="5">Left Side</th> <th colspan="5">Right Side</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">10</td> <td style="text-align: center;">12</td> <td style="text-align: center;">14</td> <td></td> <td></td> <td style="text-align: center;">12</td> <td style="text-align: center;">10</td> <td style="text-align: center;">5</td> <td></td> <td></td> </tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>	Left Side					Right Side					10	12	14			12	10	5																																																																																													10.5
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7	V_{SNAG}	<p>Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.</p> <p style="text-align: right;">Left Side: 0 Right Side: 0</p>	0.0																																																																																																														
8	V_{SSD}	<p>Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.</p> <p style="text-align: right;">Left Side: 117 Right Side: 87</p>	Not Used																																																																																																														
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Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V _{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	17.81 %																								
<table><tr><th colspan="4">Left Side</th><th colspan="4">Right Side</th></tr><tr><td>20</td><td>10</td><td>20</td><td>10</td><td>10</td><td>20</td><td>30</td><td>10</td></tr><tr><td>25</td><td>10</td><td>40</td><td>20</td><td>10</td><td>25</td><td>10</td><td>15</td></tr></table>				Left Side				Right Side				20	10	20	10	10	20	30	10	25	10	40	20	10	25	10	15
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25	10	40	20	10	25	10	15																				
11	V _{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
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60	75	50	90	25	10	60	60																				

Sample Variable 12 within the entire catchment of the stream.

12	V _{WLUSE}	Weighted Average of Runoff Score for watershed:	0.50																																								
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8A			Notes:
Variable	Value	VSI	
V _{CCANOPY}	67 %	0.72	
V _{EMBED}	4.9	0.53	
V _{SUBSTRATE}	13.25 in	0.53	
V _{BERO}	10 %	1.00	
V _{LWD}	12.0	1.00	
V _{TDBH}	10.5	1.00	
V _{SNAG}	0.0	0.10	
V _{SSD}	Not Used	Not Used	
V _{SRICH}	3.60	1.00	
V _{DETRITUS}	17.8 %	0.22	
V _{HERB}	Not Used	Not Used	
V _{WLUSE}	0.5	0.53	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Cresap, Marshall County, WV

Sampling Date: 8/14/2011

Project Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 9

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.96
Biogeochemical Cycling	0.88
Habitat	0.86

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	75.50	0.83
V_{EMBED}	Average embeddedness of channel.	4.30	0.85
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	6.95	0.94
V_{BERO}	Total percent of eroded stream channel bank.	40.00	0.86
V_{LWD}	Number of down woody stems per 100 feet of stream.	8.00	1.00
V_{TDBH}	Average dbh of trees.	11.69	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	3.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	3.60	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	39.38	0.48
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: D.Godec, G. Gerke	Latitude/UTM Northing: 39°49'50.07"N
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: 80°46'11.11"W
Location: Cresap, Marshall County, WV	Sampling Date: 8/14/2011
SAR Number: 9	Reach Length (ft): 100
Stream Type: Intermittent Stream ▼	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site ▼	Before Project ▼

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 75.5 %

List the percent cover measurements at each point below:

70	80	60	80	90	80	75	60	80	80

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 4.3

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

4	4	5	5	5	4				
4	4	5	5	4	4				
4	4	5	5	4	4				
4	4	5	4	4	4				
4	4	5	4	4	4				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 6.95 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

8.20	6.90	99.00	99.00	99.00	6.50				
6.30	8.10	99.00	99.00	4.50	1.50				
0.50	7.00	99.00	99.00	6.80	2.30				
1.20	2.50	99.00	2.50	8.10	1.10				
4.80	1.30	99.00	3.10	7.50	8.20				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 40 %

Left Bank: 25 ft

Right Bank: 15 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	<p>Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.</p> <p style="text-align: right;">Number of downed woody stems: 8</p>	8.0																																																																																																														
6	V_{TDBH}	<p>Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.</p> <p>List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="5" style="text-align: center;">Left Side</th> <th colspan="5" style="text-align: center;">Right Side</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">18</td><td style="text-align: center;">16</td><td style="text-align: center;">14</td><td style="text-align: center;">8</td><td style="text-align: center;">11</td> <td style="text-align: center;">5</td><td style="text-align: center;">9</td><td style="text-align: center;">11</td><td style="text-align: center;">7</td><td style="text-align: center;">11</td> </tr> <tr> <td style="text-align: center;">10</td><td style="text-align: center;">11</td><td style="text-align: center;">18</td><td style="text-align: center;">16</td><td style="text-align: center;">12</td> <td style="text-align: center;">10</td><td></td><td></td><td></td><td></td> </tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>	Left Side					Right Side					18	16	14	8	11	5	9	11	7	11	10	11	18	16	12	10																																																																																					11.7
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8	V_{SSD}	<p>Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.</p> <p style="text-align: right;">Left Side: Right Side: </p>	Not Used																																																																																																														
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Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V _{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	39.38 %																								
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11	V _{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
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Sample Variable 12 within the entire catchment of the stream.

