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Draft
Detailed Project Report
And
Integrated Environmental Assessment

APPENDIX 10

WATER QUALITY AND VEGETATION SURVEYS

North Park Lake
Allegheny County, PA
Section 206 Aquatic Ecosystem Restoration Project

APPENDIX 10

WATER QUALITY AND VEGETATION SURVEYS

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1. Introduction

1.1. Purpose of Study

The purpose of this study is to establish a baseline characterization of the Pine Creek basin in North Park, Allegheny County, PA, in order to develop a restoration plan for the degraded aquatic ecosystem. Study elements included chemical water quality and riparian vegetation surveys. In addition, a vegetation survey was conducted in each of the proposed dredge material placement sites. The goals of the restoration plan are to restore the health and quality of the aquatic ecosystem by: improving/enhancing stream and lake water quality; improving the quality of submerged aquatic beds; improving North Park Lake sediment quality; improving/restoring the North Park Lake warmwater and coolwater fisheries; diversifying lake aquatic habitat; protecting, enhancing, and creating shoreline emergent and shrub/scrub wetlands and edge habitat along the perimeter of North Park Lake; and enhancing bottomland hardwood wetlands in riparian areas along the North Fork of Pine Creek upstream of North Park Lake.

1.2. Authority

The authority for this study is contained in Section 206 of the Water Resources Development Act of 1996. Under this authority the U.S. Army Corps of Engineers can pursue cost shared feasibility studies for the purpose of aquatic ecosystem restoration.

1.3. Sponsors and Participants

Allegheny County, PA was the cost sharing study partner with the Pittsburgh District of the U.S. Army Corps of Engineers. Baker Engineering was utilized as a consultant for Allegheny County.

2. Description of the Pine Creek Drainage Basin

2.1. General Hydrology and Stream Nomenclature

Pine Creek is a tributary of the Allegheny River in northern Allegheny County, Pennsylvania. The confluence of Pine Creek with the Allegheny River is on the right descending bank or north side of the Allegheny River at mile (RM) 4.63, in Etna, PA, within the navigation pool of Emsworth Locks and Dam (L/D) (normal pool elevation 710 feet National Geodetic Vertical Datum (NGVD). Emsworth L/D is located at Ohio River RM 6.2, 10.9 miles downstream of the mouth of Pine Creek. Pertinent hydrologic features of the Pine Creek valley are shown on FIGURE 1.

The Pine Creek basin drains an area of 67.3 square miles and lies between 40.28^{o} to 40.38^{o} north latitude and 79.53^{o} to 80.06^{o} west longitude, north of the Allegheny River. The North Fork of Pine Creek begins in Cranberry Township, Beaver County, and runs south through Pine Township, Allegheny County and into North Park. The headwaters of Pine Creek drain western Marshall Township and northwestern Franklin Park and then run west to North Park. Total vertical relief within the Pine Creek watershed is about 590 feet, ranging from close to 1,300 feet NGVD at the basin ridges upstream of the Park, down to a minimum water surface elevation of 710 feet NGVD at the mouth of Pine Creek At the Allegheny River.

North Park is located in the Pine Creek drainage basin and includes portions of McCandless, Pine, and Hampton Townships. It is owned and operated by Allegheny County Bureau of Parks and Recreation. North Park Lake is a 63-acre (originally 75-acre), man-made lake formed by a 33 ft high dam on Pine Creek at stream mile 15.0 (Crest elevation 960 ft NGVD), located in North Park. At the dam, the Pine Creek drainage basin is 22.07 square miles. Immediately upstream of the dam, the North Fork of Pine Creek confluences with Pine Creek, creating two arms in North Park Lake, with drainage areas of 10.01 and 12.06 sq miles, respectively. Upstream of North Park Lake, about 2.34 miles of the North Fork of Pine Creek and 1.4 miles of Pine Creek lie within the boundaries of North Park (FIGURE 2).

The largest tributary embayment in North Park Lake is created by Irwin Run, a right descending bank tributary of the North Fork of Pine Creek Arm, located at North Fork mile 0.04, approximately 200 ft upstream of the dam. The drainage area of Irwin Run is approximately 1.5 square miles but it nonetheless supports high quality, diverse wetlands. Vegetation communities of the Irwin Run embayment of North Park Lake, along with those located at the upstream end of the Pine Creek Arm of North Park Lake and along the Pine Creek inflow to the lake, were of exceptional quality. Additionally, Irwin Run has also been identified as the best location in North Park to observe migrating warblers (WPAS, 1975). Protection of these wetlands is therefore a significant component of the restoration of North Park aquatic ecosystem because, not only do they enhance water quality and provide habitat, but they also provide a diverse, native seed source for newly constructed wetlands downstream.

Marshall Lake is located on the North Fork of Pine Creek, approximately 0.7 miles upstream of North Park Lake, and is created by a dam located at river mile 1.63.

2.2. Land Use

North Park Lake was built in 1939, shortly before development began in the North Hills of Pittsburgh, which caused significant land use changes in the Pine Creek basin. By the 1980's, the focus for new growth for the entire Pittsburgh metropolitan area was the north suburbs, primarily in Cranberry Township in Butler County and Pine and Marshall Townships in Allegheny County, peaking in 1995. The 2001 National census documented these townships as three of the fastest growing areas in the state of Pennsylvania (PDCED, 2003). Between 1990 and 2000, Marshall and Pine townships increased in population by 45.5 and 89.9 %, respectively, and the population of Pine Township is expected to continue to grow and double again by 2010. This development in the headwaters of both Pine Creek and the North Fork of Pine Creek, which were formerly wooded and rural, resulted in the degradation of basin floodplains, headwater tributaries, wetlands, and stream and lake water quality, attributable to sedimentation, erosion, hydrologic changes, eutrophication, and loss of riparian vegetative buffers.

Increasing impervious surface coverage associated with urbanization increases storm water runoff, peak flow discharges, and stream carrying capacity. As a consequence, over the years, North Park and Marshall Lakes have functioned as sediment traps for upstream development. Sedimentation of North Park's lakes and related problems, like turbidity and excessive growths of exotic submerged plants, are primarily responsible for the degradation of the aquatic ecosystem of Pine Creek Basin in North Park (FIGURE 3).

It is important to remember that as urbanization continues in the Pine Creek watershed, the potential for a wide variety of water quality problems typically related to urban runoff increases. These include water quality degradation due to runoff contaminated with pet wastes; lawn care chemicals; shock loads of winter season road salt; petroleum products from automobiles; chlordane from historical termite treatment activities; trash, and a steady seed bank of exotic, invasive plant species which thrive in disturbed areas like stream banks and negatively impact riparian corridors.

Within North Park itself, stream culverting, regularly mowing of riparian buffers and shoreline wetlands, heavy foot traffic, and excessive goose populations have also contributed to the degradation of Park's aquatic ecosystem. Because it is a beautiful location, which is now accessible to a large suburban population, parts of North Park have been and continue to be used so intensely that it becomes damaging. Severe soil compaction and erosion is particularly evident along North Park Lake shorelines where fishing pressure has damaged vegetation resulting in eroded and undercut banks. In addition, extensive mowing of the Park's lake and stream shorelines has devastated shoreline wetlands and riparian buffers.

An attribute of North Park that makes it particularly unique and valuable is that, as development in the surrounding communities continues, it is becoming more and more a refuge for wildlife and people; in essence, a large oasis of green space within an urban environment. North Park's 3,010 acres (4.7 sq miles) contribute approximately 21 percent of the 22 sq mile watershed upstream of Pine Creek Dam, which could be classified as open space or undeveloped land. North Park includes spectacular natural

hardwood forests and many headwater tributaries intact riparian zones with like Irwin Run. The size of this contiguous green space with uninterrupted stream corridors increases its value to wildlife, as well as the interest and potential for ecosystem restoration. According to the *Allegheny County Parks Comprehensive Master Plan, Park-specific Recommendations, North Park*, North Park is considered a conservation corridor (www 1). The wildlife resources of North Park illustrate its wild nature, and are indicative of the potentially high value of ecosystem restoration. Over 232 species of birds have been recorded in the Park during the past 24 years, with a yearly average of 150 species. North Park and Marshall Lakes were identified as the best areas for observing larger birds and the Irwin Run valley best for spring warbler movements (ASWP, 1980). Of the 34 species of amphibian and 63 mammal species that occur in PA, 14 and 32, respectively, have been identified in North Park (www 2).

3. Previous and Concurrent Studies

There have been few studies of the water quality and aquatic life of Pine Creek basin in North Park Lake (TABLE 1). The Pennsylvania Fish and Boat Commission (PA F&BC) maintain a warmwater and coolwater fishery at North Park Lake, stocking and conducting routine fishery surveys and concurrently collecting field water quality data. In their April 21, 1997 report, "Comments and Recommendations Report on North Park Lake", they classified North Park Lake as shallow, eutrophic, and turbid, and identified siltation and related turbidity problems as limiting factors for a productive lake fishery (PAFBC, 1997). This report also emphasized that sedimentation in rivers and streams represents the most pervasive water pollution problem in North America and accounts for 47% of all non-point source pollution in the U.S. They first surveyed the lake in 1947, and reported even then that the slow growth patterns observed for juvenile bass were related to excessive siltation problems.

The Pennsylvania Senior Environment Corps, the Environmental Alliance for Senior Involvement, is working with Vintage, a nonprofit senior citizens agency in Allegheny County, conducting a two-year, $50,000 Pine Creek watershed study (www 3). The

study was funded by the PA State Department of Environmental Protection. Seniors regularly collect water quality and macroinvertebrate data in lower Pine Creek and Little Pine Creek, but no data has been collected within North Park. In 2002, the Commonwealth of Pennsylvania, Department of Conservation and Natural Resources (PA DCNR) funded the *Pine Creek Watershed, Rivers Conservation Plan*, which is scheduled for completion in 2005 (www 5). Additionally, State of PA Total Maximum Daily Loads (TMDL's) have not yet been developed for the Pine Creek Watershed.

In the spring of 1999, the Penns Woods West Chapter of Trout Unlimited received a $9,972.50 The Western Pennsylvania Watershed Program Grant for stream bank stabilization and riparian buffer improvement along lower Pine Creek. (www 4)

In 2002, the PA Environmental Council and its local partner, the North Area Environmental Council, received a Growing Greener Grant to develop a watershed assessment and restoration plan for Pine Creek basin. They have planned to conduct " a preliminary evaluation of the water quality and aquatic condition of Pine Creek; inventory land use and land use policy within the 14 municipalities of the watershed; develop a preliminary restoration plan for the watershed; make recommendations on best management practices for the watershed; and propose a long-term mechanism to monitor the health of the watershed."(www 5).

The Carnegie Museum prepared a report entitled, "The Vascular Plants of Allegheny County Parks" for the Department of Parks, Recreation, and Conservation, County of Allegheny in March of 1971 (Wiegman, 1971). This list of species included plants observed at North Park between June 1969 and January 1971.

4. Study Plan Outline and Methods

To characterize the water quality and aquatic life resources of Pine Creek Basin, North Park, the following studies were conducted.

- One **summer season, low flow, water quality survey of the Pine Creek Basin within North Park; where over 52 chemical and physical parameters were** collected at nine sampling stations.

- **Sediment Quality Samples were collected in North Park Lake** for the Hazardous, Toxic, and Radioactive Waste characterization study, to determine if there might potentially be sediment contamination issues involved with the restoration of the stream ecosystem. Nutrient sample analyses were also conducted on this material to assess benefits gained by removal of nutrient laden sediments, the legacy of intense development with little or no control of sedimentation and erosion. (See. APPENDIX 5)

- The condition, quality, and composition of the **vegetation of the existing Riparian Zone** of North Park Lake (including Irwin Run embayment), Pine Creek, and the North Fork of Pine Creek within North Park were investigated and evaluated.

- The condition, quality, and composition of the **vegetation of the proposed placement** sites for material dredged from North Park Lake were investigated and sites were then evaluated and ranked from most to least degraded.

5. Water Quality of the Pine Creek Basin in North Park

5.1. Methods

Water quality efforts involved one, summer season, low flow, water quality survey of the Pine Creek Basin within North Park, which was conducted on August 20, 2002. During this survey, samples were collected at nine sampling stations. Sampling stations that flow into North Park Lake included Irwin Run; Pine Creek; and the North Fork of Pine Creek at the northern end of the park, upstream of Marshall Lake, and downstream of Marshall Lake. North Park Lake sampling stations were located at the upstream end of

the North Fork of Pine Creek Arm, midway between the mouth of the arm and the boathouse; at the upstream end of the Pine Creek Arm (approximately 1000 feet upstream of the Dam); and 50 feet upstream of the Pine Creek Dam, midway between the Pine Creek Arm and the North Fork of Pine Creek Arm. A final sampling station was located at the outflow of North Park Lake, on Pine Creek, about 200 feet downstream of the dam. The network of stations sampled during this monitoring effort is outlined in TABLE 2, and are shown on FIGURE 2. Stream samples were collected from bridges and North Park Lake samples were collected by boat.

Field parameters were measured and samples were collected and delivered to a Corps of Engineers contract analytical laboratory for analyses. To assure field and laboratory quality control, duplicate and split samples, trip blanks, and distilled water field blanks were collected for a full sample set at one station during this survey. A list of 67 parameters that were measured during the water quality survey is presented in TABLE 3 and methods of analyses are presented in TABLE 4. The results of the water quality survey are tabulated in TABLE 5 and vertical profile data for North Park Lake are presented in TABLE 6. Results of all the chemical and physical water quality analyses for our August 2002 survey of the Pine Creek Basin in North Park are presented in TABLE 7.

TABLE 5 also includes water quality data collected from a series of reference sites for comparison of North Park waters with typical, non-degraded or moderately degraded regional waters. References streams were selected that were located in Allegheny County with geology and stream order similar to that of the Pine Creek basin. They included Bull Run, a high quality tributary of the Allegheny River and Little Sewickley Creek, a moderately degraded tributary to the Ohio River. Lake reference sites included two eutrophic, shallow lakes located in the Mahoning River basin in Trumbull County, OH. The first, Mosquito Creek Lake, is a large, shallow, highly eutrophic reservoir with good water quality, and the second, Lower Girard Lake, is a small, shallow, extremely eutrophic lake with moderately degraded water quality.

5.2. Results

Relative to these other, non-degraded or only moderately degraded local streams, the waters of Pine Creek and the North Fork of Pine Creek in North Park can be characterized as hard, turbid, and mineralized with elevated nutrients and salts, likely attributable to increasing urbanization in the basin. North Park Lake is a warm, shallow, mineralized, nutrient rich, eutrophic impoundment. Eutrophication is a natural process in which lakes become shallower and more productive through the introduction and cycling of nutrients (Corbit, 1990). Both lakes in North Park suffer from cultural eutrophication, caused by human activity which speeds up the rate of addition of nutrients and sediments and the eutrophication process. The upstream reaches of North Park Lake have already passed through both the eutrophic and senescent stages, and have filled in completely. During our August 2002 survey, significant vertical thermal and chemical stratification patterns had developed in North Park Lake and dissolved oxygen was totally depleted in the hypolimnion of the lake. Within the chemically reduced environment of the hypolimnion, soluble metals (especially iron and manganese), and chemically reduced nitrogen and sulfur species such as ammonia and hydrogen sulfide had accumulated.

5.2.1. Mineralization

Mineralization is reflected by elevated conductivity and total dissolved solids concentrations. While the North Fork inflow stations were less mineralized than the Pine Creek inflow stations, the North Fork Arm was more mineralized than the Pine Creek Arm of North Park Lake. It is suspected that the nuisance goose population at Marshall Lake is a primary source of turbidity, nutrients, and high productivity in the North Fork Arm of North Park Lake.

Conductivities of inflow tributaries to North Park Lake averaged 646 umhos/cm for all North Fork stations, 891 umhos/cm for the Pine Creek station, and 875 umhos/cm at Irwin Run. Inflow turbidities mirrored this trend, with a turbidity of 5.3 ntu at the North Fork inflow and 8.0 ntu at the Pine Creek station. Conductivities of our reference

streams, which were moderately and relatively non-impacted by urban runoff, were approximately 450 umhos/cm and turbidities ranged between 1.9 and 0.8 ntu.

Specific conductivity at North Park Lake station NPL 2 1002 ranged from 547 umhos/cm at the surface to 636 umhos/cm at the bottom. At the Pine Creek Arm station, NPL 2 1003, conductivities ranged between 575 umhos/cm on the surface and 596 umhos/cm on the bottom. The North Fork Arm, station NPL 2 1001, was more mineralized than the Pine Creek Arm, with a surface conductivity of 742 umhos/cm and bottom conductivity of 732 umhos/cm. The highest turbidity values were also observed at the North Fork Arm station, with surface turbidity of 34.3 ntu and bottom turbidity 55.1 ntu. At stations NPL 2 1002 and NPL 2 1003, surface turbidities were 30.8 and 14.3 ntu, respectively.

Conductivity values of the outflow stations of Marshall and North Park Lakes were 616 umhos/cm and 570 umhos/cm, respectively. Highest turbidity values and concentrations of total suspended solids were observed in the outflows of Marshall and North Park Lakes. Pine Creek and North Fork outflow turbidity values were 26.9 and 9.0 ntu, respectively, while inflow turbidities ranged between 3.3 and 8 ntu. Total suspended solid concentrations for the Pine Creek and North Fork outflows were 20.6 and 21.2 mg/l, respectively, and inflow concentrations ranged between 8.2 and 8.3 mg/l.

5.2.2. Salts and Hardness

The major salts contributing to this mineralized condition were sodium chloride and calcium sulfate. The concentrations of the major cations were 87 mg/l and 65.5 mg/l sodium, and 61 mg/l and 54.5 mg/l calcium for the Pine Creek and the North Fork, respectively. Major anions were chlorides and sulfates. The mean Ca/Na ratio was 0.7 for the Pine Creek inflow and was 0.8 for the North Fork of Pine Creek, which is typical of streams that capture high amounts of urban runoff, compared to a ratio of 4.4, which is typical for streams that capture little urban drainage like Bull Run and are overwhelmingly calcium sulfate dominated. Although brine seepage from old oil and gas wells can cause elevated sodium concentrations and low ratios, there are no known

sources of brine in the basin so it must be assumed that the sources of the sodium chloride influencing the basin waters are from sewage and winter deicing salts. There was no evidence of either raw or treated wastewater in either of the two inflow streams. Typical increases in mineral content of surface waters from domestic water use is also presented in TABLE 5.

5.2.3. Dissolved Oxygen

If sewage were discharge into either stream, it would contribute biochemical oxygen demand (BOD) and nutrients to the stream. Oxygen consumption by a BOD load can depress dissolved oxygen concentrations. During our one time survey, the Pine Creek inflow was well aerated, with a dissolved oxygen concentration (D.O.) of 8.47 mg/l. However, D.O. concentrations recorded at sampling sites along the North Fork were a bit less than circumsaturation, averaging 6.81 mg/l. Irwin Run D.O. was also low, at 6.57 mg/l. It is likely that brief summer season dissolved oxygen depressions can develop in the Pine Creek basin in North Park, especially along the North Fork. Stream water temperatures were high. Pine Creek was 20.31 C^{o} and the North Fork sampling stations averaged 21.5 $C^{o.}$ Although the tree canopy provides some shading, reaches of riparian vegetation along both streams, particularly along the North Fork, were regularly mowed and open and channel relief was low along the stream reaches that were sampled.

North Park Lake was thermally and chemically stratified. Vertical profile sampling was conducted at 3 locations in the lake: 200 feet upstream of the Pine Creek Dam (NPL 2 1002), in the Pine Creek Arm (NPL 2 1003), and in the North Fork of Pine Creek Arm (NPL 2 2001) (TABLE 2). At station NPL 2 1002, the depth of the lake was 9 feet and there was a 2.6^{o} C vertical thermal gradient, with 25.11^{o} C at the surface of the lake and a warm 22.48^{o} C at the bottom. At a depth greater than 8 feet, the waters of the lake were anaerobic (dissolved oxygen concentration < 1.0 mg/l). At the North Fork Arm station, the total depth was 8 feet with anoxic waters at depths greater than 6 feet. Surprisingly, the hypoliminum of the Pine Creek Arm was not anoxic, with D.O. concentrations ranging between 7.72 mg/l on the surface and 6.56 mg/l on the bottom. However, at

stations NPL 2 1002 and NPL 2 1003, surface D.O. concentrations were 6.38 and 6.09 mg/l, and bottom concentrations were 0.63 and 0.62 mg/l, respectively, which were lower than the Pennsylvania Department of Environment Protection's non-degradation minimum D.O. concentration of 6.5 for warmwater fisheries (PADEP Ref.). Oxidation/reduction potential was very low throughout the lake, averaging only -8.7 mV for lake surface samples and -29.6 mV for bottom samples. Vertical profile data collected from North Park Lake on August 20, 2002 are presented in TABLE 6.

Outflows of both lakes were also very warm, 23.5 C^o at Marshall Lake outflow and 24.1 C^o C at the North Park Lake outflow.

The PA F&BC collected water quality data at North Park Lake in August of 1992. This data was very comparable to our 2002 data. Water temperatures ranged from 24 to 22 C^o and specific conductivity from 516 to 591umhos/cm, from top to bottom, respectively. D.O.

5.2.4. Nutrients

At the Pine Creek inflow sampling site, concentrations of NO2 +NO3 nitrogen were extremely elevated, 2.19 mg/l, while concentrations of phosphorus and reduced nitrogen species, Kjeldahl nitrogen and ammonia, were comparable to a moderately impacted reference stream, Little Sewickley Creek. The North Fork inflow nutrient load was lower than that of Pine Creek, where average concentrations of all nitrogen species were comparable to those of the moderately impacted reference stream (TABLE 5). Reduced nitrogen forms were significantly elevated at the sampling sites located at the outflows of North Park and Marshall Lakes. At the Pine Creek outflow from North Park Lake, ammonia and Kjeldahl nitrogen concentrations were 0.13 and 0.76 mg/l, respectively. However, reduced nitrogen forms were extremely elevated in the North Fork outflow of Marshall Lake, with concentrations of ammonia and Kjeldahl nitrogen of 0.07 and 1.18 mg/l, respectively. North Fork inflow concentrations were lower than those of Pine Creek and yet reduced nitrogen concentrations were higher in the Marshall Lake outflow

than the North Park Lake outflow, again, likely attributed to the nutrient load from the nuisance goose population along the North Fork.

Elevated ammonia concentrations are often primary limiting factors for aquatic life in local urban streams influenced by sewage (USACE 2000). Ammonia is most toxic in its non-ionized form (NH_3 rather than the ammonium ion). The ammonia concentrations of non-degraded local streams are usually about 0.04 mg/l or less, and concentrations of our reference streams, Bull Run and Little Sewickley Creek, were 0.01 and 0.04 mg/l, respectively. The ammonia concentration of Pine Creek inflow was 0.04 mg/l and the average ammonia concentration for the North Fork of Pine Creek stations was only slightly elevated at 0.045 mg/l as N. However, in anoxic and reduced North Park Lake and the outflows of both North Park and Marshall Lakes, ammonia concentrations were significantly elevated compared to our good quality reference lake, Mosquito Creek Lake. Ammonia concentration of the Marshall Lake outflow was 0.07 mg/l, the North Park Lake outflow was 0.13 mg/l, and the average of samples collected approximately 1 foot from the bottom of North Park Lake was 0.255 mg/l. The average ammonia concentration of bottom samples at our highly eutrophic reference site, Girard Lake, was 0.37 mg/l. In well aerated waters, ammonia can be oxidized to nitrite (NO_2) and nitrate (NO_3) nitrogen species, oxidized and lost to the atmosphere as nitrogen gas (N_2) by microbial actions, or be utilized and incorporated into the bodies of various nutrient hungry micro and macroscopic plants and animals.

Primary biological productivity in North Park Lake was extremely high. Chlorophyll a concentrations in lake surface waters averaged 35.5 l/m3, and 16.94 l/m3 in lake bottom samples, which is comparable to other eutrophic lakes (47.33 l/m^3 top and 34.89 l/m^3 bottom at our reference lake station). As is typical of eutrophic lakes, pennate diatoms likely pulse in the spring, green algae pulse in early summer, and blooms of blue-green algae are most likely to occur in late summer. Algae blooms could create nuisance odor problems in the lake and excessive algal production can stress fishery resources, particularly during severe winters.

5.2.5. Metals

Metals concentrations were generally low or below detection limits for most metals except for iron, manganese, and aluminum. Average iron, aluminum, and manganese values of the inflow tributaries were slightly elevated comparable to non-degraded reference streams. However, as expected in extremely anoxic, chemically reduced conditions, the highest concentrations of these three metals were observed at the lake outflow stations and in North Park Lake. Iron concentrations at the Pine Creek and North Fork outflow stations were 920 and 630 ug/l, respectively. In the aerobic surface strata of North Park Lake, concentrations of iron, aluminum, and manganese were slightly elevated, averaging 1.057, 0.693, and .367 mg/l, respectively, for all lake surface samples. However, in the anerobic deep strata of the impoundment, the concentrations of these metals were elevated. The average bottom sample concentrations were 1,850 ug/l iron, 1,150 ug/l aluminum, and 605 ug/l manganese.

In summary, during our August low flow survey, while concentrations of iron, manganese, and aluminum were elevated in chemically reduced and anoxic lake bottoms and outflows, concentrations of other metals analyzed were either non-detectable or non-remarkable.

5.2.6. Pesticides and herbicides

All lake samples were also analyzed for 19 pesticides, which are listed in TABLE 3. Results of all pesticide analyses were less than the method detection limit.

6. North Park Lake Sediment Nutrient Analyses

6.1. Methods and Results

A primary component of the North Park aquatic ecosystem restoration plan is removal of approximately 400,000 cu yds of sediments from North Park Lake to diversify lake habitat and to reduce the legacy sediment load. In February 2002, the District conducted

an HTRW survey of North Park Lake (APPENDIX 5) and analyzed a sediment sample collected just upstream of the dam for nutrients. Based on the results of this analyses, the estimated nutrient load that will be removed from the Lake with the dredged material would be 3.88 tons of NO2+NO3, 8,760 tons of Kjeldahl nitrogen, and 2,156 tons of total phosphorus (TABLE 8). Removal of this load of primarily reduced Kjeldahl nitrogen will likely improve both lake sediment and water quality.