12	V _{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																				
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Summary: SAA Number 9			Notes:
Variable	Value	VSI	
V _{CCANOPY}	76 %	0.83	
V _{EMBED}	4.3	0.85	
V _{SUBSTRATE}	6.95 in	0.94	
V _{BERO}	40 %	0.86	
V _{LWD}	8.0	1.00	
V _{TDBH}	11.7	1.00	
V _{SNAG}	3.0	1.00	
V _{SSD}	Not Used	Not Used	
V _{SRICH}	3.60	1.00	
V _{DETRITUS}	39.4 %	0.48	
V _{HERB}	Not Used	Not Used	
V _{WLUSE}	1	1.00	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Cresap, Marshall County, WV

Sampling Date: 8/14/2011

Project Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 10

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.96
Biogeochemical Cycling	0.92
Habitat	0.86

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	82.50	0.93
V_{EMBED}	Average embeddedness of channel.	3.73	1.00
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	3.30	1.00
V_{BERO}	Total percent of eroded stream channel bank.	20.00	0.97
V_{LWD}	Number of down woody stems per 100 feet of stream.	7.00	0.88
V_{TDBH}	Average dbh of trees.	10.80	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	3.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	6.00	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	18.13	0.22
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: D. Godec, G. Gerke	Latitude/UTM Northing: 39°49'48.34"N
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: 80°46'15.00"W
Location: Cresap, Marshall County, WV	Sampling Date: 8/14/2011
SAR Number: 10	Reach Length (ft): 100
Stream Type: Intermittent Stream ▼	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site ▼	Before Project ▼

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 82.5 %

List the percent cover measurements at each point below:

70	80	75	90	100	90	80	90	70	80

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 3.7

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

4	4	4	4	4	4				
3	4	3	4	4	3				
4	4	3	4	3	4				
4	5	3	3	4	4				
3	3	4	5	4	3				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 3.30 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

3.10	5.10	0.80	8.00	4.00	1.20				
3.50	0.30	4.90	6.20	2.80	8.50				
0.50	1.20	1.20	10.10	3.90	1.10				
0.90	99.00	2.30	1.30	4.10	0.80				
1.30	10.10	8.10	99.00	6.40	0.90				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 20 %

Left Bank: 10 ft

Right Bank: 10 ft

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.	7.0
Number of downed woody stems: 7			

6	V_{TDBH}	Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:	10.8																																																																																																														
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7	V_{SNAG}	Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.	3.0
Left Side: 2 Right Side: 1			

8	V_{SSD}	Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.	Not Used
Left Side: Right Side: 			

9	V_{SRICH}	Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.	6.00
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<input checked="" type="checkbox"/> <i>Liriodendron tulipifera</i>	<input checked="" type="checkbox"/> <i>Ulmus americana</i>				
<input type="checkbox"/> <i>Magnolia acuminata</i>					
6 Species in Group 1		0 Species in Group 2			

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V _{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	18.13 %																								
<table border="1"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td>10</td><td>10</td><td>40</td><td>30</td> <td>10</td><td>5</td><td>10</td><td>20</td> </tr> <tr> <td>25</td><td>30</td><td>20</td><td>30</td> <td>10</td><td>20</td><td>10</td><td>10</td> </tr> </table>				Left Side				Right Side				10	10	40	30	10	5	10	20	25	30	20	30	10	20	10	10
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11	V _{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
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Sample Variable 12 within the entire catchment of the stream.

12	V _{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																								
<table border="1"> <thead> <tr> <th>Land Use (Choose From Drop List)</th> <th>Runoff Score</th> <th>% in Catchment</th> <th>Running Percent (not >100)</th> </tr> </thead> <tbody> <tr> <td>Forest and native range (>75% ground cover)</td> <td>1</td> <td>100</td> <td>100</td> </tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> </tbody> </table>		Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)	Forest and native range (>75% ground cover)	1	100	100																																		
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Summary: SAA Number 10			Notes:	
Variable	Value	VSI		
V _{CCANOPY}	83 %	0.93		
V _{EMBED}	3.7	1.00		
V _{SUBSTRATE}	3.30 in	1.00		
V _{BERO}	20 %	0.97		
V _{LWD}	7.0	0.88		
V _{TDBH}	10.8	1.00		
V _{SNAG}	3.0	1.00		
V _{SSD}	Not Used	Not Used		
V _{SRICH}	6.00	1.00		
V _{DETRITUS}	18.1 %	0.22		
V _{HERB}	Not Used	Not Used		
V _{WLUSE}	1	1.00		

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Cresap, Marshall County, WV

Sampling Date: 8/14/2011

Project Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 13

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.94
Biogeochemical Cycling	0.82
Habitat	0.79

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	81.50	0.91
V_{EMBED}	Average embeddedness of channel.	4.47	0.77
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	3.10	1.00
V_{BERO}	Total percent of eroded stream channel bank.	25.00	0.94
V_{LWD}	Number of down woody stems per 100 feet of stream.	11.00	1.00
V_{TDBH}	Average dbh of trees.	9.06	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	0.00	0.10
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	3.60	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	20.31	0.25
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: D. Godec, G. Gerke	Latitude/UTM Northing: 39°49'38.81"N
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: 80°46'10.38"W
Location: Cresap, Marshall County, WV	Sampling Date: 8/14/2011
SAR Number: 13	Reach Length (ft): 100
Stream Type: Intermittent Stream	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site	Before Project

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 81.5 %

List the percent cover measurements at each point below:

80	75	90	90	100	70	80	80	80	70

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 4.5

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

There should be the same number of entries for Embeddedness and Substrate Size

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

4	5	5	3	4	5				
4	5	3	3	5	5				
4	5	5	5	5	5				
5	4	4	5	5	4				
4	5	5	5	4	4				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 3.10 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

6.10	0.50	0.90	12.20	0.90					
4.90	1.50	3.10	5.60	4.30					
3.20	5.20	2.20	8.10	3.10					
99.00	3.90	3.90	1.20	1.30					
1.00	1.20	0.90	0.80	6.40					

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 25 %

Left Bank: **15 ft**

Right Bank: **10 ft**

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	<p>Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.</p> <p style="text-align: right;">Number of downed woody stems: 11</p>	11.0																																																																																																														
6	V_{TDBH}	<p>Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.</p> <p>List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="5" style="text-align: center;">Left Side</th> <th colspan="5" style="text-align: center;">Right Side</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">9</td><td style="text-align: center;">5</td><td style="text-align: center;">6</td><td style="text-align: center;">5</td><td style="text-align: center;">8</td> <td style="text-align: center;">5</td><td style="text-align: center;">20</td><td style="text-align: center;">4</td><td style="text-align: center;">4</td><td style="text-align: center;">15</td> </tr> <tr><td style="text-align: center;">16</td><td style="text-align: center;">5</td><td style="text-align: center;">18</td><td style="text-align: center;">6</td><td style="text-align: center;">5</td><td style="text-align: center;">5</td><td></td><td></td><td></td><td></td></tr> <tr><td style="text-align: center;">18</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>	Left Side					Right Side					9	5	6	5	8	5	20	4	4	15	16	5	18	6	5	5					18																																																																																9.1
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7	V_{SNAG}	<p>Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.</p> <p style="text-align: right;">Left Side: 0 Right Side: 0</p>	0.0																																																																																																														
8	V_{SSD}	<p>Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.</p> <p style="text-align: right;">Left Side: Right Side: </p>	Not Used																																																																																																														
9	V_{SRICH}	<p>Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="2" style="text-align: center;">Group 1 = 1.0</th> <th colspan="2" style="text-align: center;">Group 2 (-1.0)</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/> <i>Acer rubrum</i></td> <td><input type="checkbox"/> <i>Magnolia tripetala</i></td> <td><input checked="" type="checkbox"/> <i>Ailanthus altissima</i></td> <td><input type="checkbox"/> <i>Lonicera japonica</i></td> </tr> <tr> <td><input checked="" type="checkbox"/> <i>Acer saccharum</i></td> <td><input type="checkbox"/> <i>Nyssa sylvatica</i></td> <td><input type="checkbox"/> <i>Albizia julibrissin</i></td> <td><input type="checkbox"/> <i>Lonicera tatarica</i></td> </tr> <tr> <td><input type="checkbox"/> <i>Aesculus flava</i></td> <td><input type="checkbox"/> <i>Oxydendrum arboreum</i></td> <td><input type="checkbox"/> 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Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V_{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	20.31 %																								
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11	V_{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
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Sample Variable 12 within the entire catchment of the stream.