7. Pine Creek Basin, North Park Riparian Vegetation Survey

7.1 Introduction

As a component of the North Park Lake WRDA Section 206 Aquatic Ecosystem Restoration Study, on July 13, 2000 and September 1, 5, and 6 September 2002, the District conducted a vegetation survey of the riparian zone of the Pine Creek basin in North Park. Even though historical photographs of the area prior to construction of North Park and North Park Lake show that the area had already been cleared for agriculture, the riparian zone of the Pine Creek basin was significantly altered when the park was built in the 1930s. Since then, there have been major changes in land use in the basin headwaters as well as degradation of the riparian zone within the Park itself. Reaches of the riparian zone in the park have been degraded by mowing, filling of wet and marshy areas, construction of roads, paths, and picnic sites; erosion; alteration of drainage systems and culverting of intermittent tributaries; over use, and intentional planting of exotic species (Wiegman, 1971). However, in spite of these major disturbances and modifications of the original stream channel and riparian zone, riparian vegetation in North Park remains diverse and primarily dominated by regional native species.

As discussed above, the goals of the restoration plan are to improve the health and quality of the ecosystem by expanding and developing North Park Lake shoreline wetlands, enhancing North Park Lake submerged aquatic beds; enhancing the floodplain bottomland hardwood wetlands along the North Fork of Pine Creek; improving water quality; and improving and diversifying North Park Lake deep and shallow water aquatic habitat. The vegetation survey was conducted to document pre-project conditions in

order to evaluate the biological condition of the aquatic habitat based on the structure of vegetation communities; to predict diversity and composition of newly created and enhanced wetlands and possible impacts by exotic plant species; to provide a basis for the design of the planting plans (composition and species diversity); and to provide justification for and to assess project benefits.

7.2. Study Methods

On July 23 2001, we conducted a cursory survey of riparian wetlands in North Park in support of the North Park Aquatic Ecosystem Restoration Project. Between September 3 and 6, 2002, we conducted a more thorough inventory of the vegetation of the entire riparian zone of the Pine creek Basin within North Park. The study area included shoreline areas around the perimeter of North Park Lake, its two arms, and the Irwin Run embayment; intermittent streams tributary to North Park Lake and the North Fork of Pine Creek; the eastern shore of Marshall Lake; and the free flowing reaches of the North Fork of Pine Creek and Pine Creek upstream of the lakes.

The riparian zone (areas adjacent to the stream) was defined as the area located between the lake or stream surface elevation and approximately 5 vertical feet upslope. More specifically, the study area included the area between the elevation of the stream at base flow or the pool elevation to 3 vertical feet higher, generally dominated by obligate and facultative wetland plant species, and the transitional area located between approximately 3 vertical feet above base flow and 5 vertical feet above base flow, including the existing 3 to 5 year event floodplain, which was generally dominated by facultative and facultative wet wetland species. The more gentile slopes supported the largest wetlands.

Twenty sampling reaches were selected and surveyed by foot to represent the entire study area (shown graphically in FIGURE 3 and described in TABLE 9). Referenced North Park features, roads, and picnic groves are presented in FIGURE 4. Three of these sampling reaches, the Pine Creek inflow to North Park Lake in the reach located between the intersection of Kummer Road and Lake Shore Drive, the braded reach of the Pine

Creek at the most upstream end of the Pine Creek Arm of North Park Lake, and a 200-foot long reach of the North Fork of Pine Creek located between the North Park Ice Rink (Marshall Lake) and the intersection of Pierce and Brown Roads were casually surveyed in 2000. In 2002, the same reach was re-surveyed along the North Fork and both Arms and Irwin Bay of North Park Lake; Marshall Lake; and the length of the North Fork of Pine Creek in North Park were thoroughly surveyed.

Collections of vascular plants and observations of distribution patterns and relative abundance were made along each riparian zone sampling reach, including lake submerged aquatic beds, stream and lake shoreline emergent and shrub/scrub wetlands, and mid-successional woodland and forested wetland riparian communities. Vegetation of upland areas and mowed riparian areas was not surveyed.

7.2.1. Diversity

All unique vascular plants were keyed to species with nomenclature in accordance with *The Plants of Pennsylvania* (Rhoads, 2000). References included *Gray's Manual of Botany* (Fernald, 1987) and *The Flora of West Virginia* (Strausbaugh, 1978) for information on regional distribution, *Weeds of the Northeas*t (Uva, 1997) for weedy herbaceous plants, and *Trees and Shrubs in Eastern North America* (Blackburn, 1971) for exotic woody species. Relative abundance for each species was estimated as dominant, locally dominant, abundant, locally abundant, common, scattered, occasional or few. Comparisons were made between vegetation communities along each sample reach. A distinction was made between the vegetation of disturbed areas and that of relatively undisturbed areas to quantify impacts of disturbance on existing wetland vegetation communities

7.2.2. Wetland Status

Verbatim habitat characterizations from regional botanical manuals and the US Fish & Wildlife Services' wetland indicator status[10] or tolerance to aquatic regimes were noted for each species identified (Reed, 1988). According to the USFWS, "Plant species that

occur in wetlands, as used in the *National List,* are defined as species that have demonstrated an ability to achieve maturity and reproduce in an environment where all or portions of the soil within the root zone become, periodically or continuously, saturated or inundated during the growing season". They developed a wetland fidelity system where obligate (OBL) species are those restricted to wetlands (>99%); facultative wet species (FACW) are those that usually occur in wetlands (67to79%); facultative species are those that equally occur in wetlands and non-wetlands (34-66%); and facultative upland plants (FACU) are species that usually occur in non-wetlands (67-99%) but are occasionally found in wetlands (1 to 33 %). The percent of the plants that typically grow in wetlands was then determined for each vegetation community in the study area.

7.2.3. Vegetation Community Quality

Total numbers of exotic vs. native species, the percent of the dominant species that were exotic, and the percent of the dominant species that were invasive exotic species were tabulated by location and by plant community. Increasing numbers of plant species tolerant to disturbance, decreasing numbers of species intolerant to disturbance, and increasing numbers of exotic species are indications of degraded ecosystems. Aggressive invasive exotic species are usually "weedy" and very tolerant and tend to colonize disturbed areas, without regard to hydrologic regime, out competing native species and reducing biodiversity while offering lower wildlife and habitat value (Rhoads, 2000). Because riparian areas are naturally disturbed, they are particularly vulnerable to invasion by exotic plants.

Comparisons were made between the riparian vegetation of North Park and two reference streams: Nine Mile Run, a severely degraded urban stream located in Frick Park, Pittsburgh, Allegheny County, PA, which was surveyed by the District in 1998 (USACE, 2000); and Glade Run, a minimally disturbed, western Pennsylvania stream of similar size, which was surveyed by, W. L. Black as a component of his 1947 report on the ecology of Frick Park (Black, 1944).

The vegetation survey study reaches were then rated from the least to the most degraded utilizing both diversity and quality indices. Diversity indices included # of native plant species and # of dominant native plant species. Quality indices included % species exotic, % species exotic and invasive, % dominant species exotic, and % dominant species exotic and invasive. Scores ranged from 1, the least degraded study reach, to 25, the most degraded reach, relative to the other sites surveyed for this study.

7.3. Results

The floodplain riparian plant communities surveyed included submerged, emergent, shrub/scrub, and wooded wetlands (both mid-successional woodlands and mature forest). These communities were similarly structured throughout the North Park study area. A combination of both native and introduced exotic plant species was identified in all vegetation communities of the study area. A total of 265 plant species was observed in the Pine Creek/ North Fork of Pine Creek riparian zone within North Park, of which 199 species were native and 66 species (or 25%) were exotic. Additionally, while only 15% of the dominant plant species in the study area were exotic, 8.3% of the dominant species were exotic invasive species.

In comparison to other regional streams, the riparian vegetation of the Pine Creek Basin in North Park overall can be described as diverse and only slightly impaired. Riparian zones of non-impaired regional streams generally support greater than 200 plant species (Rhoads, 2000). During his 1949 survey of Frick Park, Black used Glade Run, a relatively undisturbed stream, as his reference condition, identifying 312 plant species along the riparian corridor (Black, 1944). The presence of exotic or non-native species is an indicator of degraded biological systems. Very few exotic species were identified at Glade Run and none of the dominant species were exotic. Of the 3,400 different kinds of vascular plants now found growing spontaneously in Pennsylvania, 33% are believed to be exotic (Rhoads, 2000) while at North Park, only 25 % of the of the plant species identified were exotic. Locally, in very disturbed areas, alien plants may represent a much higher percentage of the total flora. For example, along the riparian corridor of

Nine Mile Run, a degraded urban stream tributary to the Monongahela River in Allegheny County, PA, 238 plant species were identified overall. Although species richness appeared high at Nine Mile Run, 99 or 41.6% of these plant species were exotic and 6.3% of the dominant species were exotic (USACE, 2000). In severely degraded, disturbed reaches along the same stream, only 63 total species were identified, of which 50.8% of the total number of species were exotic, 20.6% of the dominant species were exotic, and 6% of the dominant species were invasive exotic. Surprisingly, in the North Park study area, while only 15% of the dominant species were exotic, 8.3% of the dominant species were invasive exotic. This indicates that invasion by aggressive exotic species is likely during construction even though total numbers of exotic species were comparatively low.

A summary of the diversity and quality, including percentages of native, exotic, and invasive species for disturbed and undisturbed areas, for North Park riparian areas and the reference streams is presented in TABLE .11.

7.3.1. Characterization of Pine Creek Basin, North Park Riparian Vegetation by Community

Wetlands are areas with a predominance of hydrophytic vegetation, hydric soils, and wetland hydrology. Because wetlands purify and filter water, mitigate storm flows, provide low flow augmentation, provide quality habitat, and enhance species diversity, wetland creation and enhancement is a key component of the restoration of the North Park aquatic ecosystem restoration project. North Park riparian wetlands were located in the lakes and between 0 and 5 vertical feet upslope of the lake surface or stream base flow, and included palustrine system scrub/shrub and wooded wetlands, and lacustrine aquatic bed, emergent, scrub/shrub, and wooded wetlands. Summaries of relative abundance, origin, and wetland tolerance by vegetation community type are presented in TABLE 12. Species lists for areas between 0 & 3 and 3 & 5 vertical feet above pool or base flow elevations are presented in TABLES 13 and 14, respectively.

7.3.1.1. Aquatic Beds

North Park Lake submerged aquatic beds were severely degraded. Only 5 species of submerged plant species were identified, of which 2 species or 40% were exotic and 20% were exotic invasive. Although two or 66% of the 3 dominant submerged species were native (splatterdock and fragrant water lily), they were located primarily in shallow, backwater areas and invasive exotic Eurasian water-milfoil was overwhelmingly dominant throughout the deeper portions of the lake.

7.3.1.2. Shoreline Emergent Wetlands

Healthy shoreline vegetation communities are an integral component of ecosystem restoration. Not only do they provide critical habitat and help protect and stabilize stream banks, but since much of this vegetation will be likely be impacted by dredging activities and lake shoreline wetland creation and enhancement necessary for the restoration efforts, pre-project characterization is essential. By their very nature, stream shoreline vegetation communities are continually disturbed because of changing flow regimes. Healthy shorelines are typically vegetated by native obligate wetland or pioneer species (upland annual species) that are adapted to a relatively high level of disturbance. Pine Creek Basin, North Park emergent wetlands were located between 0 and 3 vertical feet above lake surfaces and stream base flows. Surprisingly, in spite of the fact that Pine Creek Basin shorelines in North Park are trampled and mowed along many reaches, emergent shoreline wetlands were very diverse and only slightly degraded. A total of 181 plant species were observed, of which 91.2% generally grow in wetlands (22.3% facultative upland; 12.8% facultative, 29.1% facultative wet; and 26.35% obligate). Of these 181 plant species, 28.4% were exotic species and 5.4% were invasive exotic species. Additionally, 21.6% of the dominant species were exotic and 8% of the dominant species were invasive exotic. Compared to disturbed shorelines along Nine Mile Run, where only 6% of the dominant species were invasive exotic species, numbers of invasive species were considered very high at North Park. High numbers of invasive exotic species could impact success rate of proposed wetland creation efforts, which emphasizes the need for implementation of an exotic plant species control plan during

construction. Twenty nine, dominant native species were identified along shorelines, a few of which included pickerel-weed, showy tic-trefoil, yard rush, creeping lovegrass, beggar-tics, common joe-pye-weed, false nettle, water smartweed, arrow-leaved tearthumb, galingale, blue vervain, and panicled aster. Dominant exotic species included yellow iris, ox-eye daisy, self-heal, and forget-me-not, and invasive Canada thistle and crown vetch.

Only one shoreline species may need special consideration, primrose-willow, *Ludwigia peploides*. Primrose-willow, was locally dominant along shallow, muddy, shorelines of the Irwin Run Bay of North Park Lake. Although not Federally or state listed, primrose-willow is rare in Pennsylvania. (Rhoads, 2000). The Irwin Run Bay will not be dredged or disturbed during North Park Lake restoration efforts.

7.3.1.3. Shrub/scrub

Pine Creek Basin, North Park riparian scrub/shrub wetlands were located between 0 and 3 vertical feet above lake surfaces and stream base flows. A total of 18 species were identified, 94% generally grow in wetlands: 16.7% obligate, 27.8% facultative wet, 22.2% facultative, and 27.8% facultative upland species. Scrub/shrub wetlands were moderately degraded with 5 species or 27.8% exotic, and 4 species or 22.2% exotic invasive. Only 2% of the dominant species were exotic but both were invasive species. Dominant scrub/shrub species included native smooth alder, kinnikinik, panicled dogwood, ninebark, black locust, and smooth arrowwood. Exotic scrub/shrub species included amur and Japanese honeysuckles.

7.3.1.4. Wooded

Pine Creek Basin, North Park riparian woodlands and forests, which were primarily located between 3 and 5 vertical feet above lake surfaces and stream base flows, were slightly degraded. Overall, a total of 143 species were identified in North Park riparian woodlands and forests, of which 23% were exotic. Of these the 143 species, 86% can be found growing in wetland areas (2.8% obligate, 22% facultative wet; 21% facultative,

and 40% facultative upland species). The woodland canopy was not degraded, supporting a total of 42 species of trees of which only 4 species or 9.5% were exotic. The canopy was dominated by native facultative wetland species including green ash, shingle oak, black willow, silver maple, sugar maple, shagbark hickory, wild black cherry, and black locust. The sub-canopy was considered moderately degraded because even though diversity was high (35 woody species), 11 or 31.4 % of these species were exotic, 25.7 % of the total species were exotic invasive, and amazingly, 50% of the dominant species were invasive exotic. Dominant sub-canopy species included native smooth alder, kinnikinik, panicled dogwood, ninebark, and smooth arrowwood. Exotic sub-canopy species included oriental bittersweet, multiflora rose, autumn olive, amur honeysuckle, and Japanese honeysuckle. Surprisingly, no Japanese Knotweed was identified in the study area but all of the dominant exotic species identified in the sub-canopy were invasive. Additionally, 66 herbaceous species were identified in the understory, of which 25.8% were exotic and 7.6 % were exotic invasive species. Dominant ground cover species included native spotted touch-me-not, white snakeroot, false nettle, and white grass, and exotic garlic mustard.

Woodlands located along North Park Lake shorelines between 0 and 3 vertical feet above base flow of lake elevations were exceptional quality. Ten tree species were identified in shoreline wetlands, none of which were exotic. Dominant species included native facultative wetland species silver maple, shagbark hickory, and black willow.

7.3.2. Characterization by Site

7.3.2.1. Pine Creek Inflow

The Pine Creek inflow to North Park Lake supported exceptional, diverse wetlands. Wetlands located upstream of the influence of North Park Lake were classified as palustrine, willow dominated wooded wetlands. Wetlands located in the braded reach at the upstream end of the Pine Creek Arm of North Park Lake were classified as lacustrine system, marsh purslane and swamp milkweed dominated emergent wetlands. A total of 68 species were identified in the Pine Creek inflow, of which 78% were wetland plants

and 23% or 25 species were obligate wetland plants. Of the plants identified, 20.1% were exotic, 8.8% were exotic invasive, and 5.9% of the dominant plant species were exotic invasive.

7.3.2.2. North Fork of Pine Creek Inflow to North Park and Marshall Lakes

Overall, North Fork of Pine Creek riparian wetlands were very diverse and minimally degraded, classified as riverine and palustrine system, emergent, scrub-shrub, and wooded, wetlands. A total of 170 species were identified in the North Fork of Pine Creek inflow to North Park Lake, of which 59.4% were species that generally grow in wetlands and 16%, or 27 species, were obligate wetland plants. Diversity was significantly higher along the North Fork than observed along Pine Creek likely because the 2002 North Fork survey was much more thorough than the 2000 Pine Creek survey. Of the 170 plant species identified, 23.5% were exotic, 8.8% were exotic invasive, and 16% of the dominant plant species were exotic invasive. Dominant native species included silver maple, green ash, wild black cherry, black willow, smooth alder, kinnikinik, wing stem, arrowwood, creeping lovegrass, marsh purslane, blue vervain, Pennsylvania smartweed, and pickerel weed.

Reaches where riparian buffers were mowed or where there was heavy foot traffic and/or goose grazing were rated as severely degraded. Mowing not only compromises wetland functions, such as augmentation of storm water flows and sediment filtering, but also destabilizes stream banks, resulting in increasing erosion and bank undercutting. Regularly mowed reaches along both the North Fork and North Park Lake, like the right bank of the Pine Creek Arm of the lake just upstream of the dam and the North Fork upstream of the North Park Skating Rink, were eroding and undercutting, while banks with thick woody (alder) vegetation were stable.

The disturbed riparian zone along the left bank of Marshall Lake was also eroding and undercutting due to heavy goose grazing and fishermen foot traffic. Bush honeysuckles, autumn olive, multiflora rose, garlic mustard, and curly dock were dominant along this

reach. Other exotic plant species such as teasel and burdock, although not dominant, were much more abundant along this disturbed reach than in other areas of the Park.

The reach along the North Fork upstream of the Maintenance Building and downstream of Marshall Lake had a healthy riparian zone, a diverse canopy, with a wide, braded channel. There is also an island in this reach. The canopy was dominated by silver maple, wild black cherry, and black locust. The understory was dominated by Japanese honeysuckle, wingstem, white snakeweed, false nettle, garlic mustard, and spotted tough-me-not.

The most diverse reach along the North Fork of Pine Creek was located between the skating rink and Kummer Road, along the right descending bank, directly across from the North Dakota Grove. This reach provides an example of what can be expected if North Fork riparian buffers were not mowed. Over XX wetland plant species were observed in this reach. On the other hand, North Dakota Grove and its access road lie in the floodplain and much of the area surrounding the grove is regularly mowed and only xx plant species were observed. One 300 feet by 50 feet wide mowed portion of the floodplain in this reach was dotted with depressions where obligate wetland plants persisted in spite of a heavy mowing schedule and the 2002 drought, an indication that mowing were discontinued, quick recovery would be likely.

In addition, 33% of the total # of dominant species were exotic invasive and an extremely high 71% of the dominant exotic species identified in disturbed areas were invasive exotic species.

7.3.2.3. <u>North Park Lake</u>

North Park Lake wetlands overall were slightly degraded compared to undisturbed wetlands of Lake inflow tributaries. They were classified as lacustrine system, black willow and wild black cherry dominated wooded wetlands; panicled dogwood,

kinnikinik, and smooth arrowwood dominated shrub/scrub wetlands; and yellow iris, aquatic milkweed, galingale, and water smartweed dominated emergent wetlands.

A total of 199 plant species were identified in North Park Lake wetlands, of which 57% were species that generally grow in wetlands and 20% were obligate wetland plants. Of the total plant species identified, 25% were exotic and 8% were exotic invasive and 16% of the dominant plant species were exotic invasive. Some of the dominant native species included silver maple, wild black cherry, black willow, shagbark hickory, shingle oak, panicled dogwood, kinnikinik, wing stem, arrowwood, ninebark, creeping lovegrass, aquatic milkweed, blue vervain, water smartweed, galingale, autumn bent, and pickerel weed. Dominant exotic species included amur honeysuckle, Japanese honeysuckle, oriental bittersweet, multiflora rose, Canada thistle, crown vetch, yellow iris, and forget-me-not.

The highest quality emergent wetlands were located in Irwin Run Bay and at the upstream end of the Pine Creek Arm of the Lake. The highest quality woodlands were also located in Irwin Bay.

The most severely eroded and undercut shorelines in North Park Lake were located along the left descending bank of the North Fork Pine Creek Arm, approximately 100 feet upstream of the boat house; the left descending bank of the North Fork Pine Creek Arm, 1000 ft upstream of the boathouse, in the reach between the Harmony Grove pavilion upstream to the next dam; the right descending bank of the North Fork of Pine Creek Arm at the Lake Shore Pavilion; and; and 100 feet upstream of Rochester Grove, and at the picnic grove along the right descending bank of the Pine Creek Arm just upstream of the Pine Creek Dam (PLATE 4).

7.3.3. <u>Vegetation Indices</u>

Results of the ratings of riparian vegetation survey reaches from most to least degraded using both diversity and quality indices are presented in TABLE 15. Diversity indices

included # of native plant species and # of dominant native plant species. Quality indices included % species exotic, % species exotic and invasive, % dominant species exotic, and % dominant species exotic and invasive. Scores ranged from 1, the least degraded study reach, to 25, the most degraded reach, relative to the other sites surveyed for this study.

Vegetation index scores for the Pine Creek inflow, the North Fork inflow, and North Park Lake, including all vegetation communities located in both disturbed and undisturbed reaches, were very similar. North Park Lake rated the lowest or least degraded (score 5), Pine Creek scored 7, and the North Fork of Pine Creek scored 9. Pine Creek inflow scored lower than the Lake because diversity was low, likely attributable to sampling technique. North Park Lake scored high because data from Irwin Bay was included in the lake score. Within North Park Lake, again including all vegetation communities, Irwin Run Bay was rated the lowest or best quality with a score of 7, the Pine Creek Arm rated 15, and the North Fork of Pine Creek Arm rated 16, which was as expected since the most disturbed reaches surveyed were located along the North Fork Arm.

Even though the North Fork scored higher than either Pine Creek or North Park Lake overall, and also highest within North Park Lake, undisturbed reaches located along the North Fork of Pine Creek scored lower than all other reaches surveyed. All North Fork undisturbed reaches together rated 1; undisturbed woodlands scored 2; emergent wetlands scored 3; and intermittent tributaries to the North Fork scored 6. The next lowest scores were observed in undisturbed areas along Pine Creek, where emergent wetland reaches scored 8 and riparian wooded reaches scored 11. The highest quality communities observed within North Park Lake were the wooded riparian areas in Irwin Bay (6), a tributary along Pine Creek (10), disturbed emergent wetland along the Pine Creek Arm (12), and undisturbed emergent wetland in Irwin Bay (13). Surprisingly, disturbed emergent wetlands and tributary along the Pine Creek Arm were comparable in quality to undisturbed emergent wetlands located in Irwin Bay, which demonstrates the high quality of North Park Lake's emergent wetlands and provides assurance that plans to expand the emergent wetlands along the shorelines of North Park Lake will succeed since natural re-vegetation is likely.

The most degraded sites were disturbed woodlands along the Pine Creek Arm of North Park Lake, again attributable to the poor quality of the sub canopy, and undisturbed woodlands along the North Fork Arm, which scored 24 and 23, respectively. The entire Marshall Lake riparian zone (emergent and wooded) was considered disturbed, scoring 22. The disturbed areas along the North Fork of Pine Creek Arm were of low quality, scoring 21, but disturbed areas along Pine Creek were less degraded, scoring only 15.

7. 4. Vegetation Survey Summary and Conclusions

In summary, the riparian vegetation of the Pine Creek North Park Riparian zone can be considered only slightly degraded compared to PA state averages and other regional streams. However, the differences in the quality and diversity of vegetation communities within the study area were significant. For example, the percent of exotic plant species ranged between 11.6 and 31.1%, the percent of dominant species exotic ranged between 0 and 75%, and the numbers of native species ranged between 149 and 15. We believe that substantial restoration benefits can be gained by focusing restoration activities on degraded, problem areas.

Overall, the sub-canopy in wooded areas and aquatic beds were the most degraded vegetation communities. Very disturbed areas, like the Marshall Lake shoreline, were of much lower quality than undisturbed areas. Of note was the high percentage of dominant species that were invasive exotic species, which may indicate vulnerability to additional disturbance. Compared to shorelines along an extremely degraded reference stream, Nine Mile Run, where only 6% of the dominant species were invasive exotic species, at North Park, numbers of dominant invasive species were very high, averaging 13.4% overall and as high as 33% in disturbed reaches along the North Fork. High numbers of dominant invasive exotic species could impact success rate of proposed wetland creation efforts, emphasizing the need for implementation of an exotic plant species control plan during construction. However, the relatively high quality of North Park Lake's emergent wetlands overall, even those that were disturbed, provides assurance that natural re-vegetation necessary for the success of emergent wetland creation is likely.

Riparian wetlands, particularly those located in picnic groves, were occasionally landscaped and purposefully planted with exotic species, such as American larch, Norway pine, European alder, bush honeysuckles, etc, but these species were generally not the dominant species (Wiegman, 1971). Mowing, rather than exotic plantings, was determined to be the primary cause of wetland degradation in the study area. Mowing not only compromises wetland functions, such as augmentation of storm water flows and sediment filtering, but also destabilizes stream banks, resulting in increasing erosion and bank undercutting. Because mowed reaches also supported a high percentage of native species, we predict that riparian wetlands would recover quickly when mowing is discontinued.

Protection of existing wetlands is a significant component of the North Park restoration plan. The highest quality emergent wetlands were located in undisturbed reaches along the North Fork of Pine Creek and the Pine Creek inflows to the lakes, and the highest quality wooded wetlands were located in the North Fork of Pine Creek inflow to the lakes and the Irwin Run Bay of North Park Lake. Within North Park Lake, Irwin Run Bay supported the highest quality emergent wetlands. Un-mowed intermittent tributaries to the North Fork and Pine Creeks were also of high quality.

While no federally listed plant species of concern were observed within the North Park study area, one rare State PNDI species was identified in the Irwin Run embayment of North Park Lake, *Ludwigia peploides* or primrose-willow. The Irwin Run Bay will not be dredged or disturbed.