12	V_{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																																		
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 65%;">Land Use (Choose From Drop List)</th> <th style="width: 5%;"></th> <th style="width: 10%;">Runoff Score</th> <th style="width: 10%;">% in Catchment</th> <th style="width: 10%;">Running Percent (not >100)</th> </tr> </thead> <tbody> <tr> <td>Forest and native range (>75% ground cover)</td> <td style="text-align: center;">▼</td> <td style="text-align: center;">1</td> <td style="text-align: center;">100</td> <td style="text-align: center;">100</td> </tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> <tr><td></td><td style="text-align: center;">▼</td><td></td><td></td><td></td></tr> </tbody> </table>				Land Use (Choose From Drop List)		Runoff Score	% in Catchment	Running Percent (not >100)	Forest and native range (>75% ground cover)	▼	1	100	100		▼					▼					▼					▼					▼					▼					▼					▼			
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Summary: SAA Number 13			Notes:
Variable	Value	VSI	
V_{CCANOPY}	82 %	0.91	
V_{EMBED}	4.5	0.77	
$V_{\text{SUBSTRATE}}$	3.10 in	1.00	
V_{BERO}	25 %	0.94	
V_{LWD}	11.0	1.00	
V_{TDBH}	9.1	1.00	
V_{SNAG}	0.0	0.10	
V_{SSD}	Not Used	Not Used	
V_{SRICH}	3.60	1.00	
V_{DETRITUS}	20.3 %	0.25	
V_{HERB}	Not Used	Not Used	
V_{WLUSE}	1	1.00	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Cresap, Marshall County, WV

Sampling Date: 8/14/2011

Project Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 14

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.78
Biogeochemical Cycling	0.76
Habitat	0.62

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	83.50	0.94
V_{EMBED}	Average embeddedness of channel.	4.67	0.67
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	99.00	0.10
V_{BERO}	Total percent of eroded stream channel bank.	15.00	0.99
V_{LWD}	Number of down woody stems per 100 feet of stream.	8.00	1.00
V_{TDBH}	Average dbh of trees.	8.82	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	0.00	0.10
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	3.00	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	19.38	0.24
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: D. Godec, G. Gerke	Latitude/UTM Northing: 39°49'37.74"N
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: 80°46'4.47"W
Location: Cresap, Marshall County, WV	Sampling Date: 8/14/2011
SAR Number: 14	Reach Length (ft): 100
Stream Type: Intermittent Stream	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site	Before Project

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 83.5 %

List the percent cover measurements at each point below:

100	90	80	80	90	70	75	80	90	80

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 4.7

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

4	4	5	5	5	5				
4	4	5	5	5	5				
4	4	5	5	5	5				
4	4	5	5	5	5				
4	4	5	5	5	5				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 99.00 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

4.40	6.20	99.00	99.00	99.00	99.00				
6.30	5.50	99.00	99.00	99.00	99.00				
4.30	6.70	99.00	99.00	99.00	99.00				
8.20	6.30	99.00	99.00	99.00	99.00				
7.10	4.90	99.00	99.00	99.00	99.00				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 15 %

Left Bank: **5 ft**

Right Bank: **10 ft**

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	<p>Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.</p> <p style="text-align: right;">Number of downed woody stems: 8</p>	8.0																																																																																																				
6	V_{TDBH}	<p>Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.</p> <p>List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="5" style="text-align: center;">Left Side</th> <th colspan="5" style="text-align: center;">Right Side</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">4</td><td style="text-align: center;">4</td><td style="text-align: center;">8</td><td style="text-align: center;">4</td><td style="text-align: center;">12</td> <td style="text-align: center;">18</td><td style="text-align: center;">4</td><td style="text-align: center;">20</td><td style="text-align: center;">4</td> </tr> <tr><td style="text-align: center;">4</td><td style="text-align: center;">15</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>	Left Side					Right Side					4	4	8	4	12	18	4	20	4	4	15																																																																																8.8
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7	V_{SNAG}	<p>Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.</p> <p style="text-align: right;">Left Side: 0 Right Side: 0</p>	0.0																																																																																																				
8	V_{SSD}	<p>Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.</p> <p style="text-align: right;">Left Side: Right Side: </p>	Not Used																																																																																																				
9	V_{SRICH}	<p>Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="2" style="text-align: center;">Group 1 = 1.0</th> <th colspan="2" style="text-align: center;">Group 2 (-1.0)</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/> <i>Acer rubrum</i></td> <td><input type="checkbox"/> <i>Magnolia tripetala</i></td> <td><input type="checkbox"/> <i>Ailanthus altissima</i></td> <td><input type="checkbox"/> <i>Lonicera japonica</i></td> </tr> <tr> <td><input checked="" type="checkbox"/> <i>Acer saccharum</i></td> <td><input type="checkbox"/> <i>Nyssa sylvatica</i></td> <td><input type="checkbox"/> <i>Albizia julibrissin</i></td> <td><input type="checkbox"/> <i>Lonicera tatarica</i></td> </tr> <tr> <td><input type="checkbox"/> <i>Aesculus flava</i></td> <td><input type="checkbox"/> <i>Oxydendrum arboreum</i></td> <td><input type="checkbox"/> <i>Alliaria 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Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V_{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	19.38 %																								
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11	V_{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
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Sample Variable 12 within the entire catchment of the stream.