8. Restoration Solutions

Proposed solutions for the restoration of the North Park aquatic ecosystem are either suggested in or compliment the *Allegheny County Parks Comprehensive Master Plan, Park-specific Recommendations,* North Park (www 1). Park-specific recommendations for North Park which support our proposed restoration solutions are as follows:

- Restore significant natural resource areas within the park system

- Preserve stream corridors, wetlands, and unique habitat areas
- Leave 30 foot vegetative buffers along streams
- Encourage the use of native vegetation
- Control aggressive exotic species
- Maintain or increase forest cover in natural areas
- Remove North Dakota Grove, including removal of the picnic shelter and cul-de-sac located in the floodplain near the Kummer Road/ Ingomar intersection and discontinue mowing
- Stabilize shores of North Park Lake, provide access, use hardened native rock ledges, and plant to reestablish native vegetation
- Maintain diversity of habitat treatment
- Maintain soft edges or transitions between different types of habitat
- Adjust frequency of mowing to establish meadow habitats, with the final goal of annual mowing

Because sedimentation of North Park's lakes is primarily responsible for the degradation of the aquatic ecosystem, North Park Lake will be dredged to reduce legacy sediment nutrient load, diversify lake habitat, increase and improve deep-water habitat, improve the productivity of the lake fishery, and improve lake and lake outflow water quality. During our August 2002 survey of North Park Lake, D.O. concentrations of both surface and lake bottom samples failed to meet the PA State minimum D.O. criteria of 6.0 mg/l. Additionally, the PAF&BC has identified high lake turbidity concentrations as a limiting factor in the recovery of the lake fishery.

North Park Lake shoreline wetlands will be enhanced and expanded. Undisturbed areas along the shoreline of North Park Lake located between 0 and 3 feet above the normal pool elevation currently support emergent wetlands. However, in order to increase the total acres of wetlands and to restore degraded mowed, eroded, or undercut lake shorelines, about 0.6 acres of shoreline emergent wetland will be created. This will be accomplished by utilizing a living, bio-engineered product called coir rolls to build benches along approximately 5,700 linear feet of shoreline. Coir rolls are 6 to 12 inch in

diameter coconut fiber rolls, pre-planted with native wetland herbaceous plants, which have been shown to be an effective natural stream bank protection technique along streams with low velocities (www 6, 7, & 8). The coir rolls will be placed lake side of the bank, in 1 to 2 feet of water, stabilized with stakes and then backfilled with dredge material. Bench water depths will range between 6 and 0 inches and will be planted with a diverse selection of attractive, native, regional obligate herbaceous wetland plant species. Native species that can already be found growing in the project area will be utilized since there is a greater chance that they will survive. Resilient early colonizers will be used to assure that new plantings get a head start over exotic species. Additionally, the planting plan will include plants that can provide some erosion control. The proposed planting plan is presented in TABLE 16. Benefits include aquatic habitat creation, erosion control, improved filtering capacity and lake water quality, increased biodiversity, and improved aesthetics. Because fragile new wetlands can be compromised by excessive foot traffic, particularly during spring growing season, which unfortunately coincides with trout fishing season, it is recommended that fishing piers or elevated, non-impervious boardwalks be built both to protect wetlands and to provide better access.

Terminating or reducing the frequency of mowing in lake and stream riparian areas will revive existing wetlands, increase shoreline stability, reduce erosion, improve stream connectivity, enhance channel storage, and increase aquatic habitat and diversity. Based on results of our vegetation surveys, it is likely that mowed riparian wetland buffers would recover quickly, stabilizing banks and providing some mitigation of downstream sedimentation and eutrophication problems. The National Resources Conservation Service (NRCS) has determined that 100 to 160 feet wide buffers are the most effective, and have been shown to remove as much as 50% of nutrients and 84% of suspended sediments. The North Park Master Plan suggests 30-foot wide buffers along all streams. We suggested that the no-mow zone along both the North Fork and North Park Lake follow the 5- foot contour to assure inclusion of all wetlands. If there is a need to maintain vistas at certain locations, the frequency of mowing could be reduced to once yearly, in the early spring before new growth starts to control woody vegetation growth.

Approximately 0.6 acres of emergent and scrub/shrub wetland will be created around the perimeter of North Park Lake by establishing a no-mow or reduced mowing buffer between 0 and 5 vertical feet above the pool elevation. These wetlands will be located directly upslope of new emergent wetlands. While it is expected that these areas will re-vegetate naturally, supplemental planting using regional native obligate and facultative wet shrubs is recommended (TABLE 16). Again, attractive, native species that can already be found growing in the project area, resilient early colonizers, those that provide erosion control would be the best candidates.

No mow buffers are also planned for the riparian zone along approximately 5,000 linear feet of the North Fork of Pine Creek, in the area located between 0 and 5 vertical feet above base flow, which will result in the creation of a total of xx acres of emergent, shrub/scrub, and wooded wetlands. North Dakota Grove and its access road lie in the floodplain along the left descending bank of the North Fork and much of the area surrounding the grove is regularly mowed. The right bank of the North Fork, even though somewhat disturbed, is not mowed and can be used as a model for conditions expected along the left bank if mowing were discontinued. An acre of bottomland wetland will be restored by not mowing the 200- foot long reach of the North Fork adjacent to the North Dakota Grove. Another spot with high potential for restoration is located just upstream of the Dakota Grove pavilion where there are not only mowed wetlands but also two mowed intermittent tributaries. A total of .3 acres of bottomland hardwood wetland will be restored along this reach. The North Park Master Plan also identified this reach as a no-mow area and suggested removal of both the North Dakota cul-de-sac and shelter pavilion.

Consideration should also be given to discontinuing or reducing frequency of mowing along intermittent streams tributary to the North Fork and North Park Lake. These small tributaries have the potential to provide extremely diverse wetland habitat as well as to improve water quality. Along an un-mowed left bank tributary of the North Fork located downstream of the Park Municipal Building and upstream of the McKinney and Ingomar

Road intersection, a total of 39 plant species were identified, of which 12.8% were exotic, 2.6% were invasive exotic, and none of the dominant species were invasive exotic species. Intermittent tributaries that could benefit if not mowed include: a right descending bank tributary of the North Fork Arm of North Park Lake, downstream of boathouse; a left descending bank tributary of the North Fork of Pine Creek Arm, upstream of boathouse, at Rochester Grove; a left descending bank of the North Fork Pine Creek Arm, approximately 35 feet upstream of Rochester Grove; a right bank tributary of the North Fork just upstream of North Park Lake, and two right bank intermittent tributaries of the North Fork located upstream of North Dakota Grove pavilion (FIGURE 1).

Control of the Canada goose population is an important component of the North Park restoration plan. Heavy goose grazing not only results in feces laden shorelines, making it unpleasant for recreation, but also destroys shoreline wetlands and increases fecal coliform counts, nutrient loads, and eutrophication of Park lakes. Since geese prefer mowed areas adjacent to open water, reduced or discontinued mowing may be enough to control their populations. Mowed areas along the North Fork upstream of the North Park Skating Rink, around Marshall Lake, and along the upstream end of the North Fork Arm of North Park Lake attract thousands of geese. There is also some concern regarding impacts of geese populations on new plants in coir rolls, an added reason for implementing goose population control measures.

An exotic plant species control plan should be implemented to insure that invasive exotic plant species do not become more prevalent during and after project construction. All areas disturbed during construction should be continually monitored and new exotic species immediately hand pulled. Particular attention should be given to selective removal of invasive exotic woody understory species like honeysuckle and buckthorn. These species may be a contributing factor in loss of habitat for songbirds including wood thrushes and robins (Schmidt, 1999). Post construction monitor plan should be implemented to assure success of the planting plan and to control potential infestations of exotic plant species.

8.1. Summary of Restoration Potential/ Conclusions

In summary, relative to these other, non-degraded or only moderately degraded local streams, the waters of Pine Creek and the North Fork of Pine Creek in North Park can be characterized as hard, turbid, and mineralized with elevated nutrients and salts, likely attributable to increasing urbanization in the basin. North Park Lake as can be characterized as mineralized, turbid, nutrient enriched, and anoxic. While riparian vegetation communities of the Pine Creek / North Fork of Pine Creek riparian zone overall are diverse and only moderately degraded, specific reaches are severely degraded and there is a high potential for restoration. The data presented and analyzed for this study indicates that it is feasible to moderate most of the problems experienced along the Pine Creek basin in North Park to a degree that would permit its aquatic ecosystem to be substantially restored. The potential value of a restored aquatic ecosystem within this unique green space would be very high.

Restoration solutions will include:

- dredging North Park Lake to remove nutrient laden sediments, reduce lake turbidity and improve water quality, increase the productivity of the lake fishery, and to increase lake habitat diversity. Additionally, construction of new North Park Lake shoreline wetlands will enhance water quality, provide base flow augmentation, create habitat, and increase diversity, trap sediment, and augment storm flows, and reducing erosion. Substantial restoration benefits could be attained simply by terminating or reducing mowing in riparian emergent wetlands and bottomlands, including those around North Park Lake, the North Fork of Pine Creek, and along small intermittent tributaries of the North Fork of Pine Creek. Riparian buffers provide habitat, increase storm water retention times, attenuate nutrient and sediment loads, and augment base flows.

- Control of the nuisance goose populations is critical for the reduction of lake nutrient loads and the protection of fragile emergent shoreline wetlands. Some consideration should be made for one species of concern in Pennsylvania, primrose-willow, which was observed at one location within the project limits, in the Irwin Run Bay of North Park Lake. This bay will not be disturbed or dredged. In addition, all existing wetlands will be protected.

- Plans for the removal of exotic species should be developed, focusing on selective removal of woody understory species like honeysuckle and glossy buckthorn. The spread of exotic plant species has been linked to loss of biodiversity and in addition, these species may be a contributing factor in loss of habitat for songbirds including wood thrushes and robins (Schmidt, 1999).

- Consideration should be given to the construction of access control measures around North Park's ponds and lakes to protect wetlands and riparian corridors, which could include elevated, non-impervious boardwalks in favorite fishing areas.

- Lastly, to assure sustainability, we encourage community awareness and action to minimize sedimentation and nutrient loads related to urbanization and continuing development in the headwaters of the Pine Creek watershed.

9. North Park Lake Alternative Dredge Material Placement Site Vegetation Survey

9.1. Introduction/ purpose

In the summer of 2003, habitat quality assessments (Habitat Evaluation Process, HEP) were conducted at five alternative sites selected for placement of sediment that will be dredged from North Park Lake as a component of the restoration plan (APPENDIX 9). In support of the HEP survey, on July 25 and August 1, 2003, we conducted vegetation surveys along all HEP study sample transects in each of the proposed placement sites, to

assess the quality of vegetation communities and to rate each of the sites based on vegetation community quality.

9.2. Methods

Descriptions and locations of the proposed alternative dredge placement sites are also summarized and presented graphically in APPENDIX 9. A total of nine, 30 foot wide, vegetation transects were surveyed to represent the five proposed dredge placement sites: one down the wooded slope between Round Top Grove and the Wildwood site; 2 in the Wildwood site; 1 at the Deer Pen Site, one at the Bull Pen site; 3 at the Latodami site; and one at the County site. Transect locations are described in TABLE 17.

Collections of vascular plants and observations of distribution patterns and relative abundance were made along each transect. Comparisons were made between vegetation communities located along each along each sample transect.

9.2.1. Diversity

All unique vascular plants were keyed to species with nomenclature in accordance with *The Plants of Pennsylvania* (Rhoads, 2000). References included *Gray's Manual of Botany* (Fernald, 1987), and *The Flora of West Virginia* (for information on regional distribution, *Weeds of the Northeas*t[8] for weedy herbaceous plants, and *Trees and Shrubs in Eastern North America* [9] for exotic woody species. Relative abundance for each species was estimated as dominant, locally dominant, abundant, locally abundant, common, scattered, occasional or few.

9.2.2. Wetland Status

Verbatim habitat characterizations from regional botanical manuals and the US Fish & Wildlife Services' wetland indicator status[10] or tolerance to aquatic regimes were noted for each species identified (USF&WS). The percent of the plant species that were wetland species was determined for each vegetation community along each transect.

9.2.3. Vegetation Community Quality

Total numbers of exotic vs. native species, the percent of the dominant species that were exotic, and the percent of the dominant species that were invasive exotic species were tabulated by transect and by plant community.

9.2.4. Vegetation Indices

The vegetation survey transects were then rated from the least to the most degraded utilizing both diversity and quality indices. Diversity indices included total # of native plant species and # of dominant native plant species. Higher diversity is generally an indication of higher quality communities and high numbers of exotic plant species of degraded communities. Quality indices included % species exotic, % species exotic and invasive, % dominant species exotic, and % dominant species exotic and invasive. Scores ranged from 1, the least degraded study reach, to 25, the most degraded reach, relative to the other sites surveyed for this study.

9.3. Results

Along the 9 survey transects, we identified palustrine emergent wetland and upland old-field; cultivated wildflower field, mid-successional woodland, and forest plant communities. These communities were similarly structured and supported a combination of both native and introduced exotic plant species. A total of 248 plant species were observed along all transects combined, of which 143 species were native and 105 species (or 42.3%) were exotic. Additionally, 49.3% of the dominant plant species in the study area were exotic and 13.7% of the dominant species were exotic invasive species.

Compared to North Park riparian areas and PA averages, the dredge placement sites were extremely degraded. As discussed in Section 7.3 above, of the states 3800 plant species, 33% are believed to be exotic (Ref 4). In the North Park riparian areas, 25% of the plant species identified were exotic. Along degraded reaches of Nine Mile Run, 238 plant

species were identified and 41.6% of these plant species were exotic and 6.3% of the dominant species were exotic (Ref.). In severely degraded, disturbed reaches along the same stream, only 63 total species were identified, of which 50.8% of the total number of species were exotic, 20.6% of the dominant species were exotic, and 6% of the dominant species were invasive exotic.

A summary of the diversity and quality, including percentages of native, exotic, and invasive species for North Park Lake dredge material alternative placement sites is presented in TABLE 16.

9.3.1. Characterization of North Park Lake Dredge Material Placement Site Vegetation by Community

9.3.1.1. Wetlands

Wetlands are areas with a predominance of hydrophytic vegetation, hydric soils, and wetland hydrology. Wetlands function to purify and filter water, mitigate storm flows, provide low flow augmentation, provide quality habitat, and enhance species diversity. The reach of Transect #9 which ran through a swale or low-lying area was classified as an isolated, palustrine system shrub/scrub and emergent wetland, according to the USFWS's *Classification of Wetlands and Deepwater Habitats of the United States* (Ref. *35*). A total of 50 species were identified in the swale, of which 58% were obligate or facultative wetland species, and 84% of the dominant species were wetland plants. While still somewhat degraded, these wetland areas were more diverse than other communities studied and had a significantly lower percentage of exotic species than all other areas studied. 40% of the total species were exotic species and only 6% of the dominant species were exotic. Dominant native woody included kinnikinik, red maple, and black willow. A few of the dominant native herbaceous species included autumn bent, blue vervain, false pimpernel, galingale, purple-leaved willow-herb, and soft rush. Dominant exotic herbaceous plant species included barnyard grass, Canada thistle, crown vetch, reed canary grass, and dock-leaved smartweed. Summaries of relative abundance, origin, and wetland tolerance by vegetation community type are presented in TABLE 16.

Species lists by transect and vegetation community are presented in Appendix 10-7. Dominant species are presented in TABLE 17.

Wetland plants were also identified in low-lying areas along Transect # 4 at the Deer Pen site and Transect #6 at the Latodami site. Along Transect #4, 35% of the 51 species observed were wetland species, and 26% of the dominant species were wetland species. Of the 90 species observed along transect #6, 27 or 30 % were wetland species. However, only 18% of the dominant species were wetland species, none of which were obligate wetland plants. The dominant wetland species observed in this low area included panicled aster, dwarf saint John's-wort, deer-tongue grass, and panicled dogwood. A summary of native, exotic, and invasive plant species by vegetation community is presented in TABLE 19.

9.3.1.2. Woodland/forest

Woodlands reaches surveyed along transects #1, 5, 6, and 9. Overall, woodlands were moderately disturbed. A total of 135 plant species were identified in woodlands and of these, 38.5% were exotic and 9.6% exotic invasive. Of the dominant plant species, 40.4% were exotic and 24% were exotic invasive. The canopy was dominated by native species such as red oak, white oak, black locust, and white ash. The sub-canopy was dominated primarily by invasive exotic species including glossy buckthorn, multiflora rose, autumn olive, common privet, and oriental bittersweet. A mixture of dominant and exotic species, including Canada thistle, common teasel, garlic mustard, sweet vernal grass, jewelweed, and white grass, dominated the understory.

9.3.1.3. Meadow/ old-field

The predominant vegetation community type along all transects except Transects #1 (Round Top) and Transect # 9 (County Site) was old-field. Old field habitat is the stage of plant growth between bare ground and forest, and are commonly found on abandoned pastureland and retired cropfields. Old fields support early succcessional plant

communities, and are primarily herbaceous annuals, biennials, and perennials. As time passes, abandoned fields are invaded by numerous woody shrubs and young trees.

A mixture of exotic and native herbaceous plants, shrubs, and immature trees was identified along transects # 2, 3, 4, 5, 6, 7, and 8, in the reaches with old-field habitat. A total of 164 species were identified, of which 48.7% were native species, 51.2% were exotic, and 7.9% were exotic invasive species. Of the dominant species, 64.7% were exotic, and 13.2% were exotic invasive. Of the vegetation identified along sample transects, old field was the most degraded, with the highest percentages of exotic and invasive exotic species.

In the spring of 2002 the Partners for Fish and Wildlife Program at California University of Pennsylvania began a native grassland project in an old-field at the Latodami site. Over 22 grassland/prairie plant species were planted along a strip running the entire length of the Latodami site (www 2). This field was analyzed separately during the vegetation survey and is referred to as the "wildflower field" in report tables. The reach of wildflower field surveyed along all three transects at the Latodami site were more degraded than old-field habitat that had not been plowed. As can be seen in TABLE 19, 109 species were identified in the Latodami old-field community while only 59 were found in the wildflower field. While the old-field communities were composed of 45.9% ecotic species, the wildflower field community was composed 57.9% exotic species.

A few of the dominant exotic species found in old-field communities included invasive crown vetch, oriental bittersweet, glossy buckthorn, garlic mustard, Canada thistle, autumn olive, and multiflora rose. Other dominant exotic species included common mullein, yellow wood sorrel, green foxtail, quackgrass, butter-and-eggs. Dominant native species included , autumn bent, broome-sedge, Indian hemp, white heath aster, white snakeroot, deer-tongue grass, wrinkle-leaved goldenrod, black locust, and panicled dogwood.

9.3.1.4. <u>Vegetation Indices</u>

Results of the ratings of all sample transects by vegetation community, from least to most degraded, using both diversity and quality indices are presented in TABLE 22. Diversity indices included # of native plant species and # of dominant native plant species. Quality indices included % species exotic, % species exotic and invasive, % dominant species exotic, and % dominant species exotic and invasive. Scores ranged from 1, the least degraded study reach, to 11, the most degraded reach, relative to the other sites surveyed for this study.

Overall, the old-field communities were the most degraded. The old-field reach along the Bull Pen site transect, was more degraded than all other sites, with a score of 11. The second most degraded vegetation community was the cultivated wildflower field stretches located along Transects # 6, 7, and 8 at the Latodami site (score 10). Old-field communities at the Wildwood and Latodami sites scored 9 and 8, respectively. Woodland communities were generally the least disturbed community, except for the small patch of degraded woodland at the County site, which scored 7, which was more degraded than the woodland at the County site. Woodlands at the Latodami and Bull Pen sites scored 4 and 2 respectively, but these communities lie outside of the proposed placement area for these sites, and would not be impacted. The moderately degraded wetland at the County site rated 3. The least degraded site overall was the Roundtop site.

9.4. Summary and Conclusions

The most degraded vegetation communities at all placement sites proposed for the North Park Lake dredge material were old-field communities. Low lying areas located along Transect #4, the Deer Pen Site and along Transect #6, the southern end of the Latodami Site, supported wetland vegetation, but cannot be classified as wetlands. The old-field community at the Deer Pen site scored slightly higher than expected because of a low lying stretch along the transect which supported wetland plants, adding diversity and increasing numbers of native plants. The swale at the County site supported approximately 1 acre of isolated, moderately degraded, shrub/scrub and emergent wetlands, and scored as the 3rd least degraded placement site. Higher quality wooded

communities located at the ends of transects # 4, 5, 6, 7, 8, and 9 will not be impacted if these areas are selected as a dredge material placement site.

Based on quality and diversity vegetation indices, the proposed dredge material placement sites rated from least to most degraded, as follows: Roundtop, County site, Deer pen, Latodami, and Wildwood. Transect #1, Roundtop, supported the highest quality vegetation community of all sites. If the Wildwood site is selected, than efforts to minimize impacts to these woodlands is recommended.

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TABLE 1
Previous and Concurrent Studies of the Pine Creek Watershed

Title	Funding	Author / Partner	Year
North Park Fishery Survey and Associated Water Quality		US F&BC	1998
Pine Creek Watershed, Rivers Conservation Plan		PA DCNR &	Initiated in 2002
Pine Creek Watershed Study	Growing Greener Grant	Richland Township	Initiated 2001
TMDL devlopment		PA DEP	Undevloped
The Vascular Plants of the Allegheny County Parks		Carnegie Museum for the Department of Parks, Recreation, and Conservation, County of Allegheny	1971

TABLE 2
Pine Creek Basin, North Park
Water Quality Sampling Stations
August 20, 2002

Sampling Station Code	Stream	Pine Creek Stream Mile	North Fork Stream Stream mile	Irwin Run Mile	Location	Station Location
NPL 2 1201	Pine Creek	14.74			Outflow North Park Lake	Pine Creek outflow of North Park Lake, 800 feet downstream of Pine Creek Dam, at foot bridge
NPL 2 1002	Pine Creek Arm	15			North Park Lake	North Park Lake, at mid-channel, 200 feet upstream of Pine Creek Dam, at mid-channel
NPL 2 1003	Pine Creek Arm	15.2			North Park Lake	Pine Creek Arm of North Park Lake, 200 feet upstream of Pine Creek Dam, at mid-channel
NPL 1 1105	Pine Creek	16.46			Inflow North Park Lake	Pine Creek inflow to North Park Lake at Grubbs Road Bridge
NPL 2 2001	North Fork Pine Creek Arm	15	0.5		North Park Lake	North Fork of Pine Creek Arm of North Park Lake, 2000 feet upstream of Pine Creek Dam, at mid-channel
NPL 1 2105	North Fork Pine Creek	15	1.32		Inflow North Park Lake	North Fork of Pine Creek, inflow to North Park Lake, at Walter Road Bridge
NPL 2 1601	North Fork Pine Creek	15	1.56		Outflow Marshall Lake	North Fork of Pine Creek, outflow of Marshall Lake at Kummer Road Bridge
NPL 1 2109	North Fork Pine Creek	15	2.34		Inflow Marshall Lake	North Fork of Pine Creek, inflow to Marshall Lake
NPL 1 2201	Irwin Run	15	0.1	0.4	Inflow North Park Lake	Irwin Run, 1400 feet upstream of the Irwin Run Bay of North Park Lake, adjacent to Irwin Road

TABLE 3

Physical and Chemical Water Quality Parameters

Collected at Pine Creek Basin, North Park, Sampling Stations

August 20, 2002

*Methodology used for analysis listed in Appendix A.

Parameter	units	Parameter	units
Field Water Temperature	Degrees C.	Total Aluminum	ug/l
Air Temperature	Degrees C	Total Antimony	ug/l
Incident Light	%	Total Arsenic	ug/l
Cloud Cover	%	Total Barium	ug/l
Wind Velocity	MPH	Total Beryllium	ug/l
Wind Direction	compass point	Total Cadmium	ug/l
Scattered Light	%	Total Chromium	ug/l
Wave Height	WMO	Total Copper	ug/l
Field Turbidity	NTU	Total Iron	ug/l
Laboratory Turbidity	NTU	Total Lead	ug/l
Secchi	inches	Total Manganese	ug/l
Apparent Color	PT-CO units	Total Mercury	ug/l
ORP	MV	Total Nickel	ug/l
Field Specific Conductivity	uhmos/cm	Total Selenium	ug/l
Lab Specific Conductivity @ 25 C	uhmos/cm	Total Silver	ug/l
Field Dissolved Oxygen	mg/l	Total Zinc	ug/l
Field pH	pH units	Delta-BHC	ug/l
Laboratory pH	pH units	Endosulfan sulfate	ug/l
Hot Peroide Acidity as CaCO3	mg/l	Alpha-Endosulfan	ug/l
Phenolphthalein Alkalinity as CaCO3	mg/l	Endrin aldehyde	ug/l
Total Acidity as CaCO3	mg/l	Aldrin	ug/l
Total Suspended Solids 105 C	mg/l	Alpha-BHC	ug/l
Nitrogen, NH_3	mg/l	Beta-BHC	ug/l
Total Kjeldahl Nitrogen	mg/l	Lindane (gamma-BHC)	ug/l
Total Nitrogen, $NO_2 + NO_3$	mg/l	Chlordane	ug/l
Total Phosphorus as P	mg/l	4,4'-DDD	ug/l
Total Hardness as CaCO3	mg/l	4,4'-DDE	ug/l
Total Calcium	mg/l	4,4'-DDT	ug/l
Total Magnesium	mg/l	Dieldrin	ug/l
Total Sodium	mg/l	Endrin	ug/l
Total Potassium	mg/l	Toxaphene	ug/l
Sulfates	mg/l	Heptachlor	ug/l
		Heptachlor epoxide	ug/l
		Methoxychlor	ug/l
		Beta-Endosulfan	ug/l

TABLE 4
Water Sample Analyses Methods

All methods used in collection and analysis of data were EPA recommended as published in Methods for Chemical Analysis of Water and Wastes (1979); Biological Field and Laboratory Methods for Measuring the Quality of Surface Waters and Effluents (1973); and Standard Methods for the Examination of Water and Wastewater, APHA (1971, 1976, 1980, 1992, and 1995).

1. Field Water Temperature - One of the three following multisensor units was used to collect field parameters: YSI Model 610-D digital display logger with multisensor probe.
2. Field pH - see number 1.
3. Field Dissolved Oxygen - see number 1.
4. Field Conductivity - see number 1.
5. Laboratory pH - Fisher pH meter, Model 210.
6. Methyl Orange (total) Alkalinity - Titration to an endpoint of pH 4.5 with 0.02 N H_2SO_4.
7. Phenolphthalein (total) Acidity - Titration to an endpoint of pH 8.3 with 0.02 N NaOH.
8. Total Hardness - Titration with EDTA in a buffered solution.
9. Turbidity - Hach Turbidimeter, Model 2100N.
10. Apparent Color - Hellige Tester, Model No. 611.A.
11. Suspended solids - appropriate sized sample is filtered through Gelman glass fiber filter discs. Filters dried to constant weight at 103-108C°. for 16" hours.
12. Nitrogen, Ammonia - Phenate method. 500 ml samples preserved with 1 ml 1:1 H_2SO_4.
13. Nitrogen, Kjeldahl - Digestion and phenate method. 500 ml samples preserved with 1 ml H_2SO_4.
14. Nitrogen, Nitrate+Nitrate - Cadmium reduction method. 500ml samples preserved with 1 ml 1:1 H_2SO_4.
15. Total Phosphorus as P - Stannous Chloride method. 50 preserved with 1 ml 1:1 H_2SO_4.
16. Total Arsenic (As) - Determined by trace inductively coupled argon plasma (ICAP). 250 ml field samples preserved with 2.5 ml 1:1 HNO_3.
17. Aluminum (Al) - Determined by inductively coupled argon plasma (ICAP) analysis. 250 ml field samples preserved with 2.5 ml 1:1 HNO_3.
18. Total Cadmium (Cd) - Same as number 17.
19. Total Barium (Ba) - Same as No. 17.
20. Total Beryllium (Be) - Same as No. 17
21. Total Calcium (Ca) - Same as No. 17.
22. Total Lead (Pb) - Same as No. 17.
23. Total Selenium (Se) - Same as No. 17.
24. Total Chromium (Cr) - Same as No. 17.
25. Total Copper (Cu) - Same as No. 17
26. Total Iron (Fe) - Same as No. 17
27. Total Potassium (K) - Same as No. 17.
28. Total Magnesium (Mg) - Same as No. 17.
29. Total Manganese (Mn) - Same as No. 17
30. Total Sodium (Na) - Same as No. 17.
31. Total Nickel (Ni) - Same as No. 17
32. Total Antimony (Sb) - Same as No. 17
33. Total Zinc (Zn) - Same as No. 17
34. Sulfates - Barium Chloride, Turbidimetric method.
35. Chlorinated Priority Pollutant Pesticides - Collected in distilled water rinsed glass jars with Teflon-lined lids. Extracted and concentrated samples analyzed by gas chromatography (GC) using electron capture (ECP) detector and confirmed by gas chromatography/mass spectrometry (GC/MS) according to EPA Method 8080.

TABLE 5
Pine Creek Basin, North Park
Water Quality Analyses
August 20, 2002

Parameter Code	Parameter	Location	Pine Creek		Irwan	North Fork Pine Creek				Little Sewickley Creek	Bull Run	North Park Lake (NPL)								Girard Lake eutrophic pond (average of values)		Mosquito Lake typical eutrophic lake (average of values)		typical untreated waste water *		increase in mineral content from domestic water use*	
		Units	Pine Creek inflow	NPL outflow, Pine Creek	Irwin Run inflow	NF inflow to NPL	NF inflow to ML	All North Fork Average	Marshall Lake Outflow	Moderate urban impact regional stream	Low urban impact Allegheny River Trib	NPL at dam		Pine Creek Arm		North Fork Arm		Average of all Stations		surface	bottom	surface	bottom	min	max	min	max
		Sampling Station Code	1105	1201	2201	2105	2109		1601			1002		1003		2001											
												surface	bottom	surface	bottom	surface	bottom	surface	bottom								
00020	Air Temperature	Degrees C										26.3		26.5		25.2											
00032	Cloud Cover	%										50		50		40											
00035	Wind Velocity	MPH										5.3		2.5		5.4											
00036	Wind Direction	Compass Point										315		270		315											
70222	Wave Height	WMO										0		0		0											
00010	Water Temperature	Degrees C	20.31	24.06	20.13	22.14	20.83	21.485	23.47	16.49	8.20	24.28		25.23		24.02		24.73	22.98	8.23	7.42	20.70	19.22				
00299	Dissolved Oxygen	mg/l	8.47	8.00	6.57	6.68	6.94	6.81	6.91	10.42	13.51	6.38	0.63	7.72	6.56	6.09	0.62	6.73	2.60	11.35	4.43	8.45	4.64				
00090	ORP	MV		19.7	75.3	72.6	56.9	64.8	55.8	208.2	120.0	-13.1	-35.5	-34.1	-30.9	21.0	-22.4	-8.7	-29.6	500.5	519.0	188.6	133.7				
00077	Secchi	Inches										12		12		12		12	12								
00080	Color	PT-CO units	17.5	50	15	20	15	17.5	40	2.5	2.5	115		90		95		80	135	15	37.5	20	37.5				
00076	Turbidity	NTU	8.0	26.9	3.3	6.1	4.5	5.3	9.0	1.9	0.8	30.8	74.3	14.3	nd	34.3	55.1	26.5	64.7	6.1	3.5	6.0	13.3				
00094	Field Sp Conductivity	uhmos/cm	891	570	875	603	689	646	616	489	467	547	636	575	596	742	732	621.3	654.7	372	417	333	336				
00530	Total Suspended Solids	mg/l at 105 C	8.2	20.6	5.2	7.9	8.3	8.1	21.2			23.5	nd	25.8	nd	25.9	40.2	25.1	40.2	5.6	13.1	8.2	17.0	0.0	350.0		
00400	Field pH	pH units	6.49	7.06	8.90	7.37	8.73	8.05	8.48	8.06	7.91	7.21		7.46		7.06		7.24	7.15	6.72	6.37	7.83	7.42				
00403	Laboratory pH	pH units	7.96	7.54	7.37	7.42	7.83	7.63	7.25	7.89	7.70	7.24		7.30		7.17		7.26	7.16	6.92	6.97	7.43	7.21				
00410	Total Alkalinity	mg/l as CaCO3	84.0	65.1	116.0	80.2	87.7	84.0	83.0	78.8	57.4	101.4		64.2		61.8		63.5	100.0	83.3	103.9	62.4	64.8	5.0	200.0	100.0	150.0
00435	Total Acidity	mg/l as CaCO3	4.0	4.0	4.0	3.0	3.0	3.0	4.0	1.9	2.9	5.4		5.9		4.4		4.6	5.9	7.0	15.4	4.3	5.2				
00625	Total Kjeldahl Nitrogen	mg/l as N	0.460	0.760		0.680	0.310	0.495	1.180	0.300	0.230	1.015		0.940		1.005		0.960	1.050	1.645	1.530	1.424	1.192				
00610	Total NH3-N	mg/l as N	0.040	0.130		0.050	0.040	0.045	0.070	0.040	0.010	0.160	0.280	0.150		0.190	0.230	0.167	0.255	0.380	0.370	0.088	0.138	12.00	50.00		
00630	Total NO3+Nitrite	mg/l as N	2.190	0.750		0.560	0.680	0.620	0.130	0.880	0.700	0.925		0.750		0.885		0.780	1.015	0.770	0.565	0.081	0.085	0.00	0.00	20.00	40.00
00665	Total Phosphorus	mg/l as P	0.050	0.100		0.050	0.020	0.035	0.100	0.040	0.010	0.085		0.070		0.060		0.067	0.080	0.085	0.055	0.058	0.062	4.00	15.00		
00900	Total Hardness	mg/l as CaCO3	215.2	144.4	248.5	146.5	185.9	166.2	159.6	151.5	196.7	149.0		143.4		138.4		142.8	144.9	106.3	125.5	97.3	97.9				
00916	Total Calcium	mg/l	61.0	39.0		42.0	67.0	54.5	43.0	40.7	37.0	39.0		39.0		36.5		37.0	39.5	31.2	34.9	25.1	25.2			15.0	40.0
00927	Total Magnesium	mg/l	15.0	9.2		11.0	15.0	13.0	11.0	10.8	12.0	9.3		9.3		8.5		8.8	9.2	7.2	7.4	6.4	6.5			15.0	40.0
00937	Total Potassium	mg/l	4.1	3.7		3.3	3.0	3.2	3.3	2.6	2.3	3.7		3.6		4.1		3.8	3.9	4.4	4.4	3.7	3.6			7.0	15.0
00929	Total Sodium	mg/l	87.0	55.0		55.0	76.0	65.5	55.0	35.6	37.0	53.0		54.0		50.0		51.0	53.5	34.0	35.6	26.7	27.2			40.0	70.0
00945	Sulfate	mg/l	72.6	43.6		35.2	61.7	48.5	35.5			46.2		44.9		42.8		43.2	46.5	23.9	16.7	22.2	22.1			15.0	30.0
01105	Total Aluminum	ug/l	200	580		110	70	90	340	60	70	1015		470		940		693	1150	222	235	169	384				
01097	Total Antimony	ug/l	5	5		5	5	5	5	5	5	5		5		5		5	5	33	33	5	5				
01002	Total Arsenic	ug/l	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0		4.0		4.0		4.0	4.0	6.5	6.5	3.9	4.2				
01007	Total Barium	ug/l	59.0	54.0		55.0	57.0	56.0	68.0	61.0	41.0	59.0		51.0		57.5		52.3	63.5	115.0	115.0	24.7	33.2				
01012	Total Beryllium	ug/l	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0		2.0		2.0		2.0	2.0	3.5	3.5	2.0	2.0				

yellow = value less than or greater than reference site value

TABLE 5
Pine Creek Basin, North Park
Water Quality Analyses
August 20, 2002

Parameter Code	Parameter	Location	Pine Creek		Irwan	North Fork Pine Creek				Little Sewickley Creek	Bull Run	North Park Lake (NPL)						Girard Lake eutrophic pond (average of values)		Mosquito Lake typical eutrophic lake (average of values)		typical untreated waste water *		increase in mineral content from domestic water use*	
		Units	Pine Creek inflow	NPL outflow, Pine Creek	Irwin Run inflow	NF inflow to NPL	NF inflow to ML	All North Fork Average	Marshall Lake Outflow	Moderate urban impact regional stream	Low urban impact Allegheny River Trib	NPL at dam		Pine Creek Arm		North Fork Arm		Average of all Stations		surface	bottom	surface	bottom	min	max	min	max
		Sampling Station Code	1105	1201	2201	2105	2109		1601			1002		1003		2001											
01027	Total Cadmium	ug/l	1	1		1	1	1	1	0.5	1	1		1		1		1	1	3	3	1	1				
01034	Total Chromium	ug/l	3	3		3	3	3	3	2	3	3		3		3		3	3	7	7	3	3				
01042	Total Copper	ug/l	5	5		5	5	5	5	5	5	5		5		5		5	5	18	18	6	6				
01045	Total Iron	ug/l	520	920		240	230	235	630	110	120	1600		770		1450		1057	1850	349	895	301	694				
01051	Total Lead	ug/l	3	3		3	3	3	3	2	3	4		3		4		3	4	36	3	3	5				
01055	Total Manganese	ug/l	100	360		170	260	215	440	14	44	515		320		480		367	605	165	1100	106	212				
71900	Total Mercury	ug/l	0.2	0.2		0.2	0.2	0.2	0.2	0.2	0.2	0.2				0.2		0.2	0.2	0.5	0.5	0.2	0.3				
01067	Total Nickel	ug/l	10	10		10	10	10	10	10	10	10		10		10		10	10	30	30	11	12				
01147	Total Selenium	ug/l	10	10		10	10	10	10	5	10	10		10		10		10	10	8	8	10	10				
01077	Total Silver	ug/l	2	2		2	2	2	2	2	2	2		2		2		2	2	1	1	2	2				
01092	Total Zinc	ug/l	10	10		10	10	10	10	10	10	15		10		10		10	15	17	25	10	10				
39360	4,4'-DDD	ug/l	0.05	0.05			0.05	0.05	0.05																		
39365	4,4'-DDE	ug/l	0.05	0.05			0.05	0.05	0.05																		
39370	4,4'-DDT	ug/l	0.05	0.05			0.05	0.05	0.05																		
39330	Total aldrin	ug/l	0.05	0.05			0.05	0.05	0.05																		
34361	Total alpha-endosulfan	ug/l	0.05	0.05			0.05	0.05	0.05																		
39338	Total beta-BHC	ug/l	0.05	0.05			0.05	0.05	0.05																		
82624	Total beta-endosulfan	ug/l	0.1	0.1			0.1	0.1	0.1																		
39350	Total chlordane	ug/l	1	1			1	1	1																		
34259	Total delta-BHC	ug/l	0.05	0.05			0.05	0.05	0.05																		
39380	Total dieldrin	ug/l	0.05	0.05			0.05	0.05	0.05																		
34351	Total endosulfan sulfate	ug/l	0.05	0.05			0.05	0.05	0.05																		
39390	Total endrin	ug/l	0.05	0.05			0.05	0.05	0.05																		
34366	Total endrin aldehyde	ug/l	0.05	0.05			0.05	0.05	0.05																		
39410	Total heptachlor	ug/l	0.05	0.05			0.05	0.05	0.05																		
39420	Total heptachlor epoxide	ug/l	0.05	0.05			0.05	0.05	0.05																		
39340	Total lindane	ug/l	0.05	0.05			0.05	0.05	0.05																		
39480	Total methoxychlor	ug/l	0.05	0.05			0.05	0.05	0.05																		
39400	Total toxaphene	ug/l	2	2			2	2	2																		
39337	Totla alpha-BHC	ug/l	0.05	0.05			0.05	0.05	0.05																		

yellow = value less than or greater than reference site value

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Water Temperature Deg C 00010	Air Temperature Deg C 00020	Incident Light % 00031	Cloud Cover % 00032	Wind Velocity MPH 00035
NPL 1 1105	Pine Creek inflow to North Park Lake	8/20/2002	0800	000	20.31				
NPL 1 2105	North Fork of Pine Creek, inflow to North Park Lake	8/20/2002	0930	000	22.14				
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000	20.83				
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1050	000					
NPL 1 2201	Irwan Run, inflow to Irwan Run Bay of North Park Lake	8/20/2002	0900	000	20.13				
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	000	25.11	26.3	100	50	5.3
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	001	24.91		21.875		
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	002	24.74		4.375		
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	003	24.61		1.0781		
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	004	24.64		0.3125		
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	005	24.47		0.0734		

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Water Temperature Deg C 00010	Air Temperature Deg C 00020	Incident Light % 00031	Cloud Cover % 00032	Wind Velocity MPH 00035
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	006	24.41				
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	007	23.77				
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	008	23.69				
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	009	22.48				
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	000	25.73	26.5	100	50	2.5
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	001	25.46		39.0625		
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	002	25.2		6.25		
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	003	25.18		4.6875		
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	004	24.98		0.3906		
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	005	24.81		1.5625		
NPL 2 1201	Pine Creek outflow of North Park	8/20/2002	0845	000	24.06				
NPL 2 1601	North Fork of Pine Creek, outflow of Marshall Lake	8/20/2002	1000	000	23.47				

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Water Temperature Deg C 00010	Air Temperature Deg C 00020	Incident Light % 00031	Cloud Cover % 00032	Wind Velocity MPH 00035
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	000	24.68	25.2	100	40	5.4
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	001	24.64		15.625		
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	002	24.47		4.375		
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	003	24.4		0.7813		
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	004	24.33		0.625		
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	005	24.26		0.1563		
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	006	24.01				
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	007	22.7				
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	008	22.68				
NPL d 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000					

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Wind Direction CP 00036	Turbidity NTU 00076	Secchi Inch 00077	Color PT-CO Units 00080	ORP MV 00090
NPL 1 1105	Pine Creek inflow to North Park Lake	8/20/2002	0800	000		7.97		17.5	
NPL 1 2105	North Fork of Pine Creek, inflow to North Park Lake	8/20/2002	0930	000		6.07		20	72.6
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000		4.5		15	56.9
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1050	000					
NPL 1 2201	Irwan Run, inflow to Irwan Run Bay of North Park Lake	8/20/2002	0900	000		3.3		15	75.3
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	000	315		12		-13.1
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	001					-14.9
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	002					-15.2
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	003		30.8	12	70	15.8
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	004					-17.5
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	005					-17.6

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Wind Direction CP 00036	Turbidity NTU 00076	Secchi Inch 00077	Color PT-CO Units 00080	ORP MV 00090
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	006					-18.1
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	007					-18.9
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	008					-20.6
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	009		74.3		160	35.5
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	000	270		12		-34.1
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	001					-32.7
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	002					-31.6
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	003		14.3	12	90	29.6
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	004					-30.7
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	005					-30.9
NPL 2 1201	Pine Creek outflow of North Park	8/20/2002	0845	000		26.9		50	19.7
NPL 2 1601	North Fork of Pine Creek, outflow of Marshall Lake	8/20/2002	1000	000		8.96		40	55.8

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Wind Direction CP 00036	Turbidity NTU 00076	Secchi Inch 00077	Color PT-CO Units 00080	ORP MV 00090
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	000	315		12		21
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	001					10.1
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	002					6.5
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	003		34.3		80	5.2
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	004					3.7
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	005					2.2
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	006					1
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	007		55.1	12	110	1
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	008					-22.4
NPL d 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000					

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Sp Conductivity Field uhmos/cm 00094	Sp Conductivity @25 C uhmos/cm 00095	Dissolved Oxygen mg/l 00299	Field pH pH Units 00400	Laboratory pH pH Units 00403
NPL 1 1105	Pine Creek inflow to North Park Lake	8/20/2002	0800	000	891	796	8.47	6.49	7.96
NPL 1 2105	North Fork of Pine Creek, inflow to North Park Lake	8/20/2002	0930	000	603	531	6.68	7.37	7.42
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000	689	607	6.94	8.73	7.83
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1050	000					
NPL 1 2201	Irwan Run, inflow to Irwan Run Bay of North Park Lake	8/20/2002	0900	000	875	774	6.57	8.9	7.37
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	000	547		6.38	7.13	
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	001	552		6.14	7.19	
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	002	560		5.88	7.2	
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	003	566	525	5.89	7.2	7.26
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	004	575		5.85	7.24	
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	005	586		5.72	7.25	

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Sp Conductivity Field uhmos/cm 00094	Sp Conductivity @25 C uhmos/cm 00095	Dissolved Oxygen mg/l 00299	Field pH pH Units 00400	Laboratory pH pH Units 00403
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	006	595		5.68	7.25	
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	007	639		4	7.21	
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	008	636		3.72	7.2	
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	009	514	530	0.63	7.18	7.21
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	000	575		7.72	7.44	
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	001	574		7.46	7.46	
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	002	578		7.26	7.46	
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	003	577	507	7.19	7.42	7.3
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	004	582		6.82	7.49	
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	005	596		6.56	7.46	
NPL 2 1201	Pine Creek outflow of North Park	8/20/2002	0845	000	570	488	8	7.06	7.54
NPL 2 1601	North Fork of Pine Creek, outflow of Marshall Lake	8/20/2002	1000	000	616	521	6.91	8.48	7.25

TABLE 7
Pine Creek Basin, North Park
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August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Sp Conductivity Field uhmos/cm 00094	Sp Conductivity @25 C uhmos/cm 00095	Dissolved Oxygen mg/l 00299	Field pH pH Units 00400	Laboratory pH pH Units 00403
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	000	742		6.09	6.98	
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	001	743		5.71	7.08	
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	002	744		5.4	7.1	
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	003	747	510	5.28	7.1	7.23
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	004	749		5.14	7.1	
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	005	732		4.9	7.1	
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	006	732		4.12	7.1	
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	007	732	502	0.84	7.06	7.1
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	008	732		0.62	6.96	
NPL d 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000					

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Total Alkalinity as CaCO3 mg/l 00410	Total Acidity as CaCO3 mg/l 00435	Total Sus Solids 105 C mg/l 00530	Total NH3-N as N mg/l 00610	Total Kjeldahl Nitrogen mg/l 00625
NPL 1 1105	Pine Creek inflow to North Park Lake	8/20/2002	0800	000	83.9623	3.9546	8.18	0.04	0.46
NPL 1 2105	North Fork of Pine Creek, inflow to North Park Lake	8/20/2002	0930	000	80.1887	2.966	7.8795	0.05	0.68
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000	87.7358	2.966		0.04	0.31
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1050	000			8.34		
NPL 1 2201	Irwan Run, inflow to Irwan Run Bay of North Park Lake	8/20/2002	0900	000	116.0377	3.9546	5.2		
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	000					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	001					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	002					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	003	64.1509	3.9546	23.4921	0.16	0.99
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	004					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	005					

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Total Alkalinity as CaCO3 mg/l 00410	Total Acidity as CaCO3 mg/l 00435	Total Sus Solids 105 C mg/l 00530	Total NH3-N as N mg/l 00610	Total Kjeldahl Nitrogen mg/l 00625
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	006					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	007					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	008					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	009	138.6792	6.9206		0.28	1.04
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	000					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	001					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	002					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	003	64.1509	5.932	25.8	0.15	0.94
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	004					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	005					
NPL 2 1201	Pine Creek outflow of North Park	8/20/2002	0845	000	65.0943	3.9546	20.5965	0.13	0.76
NPL 2 1601	North Fork of Pine Creek, outflow of Marshall Lake	8/20/2002	1000	000	83.0189	3.9546	21.1515	0.07	1.18

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Total Alkalinity as CaCO3 mg/l 00410	Total Acidity as CaCO3 mg/l 00435	Total Sus Solids 105 C mg/l 00530	Total NH3-N as N mg/l 00610	Total Kjeldahl Nitrogen mg/l 00625
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	000					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	001					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	002					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	003	62.2642	3.9546	25.913	0.19	0.95
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	004					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	005					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	006					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	007	61.3208	4.9433	40.2	0.23	1.06
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	008					
NPL d 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000				0.04	0.52

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Total NO3+Nitrite as N mg/l 00630	Total Phosphorus as P mg/l 00665	Total Hardness as CaCO3 mg/l 00900	Total Calcium mg/l 00916	Total Magnesium mg/l 00927
NPL 1 1105	Pine Creek inflow to North Park Lake	8/20/2002	0800	000	2.19	0.05	215.1515	61	15
NPL 1 2105	North Fork of Pine Creek, inflow to North Park Lake	8/20/2002	0930	000	0.56	0.05	146.4646	42	11
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000	0.68	0.02	185.8586	67	15
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1050	000					
NPL 1 2201	Irwan Run, inflow to Irwan Run Bay of North Park Lake	8/20/2002	0900	000			248.4848		
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	000					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	001					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	002					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	003	0.8	0.06	149.4949	36	8.6
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	004					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	005					

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Total NO3+Nitrite as N mg/l 00630	Total Phosphorus as P mg/l 00665	Total Hardness as CaCO3 mg/l 00900	Total Calcium mg/l 00916	Total Magnesium mg/l 00927
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	006					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	007					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	008					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	009	1.05	0.11	148.4848	42	9.9
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	000					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	001					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	002					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	003	0.75	0.07	143.4343	39	9.3
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	004					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	005					
NPL 2 1201	Pine Creek outflow of North Park	8/20/2002	0845	000	0.75	0.1	144.4444	39	9.2
NPL 2 1601	North Fork of Pine Creek, outflow of Marshall Lake	8/20/2002	1000	000	0.13	0.1	159.596	43	11

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Total NO3+Nitrite as N mg/l 00630	Total Phosphorus as P mg/l 00665	Total Hardness as CaCO3 mg/l 00900	Total Calcium mg/l 00916	Total Magnesium mg/l 00927
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	000					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	001					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	002					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	003	0.79	0.07	135.3535	36	8.5
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	004					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	005					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	006					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	007	0.98	0.05	141.4141	37	8.5
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	008					
NPL d 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000	0.53	0.03		50	13

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Total Sodium mg/l 00929	Total Potassium mg/l 00937	Sulfate mg/l 00945	Total Arsenic ug/l 01002	Total Barium ug/l 01007
NPL 1 1105	Pine Creek inflow to North Park Lake	8/20/2002	0800	000	87	4.1	72.6	L4	59
NPL 1 2105	North Fork of Pine Creek, inflow to North Park Lake	8/20/2002	0930	000	55	3.3	35.2	L4	55
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000	76	3	61.7	L4	57
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1050	000					
NPL 1 2201	Irwan Run, inflow to Irwan Run Bay of North Park Lake	8/20/2002	0900	000					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	000					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	001					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	002					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	003	49	3.6	42.8	L4	51
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	004					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	005					

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Total Sodium mg/l 00929	Total Potassium mg/l 00937	Sulfate mg/l 00945	Total Arsenic ug/l 01002	Total Barium ug/l 01007
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	006					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	007					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	008					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	009	57	3.7	49.5	L4	67
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	000					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	001					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	002					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	003	54	3.6	44.9	L4	51
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	004					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	005					
NPL 2 1201	Pine Creek outflow of North Park	8/20/2002	0845	000	55	3.7	43.6	L4	54
NPL 2 1601	North Fork of Pine Creek, outflow of Marshall Lake	8/20/2002	1000	000	55	3.3	35.5	L4	68

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Total Sodium mg/l 00929	Total Potassium mg/l 00937	Sulfate mg/l 00945	Total Arsenic ug/l 01002	Total Barium ug/l 01007
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	000					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	001					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	002					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	003	50	4.1	42	L4	55
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	004					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	005					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	006					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	007	50	4	43.5	L4	60
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	008					
NPL d 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000	62	3.3	47.8	L4	60

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Total Beryllium ug/l 01012	Total Cadmium ug/l 01027	Total Chromium ug/l 01034	Total Copper ug/l 01042	Total Iron ug/l 01045
NPL 1 1105	Pine Creek inflow to North Park Lake	8/20/2002	0800	000	L2	L1	L3	L5	520
NPL 1 2105	North Fork of Pine Creek, inflow to North Park Lake	8/20/2002	0930	000	L2	L1	L3	L5	240
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000	L2	L1	L3	L5	230
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1050	000					
NPL 1 2201	Irwan Run, inflow to Irwan Run Bay of North Park Lake	8/20/2002	0900	000					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	000					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	001					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	002					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	003	L2	L1	L3	L5	1100
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	004					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	005					

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Total Beryllium ug/l 01012	Total Cadmium ug/l 01027	Total Chromium ug/l 01034	Total Copper ug/l 01042	Total Iron ug/l 01045
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	006					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	007					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	008					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	009	L2	L1	L3	L5	2100
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	000					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	001					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	002					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	003	L2	L1	L3	L5	770
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	004					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	005					
NPL 2 1201	Pine Creek outflow of North Park	8/20/2002	0845	000	L2	L1	L3	L5	920
NPL 2 1601	North Fork of Pine Creek, outflow of Marshall Lake	8/20/2002	1000	000	L2	L1	L3	L5	630

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
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Sampling Station Code	Location	Date	Time	Depth	Total Beryllium ug/l 01012	Total Cadmium ug/l 01027	Total Chromium ug/l 01034	Total Copper ug/l 01042	Total Iron ug/l 01045
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	000					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	001					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	002					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	003	L2	L1	L3	L5	1300
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	004					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	005					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	006					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	007	L2	L1	L3	L5	1600
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	008					
NPL d 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000	L2	L1	L3	L5	600