12	V_{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																								
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Summary: SAA Number 14			Notes:
Variable	Value	VSI	
V_{CCANOPY}	84 %	0.94	
V_{EMBED}	4.7	0.67	
$V_{\text{SUBSTRATE}}$	99.00 in	0.10	
V_{BERO}	15 %	0.99	
V_{LWD}	8.0	1.00	
V_{TDBH}	8.8	1.00	
V_{SNAG}	0.0	0.10	
V_{SSD}	Not Used	Not Used	
V_{SRICH}	3.00	1.00	
V_{DETRITUS}	19.4 %	0.24	
V_{HERB}	Not Used	Not Used	
V_{WLUSE}	1	1.00	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project
Location: Cresap, Marshall County, WV
Sampling Date: 8/15/2011

Project Site Before Project

Subclass for this SAR:

Intermittent Stream

Uppermost stratum present at this SAR:
 Tree/Sapling Strata

SAR number: 16

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.59
Biogeochemical Cycling	0.72
Habitat	0.55

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	44.50	0.42
V_{EMBED}	Average embeddedness of channel.	3.60	1.00
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	4.30	1.00
V_{BERO}	Total percent of eroded stream channel bank.	80.00	0.65
V_{LWD}	Number of down woody stems per 100 feet of stream.	4.00	0.50
V_{TDBH}	Average dbh of trees.	6.09	0.50
V_{SNAG}	Number of snags per 100 feet of stream.	0.00	0.10
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	0.80	0.38
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	20.00	0.24
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	0.58	0.61

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: D. Godec	Latitude/UTM Northing: 39°49'24.84"N
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: 80°46'20.74"W
Location: Cresap, Marshall County, WV	Sampling Date: 8/15/2011
SAR Number: 16	Reach Length (ft): 100
Stream Type: Intermittent Stream	
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site	Before Project

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 44.5 %

List the percent cover measurements at each point below:

85	90	0	0	0	0	0	80	90	100

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 3.6

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

3	4	4	3	4	3				
3	4	3	4	4	3				
4	4	3	4	4	4				
3	4	3	3	4	4				
4	3	4	3	4	4				

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 4.30 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

1.20	3.80	9.80	5.90	12.50	6.30				
2.30	1.10	5.30	6.30	6.10	7.50				
6.40	0.60	1.20	4.80	1.20	8.10				
5.90	0.70	0.90	0.90	1.10	1.00				
7.10	1.10	6.40	11.00	0.80	0.80				

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 80 %

Left Bank: **40 ft**

Right Bank: **40 ft**

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	<p>Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.</p> <p style="text-align: right;">Number of downed woody stems: 4</p>	4.0																																																																																																														
6	V_{TDBH}	<p>Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches.</p> <p>List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="5">Left Side</th> <th colspan="5">Right Side</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">12</td> <td style="text-align: center;">10</td> <td style="text-align: center;">5</td> <td style="text-align: center;">5</td> <td style="text-align: center;">6</td> <td style="text-align: center;">4</td> <td style="text-align: center;">5</td> <td style="text-align: center;">4</td> <td style="text-align: center;">6</td> <td style="text-align: center;">5</td> </tr> <tr><td style="text-align: center;">5</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr> </tbody> </table>	Left Side					Right Side					12	10	5	5	6	4	5	4	6	5	5																																																																																										6.1
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8	V_{SSD}	<p>Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.</p> <p style="text-align: right;">Left Side: 30 Right Side: 45</p>	Not Used																																																																																																														
9	V_{SRICH}	<p>Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.</p> <table border="1" style="width: 100%; border-collapse: collapse; margin-top: 10px;"> <thead> <tr> <th colspan="2">Group 1 = 1.0</th> <th colspan="2">Group 2 (-1.0)</th> </tr> </thead> <tbody> <tr><td><input type="checkbox"/> <i>Acer rubrum</i></td><td><input type="checkbox"/> <i>Magnolia tripetala</i></td><td><input type="checkbox"/> <i>Ailanthus altissima</i></td><td><input type="checkbox"/> <i>Lonicera japonica</i></td></tr> <tr><td><input type="checkbox"/> <i>Acer saccharum</i></td><td><input type="checkbox"/> <i>Nyssa sylvatica</i></td><td><input type="checkbox"/> <i>Albizia julibrissin</i></td><td><input checked="" type="checkbox"/> <i>Lonicera tatarica</i></td></tr> <tr><td><input type="checkbox"/> <i>Aesculus flava</i></td><td><input type="checkbox"/> <i>Oxydendrum arboreum</i></td><td><input type="checkbox"/> <i>Alliaria petiolata</i></td><td><input type="checkbox"/> <i>Lotus 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<input type="checkbox"/> <i>Carya ovalis</i>	<input type="checkbox"/> <i>Quercus rubra</i>	<input type="checkbox"/> <i>Lespedeza bicolor</i>	<input checked="" type="checkbox"/> <i>Rosa multiflora</i>																																																																																																														
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3 Species in Group 1		2 Species in Group 2																																																																																																															