TABLE 7
Pine Creek Basin, North Park
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Sampling Station Code	Location	Date	Time	Depth	Total Lead ug/l 01051	Total Manganese ug/l 01055	Total Nickel ug/l 01067	Total Silver ug/l 01077	Total Zinc ug/l 01092
NPL 1 1105	Pine Creek inflow to North Park Lake	8/20/2002	0800	000	L3	100	L10	L2	L10
NPL 1 2105	North Fork of Pine Creek, inflow to North Park Lake	8/20/2002	0930	000	L3	170	L10	L2	L10
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000	L3	260	L10	L2	L10
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1050	000					
NPL 1 2201	Irwan Run, inflow to Irwan Run Bay of North Park Lake	8/20/2002	0900	000					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	000					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	001					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	002					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	003	3	370	L10	L2	L10
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	004					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	005					

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Total Lead ug/l 01051	Total Manganese ug/l 01055	Total Nickel ug/l 01067	Total Silver ug/l 01077	Total Zinc ug/l 01092
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	006					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	007					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	008					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	009	4	660	L10	L2	20
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	000					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	001					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	002					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	003	3	320	L10	L2	L10
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	004					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	005					
NPL 2 1201	Pine Creek outflow of North Park	8/20/2002	0845	000	L3	360	L10	L2	10
NPL 2 1601	North Fork of Pine Creek, outflow of Marshall Lake	8/20/2002	1000	000	L3	440	L10	L2	L10

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Total Lead ug/l 01051	Total Manganese ug/l 01055	Total Nickel ug/l 01067	Total Silver ug/l 01077	Total Zinc ug/l 01092
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	000					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	001					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	002					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	003	3	410	L10	L2	10
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	004					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	005					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	006					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	007	4	550	L10	L2	10
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	008					
NPL d 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000	L3	350	L10	L2	L10

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Total Antimony ug/l 01097	Total Aluminum ug/l 01105	Total Selenium ug/l 01147	delta-BHC T. ug/l 34259	Endosulfan sulfate T. ug/l 34351
NPL 1 1105	Pine Creek inflow to North Park Lake	8/20/2002	0800	000	L5	200	L10	L0.05	L0.05
NPL 1 2105	North Fork of Pine Creek, inflow to North Park Lake	8/20/2002	0930	000	L5	110	L10		
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000	L5	70	L10	L0.05	L0.05
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1050	000					
NPL 1 2201	Irwan Run, inflow to Irwan Run Bay of North Park Lake	8/20/2002	0900	000					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	000					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	001					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	002					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	003	L5	730	L10		
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	004					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	005					

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Total Antimony ug/l 01097	Total Aluminum ug/l 01105	Total Selenium ug/l 01147	delta-BHC T. ug/l 34259	Endosulfan sulfate T. ug/l 34351
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	006					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	007					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	008					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	009	L5	1300	L10		
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	000					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	001					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	002					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	003	L5	470	L10		
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	004					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	005					
NPL 2 1201	Pine Creek outflow of North Park	8/20/2002	0845	000	L5	580	L10	L0.05	L0.05
NPL 2 1601	North Fork of Pine Creek, outflow of Marshall Lake	8/20/2002	1000	000	L5	340	L10	L0.05	L0.05

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Total Antimony ug/l 01097	Total Aluminum ug/l 01105	Total Selenium ug/l 01147	delta-BHC T. ug/l 34259	Endosulfan sulfate T. ug/l 34351
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	000					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	001					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	002					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	003	L5	880	L10		
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	004					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	005					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	006					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	007	L5	1000	L10		
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	008					
NPL d 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000	L5	60	L10	L0.05	L0.05

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	alpha-Endosulfan T. ug/l 34361	Endrin aldehyde T. ug/l 34366	Aldrin T. ug/l 39330	alpha-BHC T. ug/l 39337	beta-BHC T. ug/l 39338
NPL 1 1105	Pine Creek inflow to North Park Lake	8/20/2002	0800	000	L0.05	L0.05	L0.05	L0.05	L0.05
NPL 1 2105	North Fork of Pine Creek, inflow to North Park Lake	8/20/2002	0930	000					
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000	L0.05	L0.05	L0.05	L0.05	L0.05
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1050	000					
NPL 1 2201	Irwan Run, inflow to Irwan Run Bay of North Park Lake	8/20/2002	0900	000					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	000					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	001					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	002					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	003					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	004					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	005					

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	alpha-Endosulfan T. ug/l 34361	Endrin aldehyde T. ug/l 34366	Aldrin T. ug/l 39330	alpha-BHC T. ug/l 39337	beta-BHC T. ug/l 39338
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	006					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	007					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	008					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	009					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	000					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	001					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	002					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	003					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	004					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	005					
NPL 2 1201	Pine Creek outflow of North Park	8/20/2002	0845	000	L0.05	L0.05	L0.05	L0.05	L0.05
NPL 2 1601	North Fork of Pine Creek, outflow of Marshall Lake	8/20/2002	1000	000	L0.05	L0.05	L0.05	L0.05	L0.05

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	alpha-Endosulfan T. ug/l 34361	Endrin aldehyde T. ug/l 34366	Aldrin T. ug/l 39330	alpha-BHC T. ug/l 39337	beta-BHC T. ug/l 39338
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	000					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	001					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	002					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	003					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	004					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	005					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	006					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	007					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	008					
NPL d 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000	L0.05	L0.05	L0.05	L0.05	L0.05

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Lindane (gamma-BHC) T. ug/l 39340	Chlordane T. ug/l 39350	4,4'-DDD ug/l 39360	4,4'-DDE ug/l 39365	4,4'-DDT ug/l 39370
NPL 1 1105	Pine Creek inflow to North Park Lake	8/20/2002	0800	000	L0.05	L1	L0.05	L0.05	L0.05
NPL 1 2105	North Fork of Pine Creek, inflow to North Park Lake	8/20/2002	0930	000					
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000	L0.05	L1	L0.05	L0.05	L0.05
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1050	000					
NPL 1 2201	Irwan Run, inflow to Irwan Run Bay of North Park Lake	8/20/2002	0900	000					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	000					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	001					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	002					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	003					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	004					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	005					

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Lindane (gamma-BHC) T. ug/l 39340	Chlordane T. ug/l 39350	4,4'-DDD ug/l 39360	4,4'-DDE ug/l 39365	4,4'-DDT ug/l 39370
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	006					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	007					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	008					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	009					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	000					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	001					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	002					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	003					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	004					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	005					
NPL 2 1201	Pine Creek outflow of North Park	8/20/2002	0845	000	L0.05	L1	L0.05	L0.05	L0.05
NPL 2 1601	North Fork of Pine Creek, outflow of Marshall Lake	8/20/2002	1000	000	L0.05	L1	L0.05	L0.05	L0.05

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Lindane (gamma-BHC) T. ug/l 39340	Chlordane T. ug/l 39350	4,4'-DDD ug/l 39360	4,4'-DDE ug/l 39365	4,4'-DDT ug/l 39370
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	000					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	001					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	002					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	003					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	004					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	005					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	006					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	007					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	008					
NPL d 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000	L0.05	L1	L0.05	L0.05	L0.05

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Dieldrin T. ug/l 39380	Endrin T. ug/l 39390	Toxaphene T. ug/l 39400	Heptachlor T. ug/l 39410	Heptachlor epoxide T. ug/l 39420
NPL 1 1105	Pine Creek inflow to North Park Lake	8/20/2002	0800	000	L0.05	L0.05	L2	L0.05	L0.05
NPL 1 2105	North Fork of Pine Creek, inflow to North Park Lake	8/20/2002	0930	000					
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000	L0.05	L0.05	L2	L0.05	L0.05
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1050	000					
NPL 1 2201	Irwan Run, inflow to Irwan Run Bay of North Park Lake	8/20/2002	0900	000					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	000					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	001					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	002					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	003					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	004					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	005					

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Dieldrin T. ug/l 39380	Endrin T. ug/l 39390	Toxaphene T. ug/l 39400	Heptachlor T. ug/l 39410	Heptachlor epoxide T. ug/l 39420
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	006					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	007					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	008					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	009					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	000					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	001					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	002					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	003					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	004					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	005					
NPL 2 1201	Pine Creek outflow of North Park	8/20/2002	0845	000	L0.05	L0.05	L2	L0.05	L0.05
NPL 2 1601	North Fork of Pine Creek, outflow of Marshall Lake	8/20/2002	1000	000	L0.05	L0.05	L2	L0.05	L0.05

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Dieldrin T. ug/l 39380	Endrin T. ug/l 39390	Toxaphene T. ug/l 39400	Heptachlor T. ug/l 39410	Heptachlor epoxide T. ug/l 39420
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	000					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	001					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	002					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	003					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	004					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	005					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	006					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	007					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	008					
NPL d 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000	L0.05	L0.05	L2	L0.05	L0.05

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Methoxychlor T. ug/l 39480	Wave Height WMO 70222	H.Perox.Acid CaCO3 mg/l 70508	Mercury T. ug/l 71900	Beta-Endosulfan ug/l 82624
NPL 1 1105	Pine Creek inflow to North Park Lake	8/20/2002	0800	000	L0.05			L0.2	L0.05
NPL 1 2105	North Fork of Pine Creek, inflow to North Park Lake	8/20/2002	0930	000				L0.2	
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000	L0.05			L0.2	L0.05
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1050	000					
NPL 1 2201	Irwan Run, inflow to Irwan Run Bay of North Park Lake	8/20/2002	0900	000					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	000		0			
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	001					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	002					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	003				L0.2	
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	004					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	005					

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Methoxychlor T. ug/l 39480	Wave Height WMO 70222	H.Perox.Acid CaCO3 mg/l 70508	Mercury T. ug/l 71900	Beta-Endosulfan ug/l 82624
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	006					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	007					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	008					
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	009			-62.4309	L0.2	
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	000		0			
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	001					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	002					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	003				L0.2	
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	004					
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	005					
NPL 2 1201	Pine Creek outflow of North Park	8/20/2002	0845	000	L0.05			L0.2	L0.05
NPL 2 1601	North Fork of Pine Creek, outflow of Marshall Lake	8/20/2002	1000	000	L0.05			L0.2	L0.05

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Methoxychlor T. ug/l 39480	Wave Height WMO 70222	H.Perox.Acid CaCO3 mg/l 70508	Mercury T. ug/l 71900	Beta-Endosulfan ug/l 82624
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	000		0			
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	001					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	002					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	003				L0.2	
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	004					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	005					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	006					
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	007			-51.5557	L0.2	
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	008					
NPL d 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000	L0.05			L0.2	L0.05

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Scattered Light % D0031	Field Turbidity NTU F0076
NPL 1 1105	Pine Creek inflow to North Park Lake	8/20/2002	0800	000		20.2
NPL 1 2105	North Fork of Pine Creek, inflow to North Park Lake	8/20/2002	0930	000		7.2
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000		9.36
NPL 1 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1050	000		
NPL 1 2201	Irwan Run, inflow to Irwan Run Bay of North Park Lake	8/20/2002	0900	000		10.8
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	000	100	46.8
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	001	34.6154	49.3
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	002	9.0385	49.2
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	003	2.5	50.2
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	004	0.7308	51.3
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	005	0.2115	52.6

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Scattered Light % D0031	Field Turbidity NTU F0076
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	006		55.3
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	007		88.5
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	008		91.9
NPL 2 1002	North Park Lake, at mid-channel, 50 feet upstream of the Dam	8/20/2002	1245	009		135
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	000	100	43.7
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	001	62.5	47
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	002	10.7143	45.8
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	003	2.1429	53
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	004	0.5	48.8
NPL 2 1003	Pine Creek Arm of North Park Lake, at mid-channel	8/20/2002	1330	005	0.4464	54.4
NPL 2 1201	Pine Creek outflow of North Park	8/20/2002	0845	000		90.8
NPL 2 1601	North Fork of Pine Creek, outflow of Marshall Lake	8/20/2002	1000	000		19.5

TABLE 7
Pine Creek Basin, North Park
Physical and Chemical Water Quality Analyses
August 20, 2002

Sampling Station Code	Location	Date	Time	Depth	Scattered Light % D0031	Field Turbidity NTU F0076
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	000	100	49.1
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	001	25	48.9
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	002	6.2	52
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	003	2	52
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	004	0.62	53.8
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	005	0.2	56
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	006		60.3
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	007		60.3
NPL 2 2001	North Fork of Pine Creek Arm of North Park Lake	8/20/2002	1135	008		88.1
NPL d 2109	North Fork of Pine Creek, inflow to Marshall Lake	8/20/2002	1030	000		

TABLE 8
North Park Lake
Sediment Nutrient Analyses
For a Sampling Site Located 10 Feet Upstream of Pine Creek Dam
March 2002

nutrient	nutrient concentration	yd3 or tons sediment slated for removal	% of total	tons of nutrients
Nitrogen as Nitrite NO_2	< 0.97 mg/Kg	4000000	0.00000097	3.88
Total Kjeldahl Nitrogen	2190 mg/Kg	4000000	0.00219	8760
Total Phosphorous	539 mg/Kg	4000000	0.000539	2156
Total Organic Carbon	14,700 mg/Kg			
Percent Solids	51.40%			

Sample was a composite of representative soil from the top of sediment through a depth of 5 feet. The soil material was described as a very soft greenish grey clay, CL type soil, with high moisture and low plasticity, with increased plasticity and

TABLE 9
Pine Creek Basin, North Park, Riparian Vegetation Survey
Sampling Reaches
July 2000 and September 2002

Reach #	Stream/Lake	Community Type	Descending Bank	Location
	North Partk Lake			
2	Irwin Run Bay	emergent, wooded	left	
4	Irwin Bay	emergent, wooded	upstream end	
5	Irwin Bay	wooded	right	
6	First right descending bank, unnamed tributary to the Pine Creek Arm of North Park Lake	emergent	right	Ingomar Grove
7	Pine Creek Arm of North Park Lake	emergent	right	From dam upstream to steep sloped bank
3	Pine Creek Arm of North Park Lake	emergent, scrub/shrub	left	Braded area at upstream end of Arm
8	Pine Creek Dam	emergent wooded		Upstream side of dam
9	North Fork of Pine Creek Arm of North Park Lake	emergent, wooded	left	0.5 mile downstream of boathouse
10	North Fork of Pine Creek Arm of North Park Lake	emergent, scrub/shrub	left	Upstream of boathouse
11	North Fork of Pine Creek Arm of North Park Lake	emergent	left	From the North Park boathouse, downstream 500 feet
	North Fork of Pine Creek			
12	North Fork of Pine Creek		left	From the first small dam upstream of lake upstream to second small dam at the tennis court
13	North Fork of Pine Creek		left	From the 2nd small dam (at tennis court) upstream to Ingomar Road - McKinney Road Intersection
14	North Fork of Pine Creek		left and right	From the Ingomar Road - McKinney Road Intersection upstream to Mill Grove Road (includes maintenance building)
15	North Fork of Pine Creek		left	Mill Grove Road upstream to Marshall Dam
16	North Fork of Pine Creek		left	From the skating ring to Kummer Road. Includes North Dakota Grove
17	North Fork of Pine Creek		right	From the skating ring to Kummer Road
18	Marshall Lake, North Fork of Pine Creek		right	Marshall Lake from Marshall Dam upstream to Marshall Lake Island
19	North Fork of Pine Creek		right	From the first concrete fishing pier to Lake Shore Pavilion
	Pine Creek			
1	Pine Creek	emergent, scrub/shrub, wooded	right	100-200 feet upstream of lake
2	Pine Creek	emergent, scrub/shrub, wooded	left	100-200 feet upstream of lake

TABLE 10
Pine Creek Basin, North Park
Riparian Vegetation Inventory by Area and Vegetation Community
September 2002

Scientific Name		Common Name	Relative Abundance																	
			Entire Project Area	Pine Creek*			North Fork Pine Creek									North Fork Pine Creek Arm				
				undisturbed			undisturbed				disturbed				all sites	undisturbed			disturbed	all sites
			0-5 ft	0-3 ft emergent/ submerged	3-5 ft wooded	0-5 ft all sites	0-3 ft emergent/ submerged	3-5 ft wooded	0-1 ft intermittent Tributary	0-5 ft all sites	0-3 ft emergent/ submerged	3-5 ft wooded	0-5 ft Marshall Lake	0-5 ft all sites		0-3 ft emergent/ submerged	3-5 ft wooded	0-5 ft all sites	0-5 ft emergent/ submerged/wooded	
POLYPODIACEAE																				
Onoclea sensibilis	L.	sensitive fern	**scatt**				scatt		scatt	scat					scatt					
ACERACEAE																				
Acer negundo	L.	box-elder	**few**					few		few			few	few	few					
Acer nigrum	Michx. F	black maple	**few**																	
Acer rubrum	L.	red maple	**ab**					ab		ab	com	com		com	ab					
Acer saccharinum	L.	silver maple	**ab**		dom	dom		dom		dom	ab	dom	ab	ab	dom	few		few	dom	ab
Acer saccharum	Marsh all	sugar maple	**ab**									dom	occ	com	dom					
Acer platanoides	L.	Norway maple	**occ**									occ		occ	occ					
ANACARDIACEAE																				
Rhus typhina	L.	staghorn sumac	**ab**									ab		ab	ab		ab	ab	dom	dom
Toxicodendron (Rhus) radicans	(L.) Kuntz	poison-ivy	**com**													com		com		com
APIACEAE																				
Conium maculatum	L.	poison hemlock	**few**																	
Cicuta maculata ?	L	beaver-poison	**few**													few		few		few
Daucus carota	L	Queen-Anne's-lace, wild carrot	**ab**																	
APOCYNACEAE																				
Apocynum cannabinum	L.	Indian hemp	**com**													com		com		com
ASCLEPIADACEAE																				
Asclepias incarnata	L.	swamp milkweed	**ab**	ab		ab					ab			ab	ab	ab		ab		ab
Asclepias syriaca	L.	common milkweed	**few**																	
ARACEAE																				
Symplocarpus foetidus	(L.) Sal	skunk cabbage	**few**	occ		occ														
ASTERACEAE																				
Achillea millefolium	L.	common yarrow	**scatt**													scatt		scat		scatt
Ambrosia artemisiifolia	L.	common ragweed	**occ**								occ			occ	occ					
Arctium minus	(Hill) Bernh	common burdock	**com**								com			com	com	ab	ab	ab	ab	ab
Aster cordifolius (lowicanus)	L.	blue wood aster	**com**						com	com					com					
Aster paniceulata (simplex)	Willd.	panicled aster	**ab**				ab		ab	ab	ab		com	com	ab	ab		ab	ab	ab
Aster lateriflorus	(L.) Britton	calico aster; starved aster	**ab**													ab		ab	ab	ab
Aster pilosus	Willd.	white heath aster	**com**									com		com	com					

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yellow = exotic invasive
orange = exotic

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				undisturbed			undisturbed				disturbed				all sites	undisturbed			disturbed	all sites
			0-5 ft	0-3 ft	3-5 ft	0-5 ft	0-3 ft	3-5 ft	0-1 ft	0-5 ft	0-3 ft	3-5 ft	0-5 ft	0-5 ft		0-3 ft	3-5 ft	0-5 ft	0-5 ft	
				emergent/ submerged	wooded	all sites	emergent/ submerged	wooded	intermittent Tributary	all sites	emergent/ submerged	wooded	Marshall Lake	all sites		emergent/ submerged	wooded	all sites	emergent/ submerged/wooded	
Aster prenanthoides	Muhl. Ex Willd.	zig-zag aster	**com**				com			com					com					
Bidens cernua	L.	bur-marigold	**occ**													occ		occ	occ	occ
Bidens comosa (tripartita)	(A.Gray)	beggar-ticks	**ab**				ab			ab					ab				ab	ab
Bidens connata	Muhl. Ex	beggar-ticks	**com**								com			com	com	occ		occ	scatt	scatt
Bidens frondosa	L.	beggar ticks; stick-tights	**dom**								ab			ab	ab	ab		ab	ab	ab
Chrysanthemum Leucanthemum	L.	ox-eye daisy	**ab**								scatt			scat	scatt					
Cichorium intybus	L.	chicory; blue-sailors	**few**																	
Cirsium altissimum	(L.) Spreng.	tall thistle	**few**													few		few	few	few
Cirsium arvense	(L.) Scop.	Canada thistle	**com**	occ		occ										L. dom		L. dom	scatt	com
Erechtites hieracifolia	(L.) Raf.	pilewort	**few**					few		few					few					
Eupatorium fistulosum	Barratt	common Joe-Pye-weed	**com**								com			com	com					
Eupatorium perfoliatum	L.	boneset	**ab**	com		com	ab	com	ab	ab		com		com	ab	ab		ab		ab
Eupatorium rugosum	Houtt.	white snakeroot	**dom**					dom		dom	com	dom		com	dom					
Euthamia graminifolia	(L.) Nutt.	grass-leaved goldenrod	**com**				com			com		com		com	com					
Gnaphalium uliginosum	L.	low cudweed	**occ**				occ			occ	occ			occ	occ					
Helenium autumnale	L.	common sneezeweed	**ab**				occ			occ	com			com	com	ab		ab		ab
Helianthus tuberosus	L.	thin-leaved sunflower	**occ**									occ		occ	occ					
Helianthus strumosus ?	L	rough-leaved sunflower	**few**													few		few		few
Rudbeckia laciniata	L.	tall or cutleaf coneflower	**com**								occ			occ	occ					
Rudbeckia triloba	L.	three-lobed sunflower	**com**					com		com					com					
Solidago altissima (canadensis)	L.	Canada (tall) goldenrod	**ab**					ab	com	com		com		com	com					
Solidago bicolor	L.	silver-rod, white goldenrod	**few**																	
Solidago patua	Muhl. Ex	spreading goldenrod	**com**				com			com					com					
Solidago rugosa	Mill.	wrinkle-leaf goldenrod	**sactt**				scat			scat					scatt					
Taraxacum officinale	Weber	common dandelion	**ab**																	
Tussilago farfara	L.	coltsfoot	**few**																few	few
Verbesina alternifolia	(L.) Britton	wingstem	**dom**	dom	dom	dom	dom	dom	ab	dom	dom	dom	com	dom	dom	ab	dom	dom	dom	dom
Veronia fasciculata	(L.) Nutt.	New York ironweed	**com**								com		com	com	com	ab	ab	ab		ab
Veronia gigantea (altissima)	(Walter) Trel.	tall ironweed	**scatt**																	
Xanthium strumarium	L.	common cocklebur	**scatt**								occ			occ	occ					

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September 2002

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				undisturbed			undisturbed				disturbed				all sites	undisturbed			disturbed	all sites
			0-5 ft	0-3 ft	3-5 ft	0-5 ft	0-3 ft	3-5 ft	0-1 ft	0-5 ft	0-3 ft	3-5 ft	0-5 ft	0-5 ft		0-3 ft	3-5 ft	0-5 ft	0-5 ft	
				emergent/ submerged	wooded	all sites	emergent/ submerged	wooded	intermittent Tributary	all sites	emergent/ submerged	wooded	Marshall Lake	all sites		emergent/ submerged	wooded	all sites	emergent/ submerged/wooded	
BALSMINACEA																				
Impatiens capsenis	Meerb	jewelweed, spotted touch-me-not	**dom**	dom	dom	dom		dom	com	com	dom	ab		dom	dom	com		com		com
Impatiens pallida	nutt.	pale jewelweed, touch-me-not	**com**	ab		ab		com		com					com					
BETULACEAE																				
Alnus glutinosa	(L.) Gaert	European alder	**few**																	
Alnus serrulata	(Dran d. Ex	smooth alder	**dom**		ab	ab		dom		dom	dom	dom	ab	dom	dom	dom		dom	dom	dom
Betula alleghaniensis	Britton	yellow birch	**L. dom**																	
Betula lenta	L.	sweet birch	**few**																	
Corylus americana	Walter	Americal filbert	**few**									few		few	few				few	few
BIGNONIACEAE																				
Catalpa bignonioides	Walter	catalpa; Indian-bean	**com**																	com
Catalpa speciosa	(Warde r ex	catalpa; cigar-tree	**com**									ab		ab	com					
BORAGINACEAE																				
Myosotis scorpioides	L.	forget-me-not	**dom**	dom		dom			ab	ab	ab			ab	ab	dom		dom		dom
Hackelia virginiana	(L.) I.M. Jonst.	beggar's-lice; stickseed	**few**				com			com					com					
BRASSICACEAE																				
Alliaria petiolata (officinalis)	(M. Bieb.)	garlic-mustard	**dom**	ab		ab						dom		dom	dom					
Lepidium virginicum	L.	poor-man's pepper; wild	**few**																	
Nasturtium officianle	R. Br.	watercress	**occ**	occ		occ														
Rorppia sylvestris	(L.) Be	creeping yellowcress	**com**	com		com														
CAMPANULACEAE																				
Lobelia inflata	L.	indian-tobacco	**occ**								occ			occ	occ	occ		occ		occ
Lobelia siphilitica	L.	great blue lobelia	**ab**				ab			ab	ab			ab	ab					
CAPRIFOLIACEAE																				
Lonicera japonica	Thunb	Japanese honeysuckle	**dom**								dom	dom		dom	dom		dom	dom		dom
Lonicera maackii	(Rupr.) A. Gray	amur honeysuckle	**dom**										dom	dom	dom	dom		dom	dom	ab
Lonicera morrowi		Morrow's honeysuckle	**occ**									occ		occ	occ					
Lonicera tatarica	L.	tartarian honeysuckle	**occ**		few	few						occ		occ	occ				occ	occ
Sambucus canadensis	L.	common elder; American elder	**com**	ab		ab	com			com		occ		occ	occ		com	com		com
Viburnum lentago	L.	nannyberry; sheepberry	**occ**									occ		occ	occ					

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			0-5 ft	0-3 ft	3-5 ft	0-5 ft	0-3 ft	3-5 ft	0-1 ft	0-5 ft	0-3 ft	3-5 ft	0-5 ft	0-5 ft		0-3 ft	3-5 ft	0-5 ft	0-5 ft	
				emergent/ submerged	wooded	all sites	emergent/ submerged	wooded	intermittent Tributary	all sites	emergent/ submerged	wooded	Marshall Lake	all sites		emergent/ submerged	wooded	all sites	emergent/ submerged/wooded	
Viburnum	L.	black-haw	few																	
Viburnum	Fernald	smooth (northern) arrow-wood	dom	dom		dom	ab	dom	few	ab	dom	dom	ab	dom	dom	dom	dom	dom	dom	dom
Viburnum opulus	L.	Guelder-rose; snowball	occ									occ		occ	occ					
CELASTRACEAE																				
Celastrus orbiculatus	Thunb	oriental bittersweet	com					occ		occ		com		com	com		L. dom	L. dom	occ	com
CONVOLVULACEAE		morning glory family																		
Calystegia sepium	(L.) R. Br.	hedge bindweed	occ	com		com	scatt			scat		occ		occ	occ					
CORNACEAE																				
Cornus amomum	Mill.	kinnikinik; red-willow	dom		dom	dom	ab	dom		ab	dom	ab	ab	ab	dom	ab		ab	dom	dom
Cornus florida	L.	flowering dogwood	scatt																	
Cornus stolonifera (sericea)	L.	red-osier dogwood	few										few	few	few					
Cornus racemosa	Lam.	panicled dogwood; swamp dogwood	ab	ab	ab	ab					dom			dom	dom	ab		ab	ab	ab
Nyssa sylvatica	Marsh.	blackgum	occ									occ		occ	occ					
CUCURBITACEAE																				
Echinocystis lobata	(Michx.) Torr.	prickley cucumber; wild balsam apple	occ					occ		occ					occ					
Sicyos angulatus	L.	one-seeded bur cucumber	occ		occ	occ														
CUSCUTACEAE																				
Cuscuta grovonii	Willd. E	common dodder	L. ab	ab		ab														
DIPSACACEAE																				
Dipsacus sylvestris	Huds.	common teasel	com										ab	ab	com	scatt		scat		scatt
ELEAGNACEAE																				
Elaeagnus umbellata	Thunb	autumn-olive	occ						few	few			dom	dom	com					
EUPHORBIACEAE																				
Acalypha rhomboidea	Raf.	three-seeded mercury	ab				com			com	ab			ab	ab	ab		ab	ab	ab
FABACEAE																				
Apios americana	Medik	ground-nut, wild bean	com																	
Coronilla varia	L.	crown-vetch	ab									com		com	com	L. dom		L. dom		L. dom
Desmodium canadense	(L.) DC	showy tick-trefoil	ab	ab		ab					com			com	com					
Robinia pseudo-acacia	L.	black locust	ab	dom	dom	dom			ab	ab		ab		ab	ab		ab	ab		ab
FAGACEAE																				
Quercus alba	L.	white oak	com													com		com		com

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			0-5 ft	0-3 ft	3-5 ft	0-5 ft	0-3 ft	3-5 ft	0-1 ft	0-5 ft	0-3 ft	3-5 ft	0-5 ft	0-5 ft		0-3 ft	3-5 ft	0-5 ft	0-5 ft	
				emergent/ submerged	wooded	all sites	emergent/ submerged	wooded	intermittent Tributary	all sites	emergent/ submerged	wooded	Marshall Lake	all sites		emergent/ submerged	wooded	all sites	emergent/ submerged/wooded	
Querqus bicolor	Willd.	swamp white oak	**few**									few		few	few					
Querqus imbricaria	Michx.	shingle oak	**dom**					com	ab	ab		ab		ab	ab	ab		ab	ab	ab
Quercus rubra	L.	northern red oak	**com**									com		com	com				few (imm)	few
HALORAGACEA																				
Myriophyllum spicatum	L.	Eurasian water-milfoil	**dom**								L. dom			L. dom	L. dom	dom		dom		dom
HAMAMELIDACEAE																				
Hamamelis virginiana	L.	witch-hazel	**occ**					occ		occ										
HYDRANGEACEAE																				
Hydrangea arborescens	L.	seven-bark; wild hydrangea	**occ**		occ															
JUGLANDACEAE																				
Carya laciniosa	(F. Michx.)	shellbark hickory	**few**																	
Carya ovata	(Mill.) K.	shagbark hickory	**ab**									com		com	com					
Juglans cinera	L.	butternut	**occ**									occ		occ	occ					
Juglans nigra	L.	black walnut	**ab**									ab		ab	ab					
LAMIACEAE																				
Glechoma hederacea	L.	gill-over-the-ground; ground-ivy	**com**																com	com
Lycopus americanus	Muhl. Ex. W.	water-horehound	**dom**	dom		dom			ab	ab	ab			ab	ab	dom		dom		dom
Lycopus uniflorus	Michx.	northern bugleweed; water-horehound	**com**	ab		ab					com			com	com	com		com	com	com
Lycopus virginicus	L.	bugleweed, water-horehound	**ab**	ab		ab			ab	ab					ab					
Mentha arvensis	L.	field mint	**com**	ab		ab					com			com		com		com		com
Mentha spicata	L.	spearmint	**few**				occ			occ										
Mentha x piperata		peppermint	**ab**	ab		ab	com		scatt	com	occ			occ	com	ab		ab		ab
Prunella vulgaris	L.	heal-all; self-heal	**scatt**								scatt			scat	scatt					
Scutellaria lateriflora	L.	mad-dog skullcap	**com**	ab		ab	com			com					com	occ		occ	occ	occ
Teucrium canadense	L. var.	American germander; wood-	**occ**	ab	ab	ab	com			com	occ			occ	com					
LAURACEAE																				
Lindera benzoin	(L.)	spicebush	**occ**																	
Sassafras albidum	(Nutt.)	sassafras	**occ**														occ	occ		
LYTHRACEAE																				
Lythrum salicaria	L.	purple loosestrife	**com**																	
MAGNOLIACEAE																				
Liriodendron	L.	tuliptree; yellow poplar	**few**									few		few	few					
MALVACEAE																				
Hisbiscus	L.	swamp-mallow	**few**																	

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				undisturbed			undisturbed				disturbed				all sites	undisturbed			disturbed	all sites
			0-5 ft	0-3 ft	3-5 ft	0-5 ft	0-3 ft	3-5 ft	0-1 ft	0-5 ft	0-3 ft	3-5 ft	0-5 ft	0-5 ft		0-3 ft	3-5 ft	0-5 ft	0-5 ft	
				emergent/ submerged	wooded	all sites	emergent/ submerged	wooded	intermittent Tributary	all sites	emergent/ submerged	wooded	Marshall Lake	all sites		emergent/ submerged	wooded	all sites	emergent/ submerged/wooded	
MORACEAE																				
Morus rubra	L.	red mulberry	**scatt**														scatt	scat	few	scatt
NYMPHAEACEAE																				
Nuphar lutea	(L.)	splatterdock	**dom**													dom		dom		dom
Nymphaea odorata	Aiton	fragrant water-lily	**ab, L.**																	
OLEACEAE																				
Fraxinus americana	L.	white ash	**ab**					ab		ab		com		com	com	com	ab	ab		ab
Fraxinus	Marsh	green ash, red ash	**dom**					dom		dom		ab	dom	ab	dom	ab		ab	ab	ab
Ligustrum vulgare	L.	common privet	**ab**		occ	occ		L. ab		L. ab					L. ab					
ONAGRACEAE																				
Circaea lutetiana	L.	enchanter's-nightshade	**few**																	
Epiloblum coloratum	Biehlle	purple-leaved willow-herb	**com**				com	com	com	com	com			com	com	ab		ab		ab
Ludwigia palustris	(L.)	marsh-purslane	**dom**	dom		dom	dom			dom	ab			ab	ab	dom		dom	dom	dom
Ludwigia peploides	(Kunth	primrose-willow	**L. dom**																	
Oenothera biennis	L.	common evening-primrose	**ab**				ab			ab					com	ab		ab		ab
PHYTOLACCACEA																				
Phytolacca	L.	pokeweed	**occ**								occ			occ	occ					
PINACEAE																				
Larix laricina	(Du	tamarack	**few**																few	few
Pinus resinosa	Aiton	Norway pine	**few**													few	few	few		few
Pinus strobus	L.	eastern white pine	**occ**									occ		occ	occ					
Tusga canadensis	(L.)	eastern hemlock	**occ**																occ	occ
PLANTAGINACEAE																				
Plantago lanceolata	L.	English plantain; ribgrass	**occ**						occ	occ					occ					
Plantago major	L.	broadleaf plantain	**com**													occ		occ	com	com
PLATANACEAE																				
Platanus	L.	sycamore; buttonwood	**com**					few		few		ab		ab	com					
POLYGONACEAE																				
Polygonum	Blume	Asiatic water pepper	**com**								com			com	com					
Polygonum	L.	water-pepper	**ab**																	
Polygonum	Michx.	mild water-pepper	**ab**				ab			ab					ab	ab		ab		ab
Polygonum	L.	lady's-thumb; heart's-ease	**com**				ab			ab					com					
Polygonum	L.	Pennsylvania smartweed	**ab**				com			com		com		com	com					
Polygonum	Elliot	water smartweed; dotted	**dom**	dom		dom	com	ab	ab	ab	ab			ab	ab					
Polygonum	L.	arrow-leaved tearthumb	**dom**	dom		dom	dom		dom	dom	dom	ab		ab	dom	ab		ab		ab
Polygonum	L.	climbing false buckwheat	**com**				occ			occ					occ	occ		occ	occ	occ
Polygonum	L.	Virginia knotweed; jumpseed	**com**									com		com	com					
Rumex altissimus	A. W.	tall dock	**occ**	com		com														
Rurnex crispus	L.	curly dock	**com**									com		com	com				com	com

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			0-5 ft	0-3 ft	3-5 ft	0-5 ft	0-3 ft	3-5 ft	0-1 ft	0-5 ft	0-3 ft	3-5 ft	0-5 ft	0-5 ft		0-3 ft	3-5 ft	0-5 ft	0-5 ft	
				emergent/ submerged	wooded	all sites	emergent/ submerged	wooded	intermittent Tributary	all sites	emergent/ submerged	wooded	Marshall Lake	all sites		emergent/ submerged	wooded	all sites	emergent/ submerged/wooded	
Rumex obtusifolius	L.	broad-leaf dock; bitter dock	**occ**	com		com														
PONTEDERIACEA																				
Pontederia cordata	L.	pickerel-weed	**L. dom**								occ, L. dom			L. dom	L. dom	L. dom		L. dom		L. dom
PRIMULACEAE																				
Lysimachia	L.	creeping-Charlie; moneywort	**occ**	ab		ab					occ			occ						
RANUNCULACEAE																				
Clematis virginiana	L.	Virgin's-bower	**occ**				occ			occ					occ					
Ranunculus repens	L.	creeping buttercup	**occ**	com		com					occ			occ						
Thalictrum dioicum	L.	early meadow-rue	**few**																	
RHAMNACEAE																				
Rhamnus frangula	L.	alder buckthorn	**occ**									occ		occ	occ	occ		occ	few	occ
ROSACEAE																				
Agrimonia	Wallr.	tall agrimony; harvest-lice	**occ**	com		com														
Agrimonia parviflora	Aiton	southern agrimony	**com**	com		com	com	com		com					com					
Amelanchier laevis ?	Weiga	smooth shadbush	**few**																	
Crataegus flabellata	(pach)	fan-leaf hawthorn	**few**																	
Crataegus	(L.f.)	Washington hawthorn	**few**																	
Crataegus punctata	Jacq.	dotted thorn; white hawthorn	**occ**					com		com		scatt	occ	scat	occ					
Crategus monogyna	Jacq.	English hawthorn	**few**																	
Crategus pruinosa	(H. L.	frosted hawthorn	**few**									few		few	few					
Malus pumilia	Mill.	apple	**occ**													occ		occ		occ
Physocarpus	(L.)	ninebark	**dom**	dom	dom	dom		ab		ab		dom	ab	ab	ab	dom		dom	dom	dom
Potentilla norvegica	L.	strawberry-weed	**few**																few	few
Potentilla simplex	Michx.	old-field cinquefoil	**few**													few		few		
Prunus serotina	Ehrh.	wild black cherry	**dom**		dom	dom		dom		dom		ab	dom	dom	dom		dom	dom	ab	dom
Prunus virginiana	L.	choke cherry	**com**		occ	occ						occ	com	com	com					
Rosa multiflora	Thunb	multiflora rose	**com**		com	com		com		com	com	com	dom	dom	com	occ		occ	com	com
Rosa palustris	Marsh	swamp rose	**few**	com		com					few			few	few					
Rosa rugosa	Thunb	rugosa rose	**com**								occ			occ	occ					
Rosa setigera	Michx,	prairae rose	**few**						few	few					few					
Rubus	Porter	common blackberry	**com**					com		com		com		com	com		occ	occ		occ
Rubus occidentalis	L.	black-cap; black raspberry	**com**										occ	occ	occ					
RUBIACEAE																				
Galium aparine	L.	bedstraw; cleavers;	**com**	com		com														
Galium sp.		bedstraw	**com**																	
Galium tintorium	L.	bedstraw	**scatt**	com		com														
SALICACEAE																				
Populus deltoides	Marsh	cottonwood	**scatt**									occ		occ	occ	scatt		scat		scatt
Populus	Michx.	large-toothed aspen	**occ**										occ	occ	occ					

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				emergent/ submerged	wooded	all sites	emergent/ submerged	wooded	intermittent Tributary	all sites	emergent/ submerged	wooded	Marshall Lake	all sites		emergent/ submerged	wooded	all sites	emergent/ submerged/wooded	
Populus tremuloides	Michx.	quaking aspen	**occ**										occ	occ	occ					
Salix discolor	Muhl.	pussy willow	**few**					few		few										
Salix interior	Rowle	sandbar willow	**occ**	ab		ab		occ		occ	occ			occ	occ	occ		occ		occ
Salix nigra	Marsh	black willow	**dom**	dom	ab	ab		dom		dom	dom	ab		dom	dom	ab	ab	ab		ab
Salix purpurea	L.	basket willow	**occ**										occ	occ	occ					
SAXIFRAGACEAE																				
Penthorum sedoides	L.	ditch stonecrop	**few**	occ		occ														
SCROPHULARIACE																				
Mimulus ringens	L.	common monkey flower	**scatt**	com		com	scatt		dom	com	scatt			scat	scatt					
SOLANACEAE																				
Solanum carolinense	L.	horse-nettle	**scatt**								scatt			scat	scatt					
Solanum dulcamara	L.	deadly nightshade;	**ab**									ab		ab	ab					
Solanum nigrum	L.	black nightshade	**occ**								occ			occ	occ					
TILIACEAE																				
Tilia americana	L.	American linden; basswood	**com**					com		com			few	few	few					
Tilia heterophylla	Vent.	white basswood	**few**																	
ULMACEAE																				
Ulmus americana	L.	American elm	**com**									com		com	com	few		few		few
Ulmus pumila	L.	Siberian elm	**few**														few	few		few
Ulmus rubra	Muhl.	slippery elm; red elm	**ab**									ab		ab	ab	ab		ab		ab
URTICACEAE																				
Boehmeria cylindrica	(L.)	false nettle;bog-hemp	**dom**				dom	ab	com	ab	dom	dom		dom	dom	dom		dom		dom
Laporta canadense	(L.)	wood nettle	**occ**	ab		ab						com		com						
Pilea pumila	(L.) A.	clearweed	**few**																	
Urtica dioica	L.	stinging nettle	**few**					com		com					occ					
Urtica gracilis	(Aiton)	wild nettle	**com**				com	com		com					com					
VERBENACEAE																				
Verbina hastata	L.	blue vervain	**dom**	ab		ab	ab		ab	ab	com			com	ab					
Verbena urticifolia	L.	white vervain	**ab**					occ		occ	occ			occ	occ	com	dom	com	ab	dom
VIOLACEA																				
Viola sororia	Willd.	common blue violet	**occ**																occ	occ
VITACEAE																				
Ampelopsis	(Maxi	porcelain-berry	**occ**																	
Parthenocissus	(L.)	Virginia creeper	**ab**	com		com						com		com	com	ab	com	ab	ab	ab
Vitus aestivalis	Michx.	summer grape	**ab**				occ	ab		ab		ab	com	ab	ab					
Vitis riparia	Michx.	river-bank grape	**com**									com		com	com					
Vitus labrusca	L.	fox grape	**occ**		com	com														
ALISMATACEAE																				
Alisma subcordatum	L.	water-plantain	**com**	ab		ab														

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				emergent/ submerged	wooded	all sites	emergent/ submerged	wooded	intermittent Tributary	all sites	emergent/ submerged	wooded	Marshall Lake	all sites		emergent/ submerged	wooded	all sites	emergent/ submerged/wooded	
Sagittaria latifolia	Willd.	duck-potatoe, wapato	**ab**																	
CYPERACEAE																				
Carex lupina	Willd.	sedge	**ab**	ab		ab	ab			ab					ab					
Carex lurida	Wahle	sedge	**com**	ab		ab			com	com					com					
Carex normalis	Mack.	sedge	**ab**	ab		ab										ab		ab		ab
Carex scoparia	Schko	broom sedge	**ab**				ab		dom	ab					ab					
Carex sp.			**ab**					ab		ab					ab					
Carex vulpinoidea	Michx.	foxtail sedge	**dom**	ab		ab					ab			ab	ab	dom		dom		dom
Cyperus bitartitus	Torr.	umbrella sedge	**dom**						dom	dom	dom			dom	dom	ab		ab		ab
Cyperus esculentus	L.	yellow nutsedge	**dom**																	
Cyperus strigosus	L.	galingale; false nutsedge	**dom**				dom		dom	dom	dom			dom	dom	ab		ab		ab
Eleocharic acicularis	(L.)	needle spike-rush	**ab**																	
Eleocharis obtusa	(Willd.	spike-rush	**dom**						dom	dom					dom					
Scirpus atrovirens	Willd.	black bulrush	**com**						com	com	scatt			scat	com					
Scirpus cyperinus	(L.)	wool-grass	**com**						com	com					com					
Scirpus polyphyllus	Vahl	bulrush	**few**																	
Scirpus validus	Vahl	great bulrush	**com**						com	com	scatt			scat	com	scatt		scat		L. dom
IRIDACEAE																				
Iris pseudoacorus	L.	yellow iris	**dom**				ab		dom	dom	dom		ab	dom	dom	dom		dom	dom	dom
JUNEACEAE																				
Juncus acuminatus	Michx.	sharp-fruited rush	**com**	ab		ab														
Juncus dudley	Wiega	rush	**few**						few	few					few					
Juncus effusus	L.	soft rush, common rush	**dom**	dom		dom	ab		ab	ab	ab			ab	ab	ab		ab		ab
Juncus tenuis	Willd.	yard rush; path rush	**dom**	ab		ab	ab			ab	ab			ab	ab	dom		dom	ab	dom
LEMNACEAE																				
Lemna minor	L.	duckweed	**com**																	
POACEAE																				
Agrostis perennans	(Walte	autumn bent	**dom**				ab		dom	ab					dom	dom		dom		dom
Agrostis stolinifera	L.	carpet bentgrass	**com**				com			com					com					
Andropogon gerardii	Vitma	big bluestem	**com**									com		com						
Andropogon	L.	broom-sedge	**com**						ab	ab					com					
Cinna arundinacea	L.	wood reedgrass	**ab**				com	ab		ab		ab		ab	ab					
Dactylis glomerata	L.	orchard grass	**com**																	
Digitaria ischaemum	(Schre	smooth crabgrass	**occ**								occ			occ	occ					
Echinochloa	(L.)	barnyard grass	**ab**																	
Echinochloa	(P.	barnyard grass	**occ**								occ			occ	occ					
Elymus virginicus	L.	Virginia wild-rye	**com**				ab			ab	com			com	com	com		com	com	com
Eragrostis capillaris	(L.)	lacegrass	**ab**																	
Eragrostis hypnoides	(Lam.)	creeping lovegrass	**dom**																	

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Eragrostis	(Michx	Carolina lovegrass	**com**																	
Leersia oryzoides	(L.)	rice cutgrass	**dom**	dom		dom	dom		dom	dom					dom	dom		dom		dom
Leersia virginica	Willd.	white grass	**dom**	dom		dom														
Muhlenbergia	(Poir.)	wirestem muhly	**occ**					occ		occ					occ					
Muhlenbergia	J. F.	dropseed, nimble-will	**com**									com		com	com					
Panicum capillare	L.	witchgrass (airy)	**ab**					ab		ab					ab					
Panicum	L.	deer-tongue grass	**com**				com			com					com	com		com		com
Panicum	Michx.	smooth panic grass	**dom**								ab			ab	ab					
Panicum latifolium	L.	panic grass	**com**																	
Panicum sp. #2			**com**								com			com	com					
Panicum sp.#1 (tiny)		panic grass	**com**													com		com		com
Panicum virgatum	L.	switchgrass	**ab**									ab		ab	ab					
Phalaris	L.	reed canary grass	**com**	dom		dom	ab			ab		few		few	com					
Setaria geniculata ?	(Lam.) B	perennial foxtail	**occ**																	
Setaria glauca	(L.)	yellow foxtail	**com**								com			com	com					
Tridens flavus	(L.) A.	purpletop	**com**						ab	ab					com					
TYPHACEAE																				
Typha angustifolia	L.	narrow-leaf cattail	**occ**	ab		ab	L dom			L. dom					occ					
Typha latifolia	L.	broad-leaved cattail	**occ**	ab		ab			few	few					few					
Total # species			**265**	**58**	**18**	**68**	**52**	**43**	**39**	**102**	**69**	**68**	**26**	**134**	**170**	**77**	**19**	**86**	**46**	**97**
Total # native species			**199**	**47**	**15**	**54**	**44**	**38**	**34**	**87**	**50**	**53**	**20**	**98**	**130**	**62**	**15**	**69**	**33**	**73**
Total # exotic species			**66**	**11**	**3**	**14**	**8**	**5**	**5**	**15**	**19**	**15**	**6**	**36**	**40**	**15**	**4**	**17**	**13**	**24**
Total # exotic invasive species			**21**	**3**	**3**	**6**	**1**	**3**	**1**	**5**	**4**	**10**	**3**	**14**	**15**	**7**	**3**	**9**	**6**	**12**

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Scientific Name		Common Name	North Park Lake							Entire North Park Lake	Origin	Habitat	Wetland Indicator	PA Status**
			Pine Creek Arm				Irwin Bay							
			disturbed				undisturbed							
			0-3 ft	3-5 ft	0-5 ft	0-5 ft	0-3 ft	3-5 ft	0-5 ft					
			emergent/ submerged	wooded	tributary	all sites	emergent/ submerged	wooded	all sites					
POLYPODIACEAE														
Onoclea sensibilis	L.	sensitive fern					few	few	few	few	native	moist places	FACW	throughout
ACERACEAE														
Acer negundo	L.	box-elder									native	stream banks	FAC+	throughout
Acer nigrum	Michx. F	black maple						few	few	few	native	rich woods, riverbank	FACU	west
Acer rubrum	L.	red maple	com	com		com		ab	ab	mod	native	wet woods, moist are	FACW	throughout
Acer saccharinum	L.	silver maple	ab		ab	ab		com	com	ab	native	stream banks, alluvia	FACW	throughout
Acer saccharum	Marsh.	sugar maple						L. dom	L. dom	L. dom	native	moist woods, alluvial	FACU-	throughout
Acer platanoides	L.	Norway maple									Europe	floodplains	UPL	invasive
ANACARDIACEAE														
Rhus typhina	L.	staghorn sumac		com, L. dom		com				dom	native	open hillsides	UPL	throughout
Toxicodendron (Rhus) radicans	(L.) Kuntz	poison-ivy	com	com		com		com	com	mod	native	floodplains	FAC	throughout
APIACEAE														
Conium maculatum	L.	poison hemlock					few		few	few	Europe	floodplains, moist wo	FACW	throughout
Cicuta maculata ?	L	beaver-poison					few		few	few	native	stream banks, wet me	OBL	throughout
Daucus carota	L	Queen-Anne's-lace, wild carrot	dom		com	ab				ab	Eurasia	waste places	UPL	throughout
APOCYNACEAE														
Apocynum cannabinum	L.	Indian hemp			scatt	scatt				mod	native	thickets, fields, waste	FACU	throughout
ASCLEPIADACEAE														
Asclepias incarnata	L.	swamp milkweed	dom		com	ab	few		few	ab	native	floodplains, wet meac	OBL	throughout
Asclepias syriaca	L.	common milkweed		few		few				few	native	fields, waste places	FACU-	throughout
ARACEAE														
Symplocarpus foetidus	(L.) Sa	skunk cabbage									native	moist woods, swamps	OBL	common throughout
ASTERACEAE														
Achillea millefolium	L.	common yarrow								scat	Europe	waste places	FACU	throughout
Ambrosia artemisiifolia	L.	common ragweed					few		few	few	Europe	waste places	FACU	throughout
Arctium minus	(Hill) Bernh.	common burdock			scatt	scatt	few	scatt	scatt	ab	Eurasia	waste places	FACU-	throughout
Aster cordifolius (lowrianus)	L.	blue wood aster		scatt		scatt				scat	native	woods, meadows, roadsides		common
Aster paniculata (simplex)	Willd.	panicled aster	dom			dom	com		com	ab	native	old fields	FACW	throughout
Aster lateriflorus	(L.) Britton	calico aster; starved aster								ab	native	old fields, waste place	FACW-	throughout
Aster pilosus	Willd.	white heath aster									native	waste places	UPL	common