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V _{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	20.00 %																								
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11	V _{HERB}	Average percentage cover of herbaceous vegetation (measure only if tree cover is <20%). Do <i>not</i> include woody stems at least 4" dbh and 36" tall. Because there may be several layers of ground cover vegetation percentages up through 200% are accepted. Enter the percent cover of ground vegetation at each subplot.	Not Used																								
<table border="1"> <tr> <th colspan="4">Left Side</th> <th colspan="4">Right Side</th> </tr> <tr> <td>70</td> <td></td> <td></td> <td></td> <td>70</td> <td></td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>				Left Side				Right Side				70				70											
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70				70																							

Sample Variable 12 within the entire catchment of the stream.

12	V _{WLUSE}	Weighted Average of Runoff Score for watershed:	0.58																																				
<table border="1"> <tr> <th>Land Use (Choose From Drop List)</th> <th>Runoff Score</th> <th>% in Catchment</th> <th>Running Percent (not >100)</th> </tr> <tr> <td>Forest and native range (>75% ground cover)</td> <td>1</td> <td>40</td> <td>40</td> </tr> <tr> <td>Open space (pasture, lawns, parks, etc.), grass cover >75%</td> <td>0.3</td> <td>60</td> <td>100</td> </tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> </table>				Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)	Forest and native range (>75% ground cover)	1	40	40	Open space (pasture, lawns, parks, etc.), grass cover >75%	0.3	60	100																								
Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)																																				
Forest and native range (>75% ground cover)	1	40	40																																				
Open space (pasture, lawns, parks, etc.), grass cover >75%	0.3	60	100																																				

Summary: SAA Number 16			Notes:
Variable	Value	VSI	
V _{CCANOPY}	45 %	0.42	
V _{EMBED}	3.6	1.00	
V _{SUBSTRATE}	4.30 in	1.00	
V _{BERO}	80 %	0.65	
V _{LWD}	4.0	0.50	
V _{TDBH}	6.1	0.50	
V _{SNAG}	0.0	0.10	
V _{SSD}	Not Used	Not Used	
V _{SRICH}	0.80	0.38	
V _{DETRITUS}	20.0 %	0.24	
V _{HERB}	Not Used	Not Used	
V _{WLUSE}	0.58	0.61	

FCI Calculator for the High-Gradient Headwater Streams in eastern Kentucky and western West Virginia HGM Guidebook

To ensure accurate calculations, the **UPPERMOST STRATUM** of the plant community is determined based on the calculated value for $V_{CCANOPY}$ ($\geq 20\%$ cover is required for tree/sapling strata). Go to the SAR Data Entry tab and enter site characteristics and data in the yellow cells. For information on determining how to split a project into SARs, see Chapter 5 of the Operational Draft Regional Guidebook for the Functional Assessment of High-gradient Ephemeral and Intermittent Headwater Streams in Western West Virginia and Eastern Kentucky (Environmental Laboratory U.S. Army Corps of Engineers 2010).

Project Name: AEP Mitchell Landfill Project

Location: Stream 17. Cresap, Marshall County, WV

Sampling Date: 28 Sept 2011

Project Site Before Project

Subclass for this SAR:

Ephemeral Stream

Uppermost stratum present at this SAR:

Tree/Sapling Strata

SAR number: 17

Functional Results Summary:

Enter Results in Section A of the Mitigation Sufficiency Calculator

Function	Functional Capacity Index
Hydrology	0.99
Biogeochemical Cycling	0.95
Habitat	0.85

Variable Measure and Subindex Summary:

Variable	Name	Average Measure	Subindex
$V_{CCANOPY}$	Percent canopy over channel.	61.50	0.65
V_{EMBED}	Average embeddedness of channel.	3.43	0.98
$V_{SUBSTRATE}$	Median stream channel substrate particle size.	5.25	1.00
V_{BERO}	Total percent of eroded stream channel bank.	15.00	0.99
V_{LWD}	Number of down woody stems per 100 feet of stream.	11.00	1.00
V_{TDBH}	Average dbh of trees.	9.25	1.00
V_{SNAG}	Number of snags per 100 feet of stream.	3.00	1.00
V_{SSD}	Number of saplings and shrubs per 100 feet of stream.	Not Used	Not Used
V_{SRICH}	Riparian vegetation species richness.	3.20	1.00
$V_{DETRITUS}$	Average percent cover of leaves, sticks, etc.	45.63	0.56
V_{HERB}	Average percent cover of herbaceous vegetation.	Not Used	Not Used
V_{WLUSE}	Weighted Average of Runoff Score for Catchment.	1.00	1.00

High-Gradient Headwater Streams in eastern Kentucky and western West Virginia

Field Data Sheet and Calculator

Team: Dawn York and Mary Gilmore	Latitude/UTM Northing: 39 49 18.793
Project Name: AEP Mitchell Landfill Project	Longitude/UTM Easting: 80 46 43.017
Location: Stream 17. Cresap, Marshall County, WV	Sampling Date: 28 Sept 2011
SAR Number: 17	Reach Length (ft): 100 Stream Type: Ephemeral Stream
Top Strata: Tree/Sapling Strata (determined from percent calculated in $V_{CCANOPY}$)	
Site and Timing: Project Site	Before Project

Sample Variables 1-4 in stream channel

- 1 $V_{CCANOPY}$ Average percent cover over channel by tree and sapling canopy. Measure at no fewer than 10 roughly equidistant points along the stream. Measure only if tree/sapling cover is at least 20%. (If less than 20%, enter at least one value between 0 and 19 to trigger Top Strata choice.) 61.5 %

List the percent cover measurements at each point below:

95	60	30	70	20						
80	65	70	100	25						

- 2 V_{EMBED} Average embeddedness of the stream channel. Measure at no fewer than 30 roughly equidistant points along the stream. Select a particle from the bed. Before moving it, determine the percentage of the surface and area surrounding the particle that is covered by fine sediment, and enter the rating according to the following table. If the bed is an artificial surface, or composed of fine sediments, use a rating score of 1. If the bed is composed of bedrock, use a rating score of 5. 3.4

Embeddedness rating for gravel, cobble and boulder particles (rescaled from Platts, Megahan, and Minshall 1983)

Rating	Rating Description
5	<5 percent of surface covered, surrounded, or buried by fine sediment (or bedrock)
4	5 to 25 percent of surface covered, surrounded, or buried by fine sediment
3	26 to 50 percent of surface covered, surrounded, or buried by fine sediment
2	51 to 75 percent of surface covered, surrounded, or buried by fine sediment
1	>75 percent of surface covered, surrounded, or buried by fine sediment (or artificial surface)

List the ratings at each point below:

5	3	3	5	4	4					
5	4	3	2	2	5					
4	1	5	4	5	2					
5	4	2	4	3	2					
3	2	4	3	3	2					

- 3 $V_{SUBSTRATE}$ Median stream channel substrate particle size. Measure at no fewer than 30 roughly equidistant points along the stream; use the same points and particles as used in V_{EMBED} . 5.25 in

Enter particle size in inches to the nearest 0.1 inch at each point below (bedrock should be counted as 99 in, asphalt or concrete as 0.0 in, sand or finer particles as 0.08 in):

5.00	17.80	2.50	7.50	1.50	11.90					
8.50	1.20	99.00	2.25	1.20	1.50					
11.90	0.75	1.20	19.00	4.50	9.00					
5.50	5.00	1.00	4.20	99.00	99.00					
99.00	1.70	1.20	6.20	19.30	10.00					

- 4 V_{BERO} Total percent of eroded stream channel bank. Enter the total number of feet of eroded bank on each side and the total percentage will be calculated. If both banks are eroded, total erosion for the stream may be up to 200%. 15 %

Left Bank: **12 ft**

Right Bank: **3 ft**

Sample Variables 5-9 within the entire riparian/buffer zone adjacent to the stream channel (25 feet from each bank).