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			0-3 ft	3-5 ft	0-5 ft	0-5 ft	0-3 ft	3-5 ft	0-5 ft					
			emergent/ submerged	wooded	tributary	all sites	emergent/ submerged	wooded	all sites					
Aster prenanthoides	Muhl. Ex Willd.	zig-zag aster									native	swamps, low woods	FAC	throughout
Bidens cernua	L.	bur-marigold								occ	native	wet shores, ditches	OBL	throughout
Bidens comosa (tripartita)	(A.Gray)	beggar-ticks								ab	native	stream banks, pond e	FACW	throughout
Bidens connata	Muhl. Ex.	beggar-ticks					com		com	mod	native	moist meadows	FACW+	throughout
Bidens frondosa	L.	beggar ticks; stick-tights	dom		dom	dom	ab		ab	ab	native	low waste places	FACW	throughout
Chrysanthemum leucanthemum	L.	ox-eye daisy	dom			dom	few	scatt	scatt	ab	Europe	waste places, woods, meadows		throughout
Cichorium intybus	L.	chicory; blue-sailors					few		few	few	Europe	waste places		noxious weed
Cirsium altissimum	(L.) Spreng.	tall thistle								few	native	riverbanks, fields		throughout
Cirsium arvense	(L.) Scop.	Canada thistle		few		few				L. dom	Eurasia	waste places	FACU	noxious weed
Erechtites hieracifolia	Raf.	pilewort									native	disturbed ground	FACU	throughout
Eupatorium fistulosum		common Joe-Pye-weed	dom		few	com	scatt		scatt	mod	native	floodplains, moist thic	FACW	throughout
Eupatorium perfoliatum	L.	boneset	com			com	com		com	mod	native	floodplains, stream ba	FACW+	throughout
Eupatorium rugosum	Houtt.	white snakeroot	com		dom	dom				dom	native	rich woods		throughout
Euthamia graminifolia	(L.) Nutt.	grass-leaved goldenrod						few	few	few	native	moist fields, shores	FAC	throughout
Gnaphalium uliginosum	L.	low cudweed									Europe	moist woods, stream	FAC	throughout
Helenium autumnale	L.	common sneezeweed								ab	native	riverbanks, alluvial thi	FACW+	throughout
Helianthus decapetalus	L.	thin-leaved sunflower									native	bottomlands, stream	FACU	throughout
Helianthus strumosus ?	L	rough-leaved sunflower								few	native	stream banks		throughout
Rudbeckia laciniata	L.	tall or cutleaf coneflower					com		com	mod	native	floodplains, stream ba	FACW	throughout
Rudbeckia triloba	L.	three-lobed sunflower									native	old fields, rocky slope	FACU	scatt throughout
Solidago altissima (canadensis)	L.	Canada (tall) goldenrod					ab	com	ab	ab	native	low waste places	FACU	throughout
Solidago bicolor	L.	silver-rod, white goldenrod		few		few				few	native	dry woods	UPL	throughout
Solidago patua	Muhl. Ex.	spreading goldenrod									native	floodplains, moist wo	OBL	scatt throughout
Solidago rugosa	Mill.	wrinkle-leaf goldenrod									native	floodplains, waste pla	FAC	throughout
Taraxacum officinale	Weber	common dandelion									Europe	waste places	FACU-	throughout
Tussilago farfara	L.	coltsfoot	few			few				few	Europe	waste places	FACU	throughout
Verbesina alternifolia	(L.) Britton	wingstem	com	ab		ab	dom	dom	dom	dom	native	riverbanks, floodplain	FAC	frequent
Veronia noveboracensis	(L.) Willd.	New York ironweed								ab	native	floodplains, meadows	FACW+	throughout
Veronia gigantea (altissima)	(Walter) Trel.	tall ironweed	scatt	scatt		scatt				scat	native	floodplains, moist me	FAC	frequent
Xanthium strumarium	L.	common cocklebur	few			few	scatt		scatt	scat	Europe	waste places	FACU	throughout

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			emergent/ submerged	wooded	tributary	all sites	emergent/ submerged	wooded	all sites					
BALSMINACEA														
Impatiens capensis	Meerb	jewelweed; spotted touch-me-not			dom	dom	ab		ab	mod	native	stream banks, moist g	FACW	throughout
Impatiens pallida	nutt.	pale jewelweed; touch-me-not									native	stream banks, moist v	FACW	throughout
BETULACEAE														
Alnus glutinosa	(L.) Gaert	European alder			few	few				few	Eurasia	escaped	FACW-	occasional
Alnus serrulata	(Ait. d. Ex	smooth alder	com			com	ab		ab	dom	native	wet woods, swamps	OBL	common
Betula alleghaniensis	Britton	yellow birch						dom	dom	dom	native	cool, moist woods	FAC	N. higher elevations
Betula lenta	L.	sweet birch						few	few	few	native	stream banks	FACU	throughout
Corylus americana	Walter	Americal filbert						few	few	few	native	rich woods, edges	FACU-	throughout
BIGNONIACEAE														
Catalpa bignonioides	Walter	catalpa; Indian-bean			occ	occ				occ	south US	floodplains, waste pla	UPL	escaped, mostly south
Catalpa speciosa	(Warder ex	catalpa; cigar-tree									Gulf state	low woods, waste pla	FAC	escaped
BORAGINACEAE														
Myosotis scorpioides	L.	forget-me-not	dom			dom	com		com	dom	Europe	floodplains, stream ba	OBL	throughout
Hackelia virginiana	(L.) I.M. Jonst.	beggar's-lice; stickseed	few			few		few	few	few	native	moist woods, wooded	FACU	common throughout
BRASSICACEAE														
Alliaria petiolata (officinalis)	(M. Bieb.)	garlic-mustard					ab		ab	ab	Europe	floodplains, waste pla	FACU-	invasive
Lepidium virginicum	L.	poor-man's pepper; wild					few		few	few	Europe	waste places	FACU-	throughout
Nasturtium officianle	R. Br.	watercress					L. ab		L. ab	L. ab	Europe	quiet flowing water	OBL	throughout
Rorppia sylvestris	(L.) Be	creeping yellowcress									Europe	stream banks, waste	FACW	throughout
CAMPANULACEAE														
Lobelia inflata	L.	indian-tobacco								occ	native	old fields, meadows	FACU	throughout
Lobelia siphilitica	L.	great blue lobelia					scatt		scatt	scat	native	low wet places, strear	FACW+	throughout
CAPRIFOLIACEAE														
Lonicera japonica	Thunb	Japanese honeysuckle		dom		dom				dom	Asia	disturbed woods, ban	FAC-	invasive
Lonicera maackii	(Rupr.)	amur honeysuckle								dom	Asia	disturbed floodplains,		invasive
Lonicera morrowi	A. Gray	Morrow's honeysuckle									Japan	disturbed floodplains,	FACU	invasive
Lonicera tatarica	L.	tartarian honeysuckle								occ	Eurasia	disturbed woods, ban	FACU	invasive
Sambucus canadensis	L.	common elder; American elder					com		com	mod	native	rich moist soil, stream	FACW-	throughout
Viburnum lentago	L.	nannyberry; sheepberry						few	few	few	native	stream banks, moist v	FAC	throughout

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			emergent/ submerged	wooded	tributary	all sites	emergent/ submerged	wooded	all sites					
Viburnum	L.	black-haw						few	few	few	native	successional woods,	FACU	common
Viburnum recognitum	Fernald	smooth (northern) arrow-wood	com	few	com	com				dom	native	stream banks	FACW-	throughout
Viburnum opulus	L.	Guelder-rose; snowball						few	few	few	Europe	old fields, roadsides		escaped
CELASTRACEAE														
Celastrus orbiculatus	Thunb	oriental bittersweet		few		few				L. dom	Asia	disturbed edges	UPL	escaped
CONVOLVULACEAE		morning glory family												
Calystegia sepium	(L.) R. Br.	hedge bindweed	com			com				mod	rope/nati	waste places	FAC-	throughout
CORNACEAE														
Cornus amomum	Mill.	kinnikinik; red-willow	ab		ab	ab	dom	com	com	ab	native	swamps, streams	FACW	throughout
Cornus florida	L.	flowering dogwood						scatt	scatt	scat	native	edges	FACU-	throughout, not N
Cornus stolonifera (sericea)	L.	red-osier dogwood	com			com				mod	native	swamps, moist fields	FACW+	scatt
Cornus racemosa	Lam.	panicled dogwood, swamp dogwood					ab	ab	ab	ab	native	swampy meadows, n	FAC-	throughout
Nyssa sylvatica	Marshall	blackgum						few	few	few	native	moist woods	FAC	throughout
CUCURBITACEAE														
Echinocystis lobata	(Michx.) Torr.	prickley cucumber, wild balsam apple									native	alluvial soil, stream ba	FAC	throughout
Sicyos angulatus	L.	one-seeded bur cucumber									native	stream banks, waste	FACU	south, scatt
CUSCUTACEAE														
Cuscuta grovonii	Willd. E	common dodder									native	low wet areas		throughout
DIPSACACEAE														
Dipsacus sylvestris	Huds.	common teasel					com	few	few	scat	Europe	waste places	FACU-	throughout
ELEAGNACEAE														
Elaeagnus umbellata	Thunb	autumn-olive		few		few				few	Asia	open ground		serious weed
EUPHORBIACEAE														
Acalypha rhomboidea	Raf.	three-seeded mercury	dom			dom				ab	native	waste ground	FACU-	throughout
FABACEAE														
Apios americana	Medik	ground-nut, wild bean	com			com				mod	native	moist woods, floodpla	FACW	throughout
Coronilla varia	L.	crown-vetch	com			com		ab	ab	L. dom	Europe	planted highways		invasive
Desmodium canadense	(L.) DC	showy tick-trefoil	dom		scatt	dom				dom	native	open woods	FAC	frequent throughout
Robinia pseudoacacia	L.	black locust								ab	native	floodplains, open woo	FACU-	throughout
FAGACEAE														
Quercus alba	L.	white oak		com		com		few	few	mod	native	rich moist woods	FACU	throughout

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			emergent/ submerged	wooded	tributary	all sites	emergent/ submerged	wooded	all sites					
Querqus bicolor	Willd.	swamp white oak									native	swamps, low woods	FACW+	frequent
Querqus imbricaria	Michx.	shingle oak		dom	ab	dom		ab	ab	ab	native	moist woods	FAC	frequent
Quercus rubra	L.	northern red oak			few	few		com	com	few	native	woods	FACU-	throughout
HALORAGACEA														
Myriophyllum spicatum	L.	Eurasian water-milfoil	dom			dom	dom		dom	dom	Eurasia	1 to 3 meters deep in	OBL	invasive
HAMAMELIDACEAE														
Hamamelis virginiana	L.	witch-hazel									native	moist rocky woods	FAC-	throughout
HYDRANGEACEAE														
Hydrangea arborescens	L.	seven-bark; wild hydrangea						occ		occ	native	stream banks	FACU	
JUGLANDACEAE														
Carya laciniosa	(F. Michx. K	shellbark hickory						few	few	few	native	floodplains, bottomlar	FAC	mostly south
Carya ovata	(Will.)	shagbark hickory					dom	ab	dom	L. dom	native	moist woods	FACU	throughout
Juglans cinera	L.	butternut									native	rich woods	FACU+	throughout
Juglans nigra	L.	black walnut									native	floodplains, moist me	FACU	throughout
LAMIACEAE														
Glechoma hederacea	L.	gill-over-the-ground; ground-ivy								mod	Eurasia	waste places	FACU	throughout
Lycopus americanus	Muhl. Ex. W	water-horehound	dom		dom	dom	few		few	dom	native	moist thickets, swamp	OBL	throughout
Lycopus uniflorus	Michx.	northern bugleweed, water-horehound	dom			dom	com		com	mod	native	floodplains, lake marg	OBL	throughout
Lycopus virginicus	L.	bugleweed, water-horehound					com		com	mod	native	stream banks, moist v	OBL	throughout
Mentha arvensis	L.	field mint	occ			occ	few		few	mod	native	moist banks, meadow	FACW	throughout
Mentha spicata	L.	spearmint									Europe	stream banks, wet pa	FACW+	throughout
Mentha x piperata		peppermint	ab		com	ab	few		few	ab	Eurasia	stream banks, moist t	FACW+	throughout
Prunella vulgaris	L.	heal-all; self-heal	dom			dom				dom	Europe	waste places	FACU+	throughout
Scutellaria lateriflora	L.	mad-dog skullcap								occ	native	floodplains, wet wood	FACW+	throughout
Teucrium canadense	L. var.	American germander; wood-					scatt		scatt	scat	native	rich low places	FACW	throughout
LAURACEAE														
Lindera benzoin	(L.)	spicebush						occ		occ	native	streams, moist woods	FACW-	throughout except N
Sassafras albidum	(Nutt.)	sassafras						com		occ	native	edges, thickets	FACU-	throughout
LYTHRACEAE														
Lythrum salicaria	L.	purple loosestrife	com		few	com				mod	Europe	swamps, wet meadow	FACW+	noxious weed PA
MAGNOLIACEAE														
Liriodendron	L.	tuliptree; yellow poplar									native	rich soil	FACU	throughout not north
MALVACEAE														
Hisbiscus	L.	swamp-mallow	few			few				few	native	swamps, shallow wat	OBL	SE & W

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			emergent/ submerged	wooded	tributary	all sites	emergent/ submerged	wooded	all sites					
MORACEAE														
Morus rubra	L.	red mulberry		few		few				scat	native	moist alluvial soils	FACU	frequent
NYMPHAEACEAE														
Nuphar lutea	(L.)	splatterdock					few		few	dom	native	quiet waters	OBL	throughout
Nymphaea odorata	Aiton	fragrant water-lily	L. dom			L. dom	dom		dom	L. dom	native	quiet waters	OBL	throughout
OLEACEAE														
Fraxinus americana	L.	white ash	com	ab		ab		ab	ab	ab	native	rich moist woods	FACU	throughout
Fraxinus	Marsh	green ash, red ash					few	few	few	ab	native	alluvial woods, strean	FACW	throughout
Ligustrum vulgare	L.	common privet									Europe	disturbed	FACU	invasive
ONAGRACEAE														
Circaea lutetiana	L.	enchanter's-nightshade						few		few	native	floodplains	FACU	throughout
Epiloblum coloratum	Biehlle	purple-leaved willow-herb	com			com	scatt		scatt	ab	native	floodplains	FACW+	throughout
Ludwigia palustris	(L.)	marsh-purslane	dom		com	dom				dom	native	muddy shores, shallo	OBL	throughout
Ludwigia peploides	(Kunth	primrose-willow					L dom		L. dom	L. dom	native	muddy shores, shallo	OBL	rare
Oenothera biennis	L.	common evening-primrose	few	few		few				ab	native	cultivated fields, wast	FACU-	throughout
PHYTOLACCACEA														
Phytolacca	L.	pokeweed			occ	occ				occ	native	open ground	FACU+	throughout
PINACEAE														
Larix laricina	(Du	tamarack								few	native	sphagnum bogs	FACW	infrequent
Pinus resinosa	Aiton	Norway pine								few	native	dry slopes, mountain	FACU	north central, planted
Pinus strobus	L.	eastern white pine									native	forests	FACU	throughout
Tusga canadensis	(L.)	eastern hemlock								occ	native	moist woods, shaded	FACU	throughout
PLANTAGINACEAE														
Plantago lanceolata	L.	English plantain; ribgrass									Europe	waste places	UPL	throughout
Plantago major	L.	broadleaf plantain								mod	Europe	waste places	FACU	throughout
PLATANACEAE														
Platanus	L.	sycamore; buttonwood	com			com				mod	native	river banks, floodplair	FACW-	throughout
POLYGONACEAE														
Polygonum	Blume	Asiatic water pepper					com		com	mod	Asia	waste places	FACU	throughout
Polygonum	L.	water-pepper	ab		ab	ab	few		few	ab	Europe	stream edges	OBL	common
Polygonum	Michx.	mild water-pepper								ab	native	lake shores, streams	OBL	throughout
Polygonum	L.	lady's-thumb; heart's-ease					com		com	mod	Europe	waste places	FACW	ubiquitous weed
Polygonum	L.	Pennsylvania smartweed			dom	dom	few		few	ab	native	meadows, waste plac	FACW	throughout
Polygonum	Elliot	water smartweed; dotted	com			com	dom		dom	ab	native	wet places	OBL	throughout
Polygonum	L.	arrow-leaved tearthumb	com		ab	ab	com		com	ab	native	wet places, wet meac	OBL	throughout
Polygonum	L.	climbing false buckwheat						com	com	occ	native	waste places, moist tl	UPL	throughout
Polygonum	L.	Virginia knotweed; jumpseed	scatt			scatt		scatt	scatt	scat	native	rich woods, floodplair	FAC	throughout
Rumex altissimus	A. W.	tall dock									native	alluvial soils, river bar	FACW-	throughout
Rurnex crispus	L.	curly dock	dom		scatt	scatt	few		few	mod	Europe	waste places	FACU	common weed

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Rumex obtusifolius	L.	broad-leaf dock; bitter dock									Europe	waste places	FACU-	common weed
PONTEDERIACEA														
Pontederia cordata	L.	pickerel-weed	few			few				L. dom	native	lake edges	OBL	frequent
PRIMULACEAE														
Lysimachia	L.	creeping-Charlie; moneywort					occ		occ	occ	Europe	wet woods, floodplain	OBL	throughout
RANUNCULACEAE														
Clematis virginiana	L.	Virgin's-bower									native	low woods, stream ba	FAC	throughout
Ranunculus repens	L.	creeping buttercup					occ		occ	occ	Europe	meadows, stream bar	FAC	throughout
Thalictrum dioicum	L.	early meadow-rue						few	few	few	native	alluvial terraces	FAC	throughout
RHAMNACEAE														
Rhamnus frangula	L.	alder buckthorn		few	few	few		few	few	few	Europe	escaped, wet	FAC	invasive
ROSACEAE														
Agrimonia	Wallr.	tall agrimony; harvest-lice					occ		occ	occ	native	moist woods, floodpla	FACU	throughout
Agrimonia parviflora	Aiton	southern agrimony									native	moist woods	FACW	south
Amelanchier laevis ?	Weiga	smooth shadbush		few		few				few	native	rocky woods, roadsid	UPL	throughout
Crataegus flabellata	(pach)	fan-leaf hawthorn						few	few	few	native	rich hillsides, open wo	UPL	throughout
Crataegus	(L.f.)	Washington hawthorn		few		few				few	ve & plar	roadsides	FAC	occasional
Crataegus punctata	Jacq.	dotted thorn; white hawthorn									native	woods, alluvial banks		throughout
Crategus monogyna	Jacq.	English hawthorn		few		few				few	Eurasia	roadsides, waste plac	UPL	occasionally escaped
Crategus pruinosa	(H. L.	frosted hawthorn									native	open woods, thickets	UPL	throughout
Malus pumilia	Mill.	apple								occ	Eurasia	escaped, old fields	UPL	frequent
Physocarpus	(L.)	ninebark			ab	ab		com	com	dom	native	stream banks, wet wo	FACW-	throughout
Potentilla norvegica	L.	strawberry-weed								few	native	waste ground	FACU	throughout
Potentilla simplex	Michx.	old-field cinquefoil								few	native	woods, old fields	FACU-	throughout
Prunus serotina	Ehrh.	wild black cherry		ab		ab		dom	dom	dom	native	woods	FACU	throughout
Prunus virginiana	L.	choke cherry		few		few		few	few	few	native	woods, swamp board	FACU	throughout
Rosa multiflora	Thunb	multiflora rose		few, L.		few		few	few	mod	Asia	escaped, thickets	FACU	noxious weed PA
Rosa palustris	Marsh	swamp rose									native	swamps, marshes	OBL	throughout
Rosa rugosa	Thunb	rugosa rose		com		com		ab	ab	mod	Asia	cultivated	FACU-	occasionally escaped
Rosa setigera	Michx,	prairae rose									western U	escaped	FACU	adventive
Rubus	Porter	common blackberry								occ	native	old fields, clearings	FACU-	throughout
Rubus occidentalis	L.	black-cap; black raspberry		occ		occ				occ	native	woods, old fields		throughout
RUBIACEAE														
Galium aparine	L.	bedstraw; cleavers;									native	rich woods, stream ba	FACU	throughout
Galium sp.		bedstraw					com	com	com	mod	native			
Galium tintorium	L.	bedstraw					scatt		scatt	scat	native	stream banks, floodpl	OBL	throughout
SALICACEAE														
Populus deltoides	Marsh	cottonwood						few	few	scat	native	floodplains, swamps	FACU-	occassional, scatt
Populus	Michx.	large-toothed aspen									native	early successional for	FACU-	throughout

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com = common
scat = scattered
L. = locally

OBL= obligate
FAC= facultative
W = wet
U= upland
yellow = exotic invasive
orange = exotic

TABLE 10
Pine Creek Basin, North Park
Riparian Vegetation Inventory by Area and Vegetation Community
September 2002

Scientific Name		Common Name	North Park Lake								Origin	Habitat	Wetland Indicator	PA Status**
			Pine Creek Arm				Irwin Bay			Entire North Park Lake				
			disturbed				undisturbed							
			0-3 ft	3-5 ft	0-5 ft	0-5 ft	0-3 ft	3-5 ft	0-5 ft					
			emergent/ submerged	wooded	tributary	all sites	emergent/ submerged	wooded	all sites					
Populus tremuloides	Michx.	quaking aspen									native	disturbed wet open w		throughout
Salix discolor	Muhl.	pussy willow									native	swamps, wet woods	FACW	throughout
Salix interior	Rowle	sandbar willow	few			few				few	native	sandy bars, shores	OBL	throughout
Salix nigra	Marsh	black willow					ab	ab	ab	ab	native	stream banks, alluvia	FACW+	throughout
Salix purpurea	L.	basket willow									Europe	low ground		naturalized
SAXIFRAGACEAE														
Penthorum sedoides	L.	ditch stonecrop									native	low wet ground, ditch	OBL	throughout
SCROPHULARIACE														
Mimulus ringens	L.	common monkey flower									native	wet places, shores	OBL	throughout
SOLANACEAE														
Solanum carolinense	L.	horse-nettle									native	fields, stream banks	UPL	throughout
Solanum dulcamara	L.	deadly nightshade;	ab			ab				ab	Eurasia	moist waste places	FACU	common
Solanum nigrum	L.	black nightshade									Europe	moist waste places		common
TILIACEAE														
Tilia americana	L.	American linden; basswood		com	occ	com		ab	ab	mod	native	bottomlands	FACU	throughout
Tilia heterophylla	Vent.	white basswood						few	few	few	native	woods	FACU	occasional
ULMACEAE														
Ulmus americana	L.	American elm						few	few	few	native	rich woods	FACW	throughout
Ulmus pumila	L.	Siberian elm	few			few				few	Asia	escaped	UPL	invasive
Ulmus rubra	Muhl.	slippery elm; red elm		com		com	com	com	com	mod	native	rich soil	FAC-	throughout
URTICACEAE														
Boehmeria cylindrica	(L.)	false nettle;bog-hemp	com		ab	ab	ab	ab	ab	ab	native	wet woods, stream m	FACW+	throughout
Laporta canadense	(L.)	wood nettle									native	moist woods, stream	FAC	throughout
Pilea pumila	(L.) A.	clearweed									native	moist shady areas	FACW	throughout
Urtica dioica	L.	stinging nettle									Europe, nat	floodplains, moist are	FACU	throughout
Urtica gracilis	(Aiton)	wild nettle									Europe	floodplains, thickets	FACU	throughout
VERBENACEAE														
Verbina hastata	L.	blue vervain	dom		com	dom	scatt		scatt	ab	native	floodplains, moist pla	FACW+	throughout
Verbena urticifolia	L.	white vervain	few			few	few		few	mod	native	moist meadows, wast	FACU	common throughout
VIOLACEA														
Viola sororia	Willd.	common blue violet								occ	native	moist woods, swamps	FAC	throughout
VITACEAE														
Ampelopsis	(Maxi	porcelain-berry		occ		occ				occ	Asia	escaped		serious weed
Parthenocissus	(L.)	Virginia creeper	occ	ab		ab		ab	ab	ab	native	woods, fields, edges	FACU	throughout
Vitus aestivalis	Michx.	summer grape									native	wooded slopes	FACU	throughout
Vitis riparia	Michx.	river-bank grape		com		com		com	com	mod	native	stream banks, alluvia	FACW	throughout
Vitus labrusca	L.	fox grape						com	com	mod	native	stream banks	FACU	throughout not N
ALISMATACEAE														
Alisma subcordatum	L.	water-plantain	ab		ab	ab	few		few	ab	native	muddy shores	OBL	throughout

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TABLE 10
Pine Creek Basin, North Park
Riparian Vegetation Inventory by Area and Vegetation Community
September 2002

Scientific Name		Common Name	North Park Lake							Entire North Park Lake	Origin	Habitat	Wetland Indicator	PA Status**
			Pine Creek Arm				Irwin Bay							
			disturbed				undisturbed							
			0-3 ft	3-5 ft	0-5 ft	0-5 ft	0-3 ft	3-5 ft	0-5 ft					
			emergent/ submerged	wooded	tributary	all sites	emergent/ submerged	wooded	all sites					
Sagittaria latifolia	Willd.	duck-potatoe, wapato					ab		ab	L. ab	native	shallow water	OBL	throughout
CYPERACEAE														
Carex lupina	Willd.	sedge									native	wet woods	OBL	common throughout
Carex lurida	Wahle	sedge									native	wet meadows	OBL	throughout
Carex normalis	Mack.	sedge								ab	native	moist woods, meadov	FACU	throughout
Carex scoparia	Schko	broom sedge									native	wet places, ditches	FACW	throughout
Carex sp.											native			
Carex vulpinoidea	Michx.	foxtail sedge	dom			dom	com		com	dom	native	swampy places, ditch	OBL	throughout
Cyperus bitartitus	Torr.	umbrella sedge	dom		dom	dom	dom		dom	dom	native	muddy shores	FACW+	throughout
Cyperus esculentus	L.	yellow nutsedge					dom		dom	L. dom	native	moist ground weed	FACW	throughout, weed
Cyperus strigosus	L.	galingale; false nutsedge	dom		ab	dom	ab		ab	ab	native	damp places, stream	FACW	throughout
Eleocharic acicularis	(L.)	needle spike-rush	ab			ab				mod	native	shallow water, wet sh	OBL	throughout
Eleocharis obtusa	(Willd.	spike-rush	com		com	com				mod	native	muddy places	OBL	throughout
Scirpus atrovirens	Willd.	black bulrush	scatt			scatt				scat	native	swamps, meadows	OBL	throughout but rare N
Scirpus cyperinus	(L.)	wool-grass									native	swamps, wet meadov	FACW+	throughout
Scirpus polyphyllus	Vahl	bulrush					few		few	few	native	wooded streams	OBL	throughout
Scirpus validus	Vahl	great bulrush			few	few	scatt		scatt	scat	native	lake & pond margins	OBL	throughout
IRIDACEAE														
Iris pseudoacorus	L.	yellow iris	dom		ab	dom	L. ab		L. ab	dom	Europe	moist shores, shallow	OBL	frequent
JUNEACEAE														
Juncus acuminatus	Michx.	sharp-fruited rush					com		com	mod	native	wet fields, stream bar	OBL	throughout
Juncus dudley	Wiega	rush									native	wet fields, stream banks		occasional, mostly S
Juncus effusus	L.	soft rush, common rush	dom			dom				ab	native	floodplains, shores	OBL	throughout
Juncus tenuis	Willd.	yard rush; path rush	ab		ab	ab	dom		dom	ab	native	disturbed areas	FAC-	throughout
LEMNACEAE														
Lemna minor	L.	duckweed					com		com	mod	native	ponds, ditches, strear	OBL	throughout, not high
POACEAE														
Agrostis perennans	(Walte	autumn bent	com			com				ab	native	low ground	FACU	throughout
Agrostis stolinifera	L.	carpet bentgrass									Europe	wet meadows, shores	FACW	throughout
Andropogon gerardii	Vitma	big bluestem									native	swamps, moist mead	FAC-	throughout
Andropogon	L.	broom-sedge									native	waste places	FACU	mostly South
Cinna arundinacea	L.	wood reedgrass			com	com	com	occ	com	mod	native	swamps, wet woods	FACW	throughout
Dactylis glomerata	L.	orchard grass	dom			dom	few	few	few	ab	Europe	waste places	FACU	common throughout
Digitaria ischaemum	(Schre	smooth crabgrass					few		few	few	Eurasia	waste places	UPL	common throughout
Echinochloa	(L.)	barnyard grass					ab		ab	ab	Eurasia	weed, moist fields	FACU	common throughout
Echinochloa	(P.	barnyard grass									native	moist ground, alluvial	FACW+	throughout
Elymus virginicus	L.	Virginia wild-rye					few		few	mod	native	moist ground, stream	FACW-	throughout
Eragrostis capillaris	(L.)	lacegrass					ab		ab	L. ab	native	disturbed places		scatt
Eragrostis hypnoides	(Lam.)	creeping lovegrass					dom		dom	L. dom	native	wet shores, mudflats	OBL	occasional