5	V_{LWD}	Number of down woody stems (at least 4 inches in diameter and 36 inches in length) per 100 feet of stream reach. Enter the number from the entire 50'-wide buffer and within the channel, and the amount per 100 feet of stream will be calculated.	11.0
Number of downed woody stems: 11			

6	V_{TDBH}	Average dbh of trees (measure only if $V_{CCANOPY}$ tree/sapling cover is at least 20%). Trees are at least 4 inches (10 cm) in diameter. Enter tree DBHs in inches. List the dbh measurements of individual trees (at least 4 in) within the buffer on each side of the stream below:	9.3
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Left Side					Right Side				
13					8.5				
15					8				
5					4				
6.5					8.5				
6					5.5				
8.5					12				
13					9				
					12.5				
					13				

7	V_{SNAG}	Number of snags (at least 4" dbh and 36" tall) per 100 feet of stream. Enter number of snags on each side of the stream, and the amount per 100 feet will be calculated.	3.0
Left Side: 1 Right Side: 2			

8	V_{SSD}	Number of saplings and shrubs (woody stems up to 4 inches dbh) per 100 feet of stream (measure only if tree cover is <20%). Enter number of saplings and shrubs on each side of the stream, and the amount per 100 ft of stream will be calculated.	Not Used
Left Side: 37 Right Side: 58			

9	V_{SRICH}	Riparian vegetation species richness per 100 feet of stream reach. Check all species present from Group 1 in the tallest stratum. Check all exotic and invasive species present in all strata. Species richness per 100 feet and the subindex will be calculated from these data.	3.20
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Group 1 = 1.0				Group 2 (-1.0)			
<input type="checkbox"/> <i>Acer rubrum</i>	<input type="checkbox"/> <i>Magnolia tripetala</i>	<input type="checkbox"/> <i>Ailanthus altissima</i>	<input checked="" type="checkbox"/> <i>Lonicera japonica</i>				
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<input type="checkbox"/> <i>Carya ovalis</i>	<input checked="" type="checkbox"/> <i>Quercus rubra</i>	<input type="checkbox"/> <i>Lespedeza bicolor</i>	<input type="checkbox"/> <i>Sorghum halepense</i>				
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<input checked="" type="checkbox"/> <i>Liriodendron tulipifera</i>	<input checked="" type="checkbox"/> <i>Ulmus americana</i>						
<input type="checkbox"/> <i>Magnolia acuminata</i>							
6 Species in Group 1		2 Species in Group 2					

Sample Variables 10-11 within at least 8 subplots (40" x 40", or 1m x 1m) in the riparian/buffer zone within 25 feet from each bank. The four subplots should be placed roughly equidistantly along each side of the stream.

10	V_{DETRITUS}	Average percent cover of leaves, sticks, or other organic material. Woody debris <4" diameter and <36" long are include. Enter the percent cover of the detrital layer at each subplot.	45.63 %																								
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Left Side				Right Side																							

Sample Variable 12 within the entire catchment of the stream.

12	V_{WLUSE}	Weighted Average of Runoff Score for watershed:	1.00																																								
<table border="1" style="width: 100%; border-collapse: collapse; margin: 5px 0;"> <tr> <th style="width: 65%;">Land Use (Choose From Drop List)</th> <th style="width: 5%;">Runoff Score</th> <th style="width: 10%;">% in Catchment</th> <th style="width: 20%;">Running Percent (not >100)</th> </tr> <tr> <td>Forest and native range (>75% ground cover) ▼</td> <td style="text-align: center;">1</td> <td style="text-align: center;">100</td> <td style="text-align: center;">100</td> </tr> <tr><td> ▼</td><td> </td><td> </td><td> </td></tr> <tr><td> ▼</td><td> </td><td> </td><td> </td></tr> <tr><td> ▼</td><td> </td><td> </td><td> </td></tr> <tr><td> ▼</td><td> </td><td> </td><td> </td></tr> <tr><td> ▼</td><td> </td><td> </td><td> </td></tr> <tr><td> ▼</td><td> </td><td> </td><td> </td></tr> <tr><td> ▼</td><td> </td><td> </td><td> </td></tr> <tr><td> ▼</td><td> </td><td> </td><td> </td></tr> </table>				Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)	Forest and native range (>75% ground cover) ▼	1	100	100	▼				▼				▼				▼				▼				▼				▼				▼			
Land Use (Choose From Drop List)	Runoff Score	% in Catchment	Running Percent (not >100)																																								
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Summary: SAA Number 17			Notes:
Variable	Value	VSI	
V_{CCANOPY}	62 %	0.65	
V_{EMBED}	3.4	0.98	
$V_{\text{SUBSTRATE}}$	5.25 in	1.00	
V_{BERO}	15 %	0.99	
V_{LWD}	11.0	1.00	
V_{TDBH}	9.3	1.00	
V_{SNAG}	3.0	1.00	
V_{SSD}	Not Used	Not Used	
V_{SRICH}	3.20	1.00	
V_{DETRITUS}	45.6 %	0.56	
V_{HERB}	Not Used	Not Used	
V_{WLUSE}	1	1.00	