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TABLE 10
Pine Creek Basin, North Park
Riparian Vegetation Inventory by Area and Vegetation Community
September 2002

Scientific Name		Common Name	North Park Lake							Entire North Park Lake	Origin	Habitat	Wetland Indicator	PA Status**
			Pine Creek Arm				Irwin Bay							
			disturbed				undisturbed							
			0-3 ft	3-5 ft	0-5 ft	0-5 ft	0-3 ft	3-5 ft	0-5 ft					
			emergent/ submerged	wooded	tributary	all sites	emergent/ submerged	wooded	all sites					
Eragrostis	(Michx	Carolina lovegrass	com			com				mod	native	waste places	FAC	throughout
Leersia oryzoides	(L.)	rice cutgrass			ab	ab	dom		dom	dom	native	streams, wet meadow	OBL	throughout
Leersia virginica	Willd.	white grass					dom	dom	dom	dom	native	swamps, moist woods	FACW	throughout
Muhlenbergia	(Poir.)	wirestem muhly						occ	occ	occ	native	moist woods, stream	FAC	common throughout
Muhlenbergia	J. F.	dropseed, nimble-will									native	waste places	FAC	throughout
Panicum capillare	L.	witchgrass (airy)									native	fields, shores	FAC-	throughout
Panicum	L.	deer-tongue grass								mod	native	moist woods, edges	FAC+	throughout
Panicum	Michx.	smooth panic grass	dom			dom				L. dom	pics/nati	low waste places	FACW-	throughout
Panicum latifolium	L.	panic grass					com		com	mod	native	shores, thickets	FACU-	throughout
Panicum sp. #2											native			
Panicum sp.#1 (tiny)		panic grass								mod	native			
Panicum virgatum	L.	switchgrass									native	alluvium, banks	FAC	
Phalaris	L.	reed canary grass	com			com	ab		ab	mod	rope/nati	alluvial meadows, sho	FACW	invasive
Setaria geniculata ?	(Lam.) B	perennial foxtail					com		com	mod	native	dry to moist open soil	FAC	mostly SE
Setaria glauca	(L.)	yellow foxtail									Europe	waste places	FAC	throughout
Tridens flavus	(L.) A.	purpletop									native	old fields	FACU	mostly south
TYPHACEAE														
Typha angustifolia	L.	narrow-leaf cattail					L. dom		L. dom	L. dom	native	wet meadows, shores	OBL	occasional, salted hig
Typha latifolia	L.	broad-leaved cattail					L. dom		L. dom	L. dom	native	wet meadows, shores	OBL	throughout
Total # species			**68**	**32**	**39**	**104**	**85**	**60**	**124**	**199**				
Total # native species			**50**	**22**	**29**	**74**	**60**	**51**	**94**	**149**				
Total # exotic species			**18**	**10**	**10**	**30**	**25**	**9**	**30**	**50**				
Total # exotic invasive species			**5**	**7**	**2**	**12**	**5**	**3**	**8**	**16**				

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com = common
scat = scattered
L. = locally

OBL= obligate
FAC= facultative
W = wet
U= upland
yellow = exotic invasive
orange = exotic

TABLE 11
Pine Creek Basin, North Park Riparian Vegetation Survey
Summary of Native, Exotic, and Invasive Riparian Vascular Plant Species
by Location
For All Species and All Dominant Species
July 2000 and September 2002

# Species	Entire Study Area	Pine Creek	North Fork Pine Creek			North Park Lake						Reference Sites		
						North Fork Pine Creek Arm			Pine Creek Arm	Irwin Bay	Entire North Park Lake	Glade Run	Nine Mile Run	
		Undisturbed	Undisturbed	Disturbed	Entire North Fork Pine Creek	Undisturbed	Disturbed	Entire North Fork Arm	Disturbed	Undisturbed		excellent	degraded	severely degraded
All Species														
Native	**199**	54	87	98	130	69	33	73	74	94	149	**307**	**139**	**32**
Exotic	**66**	14	15	36	40	17	13	24	30	30	50	**5**	**99**	**31**
Exotic Invasive	**22**	6	5	14	15	9	6	12	12	8	16	**0**	**15**	**13**
Total	**265**	68	102	134	170	86	46	97	104	124	199	**312**	**238**	**63**
% Native	**75.1**	79.4	85.3	73.1	76.5	80.2	71.7	75.3	71.2	75.8	74.9	**98.4**	**58.4**	**50.8**
% Exotic	**24.9**	20.6	14.7	26.9	23.5	19.8	28.3	24.7	28.8	24.2	25.1	**1.6**	**41.6**	**49.2**
% Exotic Invasive	**8.3**	8.8	4.9	10.4	8.8	10.5	13.0	12.4	11.5	6.5	8.0	**0.0**	**6.3**	**20.6**
% Total	**100.0**	25.7	38.5	50.6	64.2	32.5	17.4	36.6	39.2	46.8	75.1			
Dominant Species														
Native	**52**	15	14	11	20	14	8	19	19	17	26	**20**	**36**	**13**
Exotic	**15**	2	1	7	5	8	2	7	7	2	9	**0**	**17**	**14**
Exotic Invasive	**9**	1	0	6	4	6	1	4	2	2	6	**0**	**9**	**6**
Total	**67**	17	15	18	25	22	10	26	26	19	35	**20**	**53**	**27**
% Native	**77.6**	88.2	93.3	61.1	80.0	63.6	80.0	73.1	73.1	89.5	74.3	**100.0**	**67.9**	**48.1**
% Exotic	**22.4**	11.8	6.7	38.9	20.0	36.4	20.0	26.9	26.9	10.5	25.7	**0.0**	**32.1**	**51.9**
% Exotic Invasive	**13.4**	5.9	0.0	33.3	16.0	27.3	10.0	15.4	7.7	10.5	17.1	**0.0**	**17.0**	**22.2**
% Total	**100.0**	25.4	22.4	26.9	37.3	32.8	14.9	38.8	38.8	28.4	52.2			
Wetland Indicator														
# Upland (upl) species	**19**	0	5	10	12	4	3	5	9	3	13			
# weed species (UPL or all hydrologic regimes)	**9**	0	1	6	6	3	1	3	5	4	8			
# facultative upland species (facu)	**80**	15	21	37	48	24	17	30	26	34	60			
# facultative species (fac)	**39**	7	15	22	26	9	6	10	13	17	25			
# facultative wet species (facw)	**60**	19	36	38	45	24	13	26	27	34	48			
# obligate species (obl)	**46**	25	21	19	27	20	4	19	23	29	39			
no indicator wet hbabitats	**5**	2	1	1	3	1		1		0	1			
no indicator	**7**	0	2	1	3	2	1	2	1	2	5			
Total plants	**265**	**68**	**102**	**134**	**170**	**87**	**45**	**96**	**104**	**123**	**199**			
% wetland plants	**56.60**	**77.94**	**71.57**	**59.70**	**59.41**	**62.07**	**51.11**	**58.33**	**60.58**	**65.04**	**56.78**			

TABLE 12
Pine Creek Basin, North Park
Riparian Vegetation Survey
Summary of Origin and Wetland Status by Vegetation Community
September 2002

		aquatic bed	0 - 3 ft							3- 5 ft				
			emergent		scrub/shrub		canopy		All 0-3 ft	wooded 3-5 ft				
			emergent	% of Total	shrub/ scrub *	% of Total	canopy	% of Total		herbaceous	sub-canopy	canopy	All Wooded	% of Total
Origin	Total # species	5	148		18		10		181	66	35	42	143	
	Total # exotic species	2	42		5		0		49	17	11	4	32	
	Total # Native Species	3	106		13		10		132	49	24	38	111	
	% exotic species	40.0	28.4		27.8		0.0		27.1	25.8	31.4	9.5	22.4	
	Total # exotic invasive species	1	8		4		0		13	5	9	2	16	
	% of total species that are exotic invasive	20.0	5.4		22.2		0.0		7.2	7.6	25.7	4.8	11.2	
	% of Exotic species that are invasive	50.0	19.0		80.0		0.0		26.5	29.4	81.8	50.0	50.0	
	# dominant species	3	37		11		3		50	5	10	10	25	
	# dominant species exotic	1	8		2		0		10	1	5	0	7	
	% dominant species exotic	33.3	21.6		18.2		0.0		20.0	20.0	50.0	0.0	28.0	
	# dominant species invasive exotic	1	2		2		0		4	1	5	0	5	
	% dominant species invasive exotic	33.3	5.4		18.2		0.0		8.0	20.0	50.0	0.0	20.0	
	% dominant exotic species invasive exotic	100.0	25.0		100.0		0.0		40.0	100.0	100.0	0.0	71.4	
	% exotic invasive species that are dominant	100.0	25.0		50.0		0.0		30.8	20.0	55.6	0.0	31.3	
Wetland Indicator	# Upland (upl) species	0	7	4.73	0	0.00	0	0.00	7	4	3	3	10	6.99
	# pioneer species	0	2	1.35	0	0.00	0	0.00	2				0	0.00
	# weed species (UPL or any hydrologic regime)	0	0	5.03	1	5.56	1	10.00	2	2	5	2	9	6.29
	# facultative upland species (facu)	0	33	22.30	5	27.78	3	30.00	41	23	14	20	57	39.86
	# facultative species (fac)	0	19	12.84	4	22.22	1	10.00	24	19	5	8	32	22.38
	# facultative wet species (facw)	0	43	29.05	5	27.78	5	50.00	53	15	6	9	30	20.98
	# obligate species (obl)	5	39	26.35	3	16.67	0	0.00	47	2	2		4	2.80
	no indicator wet hbabitats	0	1	0.68	0	0.00	0	0.00	1					
	no indicator	0	4	2.70	0	0.00	0	0.00	4	1			1	0.70
	Total plants	4	148		18		10			66	35	42	143	
	% wetland plants	100		91.22		94.44		90.00						86.01

Table 13
Pine Creek Basin, North Park
Summary of Dominant Native and Exotic Ripartian Vascular Plant Species
By Location and Vegetation Community
September 2002

Origin	Scientific Name	Common Name	Relative Abundance															
			Pine Creek*		North Fork Pine Creek						North Park Lake							
											North Fork Pine Creek Arm			Pine Creek Arm			Irwin Bay	
			not disturbed		not disturbed			disturbed			not disturbed		disturbed	disturbed			not disturbed	
			0-3 ft	3-5 ft	0-3 ft	3-5 ft	0-1 ft	0-3 ft	3-5 ft	0-5 ft	0-3 ft	3-5 ft	0-5 ft	0-3 ft	3-5 ft	0-5 ft	0-3 ft	3-5 ft
			emergent/ submerged	wooded	emergent/ submerged	wooded	intermittent Tributary	emergent/ submerged	wooded	Marshall Lake	emergent/ submerged	wooded	emergent/ submerged/wooded	emergent/ submerged	wooded	tributary	emergent/ submerged	wooded
	Canopy																	
native	Acer saccharinum	silver maple		X		X			X				X					
native	Acer saccharum	sugar maple							X									X
native	Betula alleghaniensis (lutea)	yellow birch	X								X			X		X		
native	Carya ovata	shagbark hickory															X	
native	Fraxinus pennsylvanica	green ash, red ash				X				X								
native	Prunus serotina	wild black cherry		X		X				X		X						X
native	Querqus imbricaria	shingle oak													X			
native	Rhus typhina	staghorn sumac											X		X			
native	Robinia pseudo-acacia	black locust	X	X														
native	Salix nigra	black willow	X			X		X										
	Sub Canopy																	
exotic	Celastrus orbiculatus	oriental bittersweet										X						
exotic	Elaeagnus umbellata	autumn-olive								X								
exotic	Lonicera japonica	Japanese honeysuckle						X	X			X			X			
exotic	Lonicera maackii	amur honeysuckle								X	X		X					
exotic	Rosa multiflora	multiflora rose								X					X			
native	Alnus serrulata	smooth alder				X		X	X		X		X					
native	Cornus amomum	kinnikinik; red-willow		X		X		X					X				X	
native	Cornus racemosa	panicled dogwood						X										
native	Physocarpus opulifolius	ninebark	X	X					X		X		X					
native	Verbesina alternifolia	wingstem	X	X	X	X		X	X			X	X				X	X
native	Viburnum recognitum	smooth arrow-wood	X			X		X	X		X	X	X					
	Herbaceous																	
exotic	Alliaria petiolata (officinalis)	garlic-mustard							X									
exotic	Chrysanthemum leucanthemum	ox-eye daisy	X														X	X
exotic	Cirsium arvense	Canada thistle												X				
exotic	Coronilla varia	crown-vetch									X							
exotic	Dactylis glomerata	orchard grass									X							
exotic	Iris pseudoacorus	yellow iris												X				
exotic	Myosotis scorpioides	forget-me-not					X	X			X							
exotic	Myriophyllum spicatum	Eurasian water-milfoil	X		X						X		X	X				
exotic	Prunella vulgaris	heal-all; self-heal												X			X	
exotic	Rurnex crispus	curly dock					X	X			X		X	X				
native	Acalypha rhomboidea	three-seeded mercury	X								X			X				

Table 13
Pine Creek Basin, North Park
Summary of Dominant Native and Exotic Ripartian Vascular Plant Species
By Location and Vegetation Community
September 2002

Origin	Scientific Name	Common Name	Relative Abundance															
			Pine Creek*		North Fork Pine Creek						North Park Lake							
											North Fork Pine Creek Arm			Pine Creek Arm			Irwin Bay	
			not disturbed		not disturbed			disturbed			not disturbed		disturbed	disturbed			not disturbed	
			0-3 ft	3-5 ft	0-3 ft	3-5 ft	0-1 ft	0-3 ft	3-5 ft	0-5 ft	0-3 ft	3-5 ft	0-5 ft	0-3 ft	3-5 ft	0-5 ft	0-3 ft	3-5 ft
			emergent/ submerged	wooded	emergent/ submerged	wooded	intermittent Tributary	emergent/ submerged	wooded	Marshall Lake	emergent/ submerged	wooded	emergent/ submerged/wooded	emergent/ submerged	wooded	tributary	emergent/ submerged	wooded
native	Agrostis perennans	autumn bent						X			X			X			X	
native	Asclepias incarnata	swamp milkweed												X				
native	Aster lanceolata (simplex)	panicled aster															X	
native	Bidens frondosa	beggar ticks; stick-tights												X			X	
native	Boehmeria cylindrica	false nettle;bog-hemp												X				
native	Carex scoparia	broom sedge												X				
native	Carex vulpinoidea	foxtail sedge												X				
native	Cyperus bitartitus (rivularis)	umbrella sedge					X				X							
native	Cyperus esculentus	yellow nutsedge												X				
native	Cyperus strigosus	galingale; false nutsedge												X				
native	Desium canadense	showy tick-trefoil												X				
native	Eleocharis obtusa	spike-rush				X			X							X		
native	Eragrostis hypnoides	creeping lovegrass			X												X	
native	Eupatorium fistulosum	common Joe-Pye-weed												X				
native	Eupatorium rugosum	white snakeroot														X		
native	Impatiens capensis	spotted touch-me-not	X	X		X		X								X		
native	Juncus effusus	soft rush, common rush	X											X				
native	Juncus tenuis	yard rush; path rush															X	
native	Leersia oryzoides	rice cutgrass																X
native	Leersia virginica	white grass												X		X		
native	Ludwigia palustris	marsh-purslane			X			X	X		X							
native	Ludwigia peploides	primrose-willow															X	
native	Lycopus americanus	water-horehound	X														X	
native	Lycopus uniflorus	northern bugleweed									X			X				
native	Nuphar lutea	splatterdock												X				
native	Nymphaea odorata	fragrant water-lily									X							
native	Panicum dichotomiflorum	smooth panic grass					X	X						X		X	X	
native	Polygonum pensylvanicum	Pennsylvania smartweed	X		X		X	X										
native	Polygonum punctatum	water smartweed									X						X	
native	Polygonum sagittatum	arrow-leaved tearthumb															X	
native	Pontederia cordata	pickerel-weed			X		X	X						X				
native	Typha angustifolia	narrow-leaf cattail												X				
native	Typha latifolia	broad-leaved cattail	X		X		X				X						X	
native	Verbina hastata	blue vervain					X											

Table 14
Pine Creek Basin, North Park
Summary of Dominant, Native, and Exotic Riparian Vascular Plant Species
of Wooded Wetland Communities
(3-5 Vertical Feet above Pool or Base Flow)
September 2002

Origin	Scientific Name	Common Name
	Canopy	
native	Acer saccharinum	silver maple
native	Acer saccharum	sugar maple
native	Betula alleghaniensis (lutea)	yellow birch
native	Carya ovata	shagbark hickory
native	Fraxinus pennsylvanica	green ash, red ash
native	Prunus serotina	wild black cherry
native	Querqus imbricaria	shingle oak
native	Rhus typhina	staghorn sumac
native	Robinia pseudo-acacia	black locust
native	Salix nigra	black willow
	Sub Canopy	
exotic	Celastrus orbiculatus	oriental bittersweet
exotic	Elaeagnus umbellata	autumn-olive
exotic	Lonicera japonica	Japanese honeysuckle
exotic	Lonicera maackii	amur honeysuckle
exotic	Rosa multiflora	multiflora rose
native	Alnus serrulata	smooth alder
native	Cornus amomum	kinnikinik; red-willow
native	Physocarpus opulifolius	ninebark
native	Verbesina alternifolia	wingstem
native	Viburnum recognitum	smooth arrow-wood
	Herbaceous	
exotic	Alliaria petiolata (officinalis)	garlic-mustard
native	Boehmeria cylindrica	false nettle;bog-hemp
native	Eupatorium rugosum	white snakeroot
native	Impatiens capensis	spotted touch-me-not
native	Leersia virginica	white grass

TABLE 15
Pine Creek Basin, North Park Riparian Vegetation Survey
Ranking of Vegetation Communities by Quality and Diversity
Ordered from Least to Most Degraded
September 2002

Location		Site condition	Vegetation Community	Quality Metrics										Diversity Metrics					All Metrics	
				% exotic species		% invasive exotic species		% of dominant species exotic		% of dominant species exotic invasive		Summary of Quality Metrics		Total # species	Total # native species		Total # dominant species native		Average rank	Rank from Least to Most Degraded
				value	rank	value	rank	value	rank	value	rank	average rank	score	value	value	rank	value	rank		
Pine Creek		undisturbed	entire	20.6	10	8.8	14	11.8	11	2.0	8.5	43.5	9	68	54	11	15	6.5	10.17	7
Pine Creek		undisturbed	emergent	19.0	7	5.2	7	13.1	12	6.7	13	39.0	8	58	47	16	13	10	10.83	8
Pine Creek		undisturbed	woodland	16.7	6	16.7	24	0.0	1	0.0	1	32.0	7	18	15	24	7	19.5	12.58	11
North Fork Pine Creek		undisturbed	all	14.7	3	3.9	3	6.7	7	1.0	6.5	19.5	4	102	87	5	14	8.5	5.50	1
North Fork Pine Creek		undisturbed	woodland	11.6	1	4.7	4	0.0	1	0.0	1	7.0	1	43	38	18	10	15	6.67	2
North Fork Pine Creek		undisturbed	emergent	15.4	5	1.9	1	0.0	1	0.0	1	8.0	2	52	44	17	7	19.5	7.42	3
North Fork Pine Creek		undisturbed	tributary	12.8	2	2.6	2	11.1	10	1.0	6.5	20.5	5	39	34	19	8	17	9.42	6
North Fork Pine Creek		disturbed + undisturbed	entire	23.4	14	8.2	13	20.0	14	16.0	21	62.0	16	171	131	2	20	2	11.00	9
North Fork Pine Creek		disturbed	emergent	27.1	21	5.7	8	21.4	16	3.0	10.5	55.5	12	70	51	14	11	13.5	13.83	14
North Fork Pine Creek		disturbed	woodland	22.1	12	13.2	23	20.0	14	2.0	8.5	57.5	13	68	53	12	8	17	14.42	18
North Fork Pine Creek		disturbed	all	26.7	20	9.6	17	38.9	23	7.0	14	74.0	22	135	99	3	11	13.5	15.08	20
North Fork Pine Creek		disturbed	Marshall	23.1	13	11.5	22	60.0	24	3.0	10.5	69.5	19	26	20	23	2	24	19.42	22
North Park Lake	Irwin Bay	undisturbed	woodland	15	4	5	5	0	1	0	1	11.0	3	60	51	14	5	22	7.83	4
North Park Lake		disturbed + undisturbed	entire	25.1	17	7.5	12	5	6	14.3	18.5	53.5	11	199	149	1	26	1	9.25	5
North Park Lake	Irwin Bay	undisturbed	all	24.2	15	6.5	10	10.5	9	11.8	17	50.5	10	124	94	4	15	6.5	10.17	7
North Park Lake	Pine Creek Arm	disturbed	tributary	25.6	18	5.1	6	0	1	0	1	26.0	6	39	29	21	6	21	11.33	10
North Park Lake	Pine Creek Arm	disturbed	emergent	26.1	19	7.2	11	32	19	4	12	61.0	15	69	51	14	17	5	13.33	12
North Park Lake	Irwin Bay	undisturbed	emergent	29.4	24	5.9	9	10.5	9	14.3	18.5	60.0	14	85	60	10	12	11.5	13.58	13
North Park Lake	Pine Creek Arm	disturbed	all	28.6	23	10.5	19	26.9	18	7.7	15	74.0	23	105	75	6	19	3.5	13.92	15
North Park Lake	North Fork Arm	disturbed + undisturbed	all	24.5	16	11.2	21	26.9	18	15.4	20	74.5	24	98	74	7	19	3.5	14.17	16
North Park Lake	North Fork Arm	undisturbed	all	19.5	9	9.2	16	36.4	21	22.7	23	69.0	17	87	70	8	14	8.5	14.25	17
North Park Lake	North Fork Arm	undisturbed	emergent	19.2	8	9	15	36.8	22	26.3	24	69.0	18	78	63	9	12	11.5	14.92	19
North Park Lake	North Fork Arm	disturbed	all	28.3	22	10.9	20	20	14	10	16	72.0	21	46	33	20	8	17	18.17	21
North Park Lake	North Fork Arm	undisturbed	woodland	21.1	11	10.5	19	33.3	20	16.7	22	71.5	20	19	15	25	4	23	19.92	23
North Park Lake	Pine Creek Arm	disturbed	woodland	31.3	25	18.8	25	75	25	50	25	100.0	25	32	22	22	1	25	24.50	24

TABLE 16
North Park Lake Proposed Wetland Vegetation Planting Plan

Overall Spacing (ft off center)	Quantity per acre	Frequency (%)	Species Quantity	Vegetation Strata/ Species Name	Common Name	Spacing Type	size	Individual spacing (ft.)	Unit	Unit Cost	Total Cost
SHORELINE WETLANDS 0.55 acres											
SHORELINE SCRUB-SHRUB WETLANDS 0.55 acres											
8	681				SHORELINE SHRUBS						
		10	23		Smooth Alder	Random	3-4 ft	21	each	7.00	$158.90
		10	23		Black choke cherry	Random	2-3 ft	25	each	7.00	$158.90
		10	23		Buttonbush	Random	3-4 ft	25	each	7.00	$158.90
		10	23		Silky dogwood	Random	2-3 ft	25	each	7.00	$158.90
		5	11		Red-osier dogwood	Random	2-3 ft	36	each	7.00	$79.45
		5	11		Panicled dogwood	Random	2-3 ft	25	each	7.00	$79.45
		10	23		Winterberry	Random	3-4 ft	25	each	7.00	$158.90
		10	23		Ninebark	Random	3-4 ft	25	each	7.00	$158.90
		10	23		Steeplebush	Random	2-3 ft	25	each	7.00	$158.90
		5	11		Highbush blueberry	Random	2-3 ft	25	each	7.00	$79.45
		5	11		Common elderberry	Random	2-3 ft	25	each	7.00	$79.45
		10	23		Northern arrowwood	Random	3-4 ft	16	each	7.00	$158.90
		100	**227**		**Total Shrubs**						**$1,589.00**
4	2723				SHORELINE HERBACEOUS PLANTS						
		15	204		Swamp milkweed	Random	2" plug	10	each	1.00	$204.30
		10	136		Fringed sedge	Random	2" plug	10	each	1.00	$136.20
		20	272		Common rush	Random	2" plug	9	each	1.00	$272.40
		15	204		Cardinal flower	Random	2" plug	10	each	1.00	$204.30
		15	204		Tall coneflower	Random	2" plug	9	each	1.00	$204.30
		5	68		New York aster	Random	quart	9	each	1.00	$68.10
		5	68		Boneset	Random	2" plug	8	each	1.00	$68.10
		15	204		Three square	Random	2" plug	10	each	1.00	$204.30
		100	**1362**		**Total Herbaceous plants**						**$1,362.00**
N/A	50				SHORELINE NATIVE SEED MIX						
		10	3		Big bluestem	seed	N/A	N/A	sq yrd	1.10	$3.08
		10	3		Canada bluejoint	seed	N/A	N/A	sq yrd	1.10	$3.08
		15	4		Fox sedge	seed	N/A	N/A	sq yrd	1.10	$4.62
		20	6		Virginia wild rye	seed	N/A	N/A	sq yrd	1.10	$6.16
		20	6		Spreading witchgrass	seed	N/A	N/A	sq yrd	1.10	$6.16
		20	6		Switchgrass	seed	N/A	N/A	sq yrd	1.10	$6.16

TABLE 16
North Park Lake Proposed Wetland Vegetation Planting Plan

Overall Spacing (ft off center)	Quantity per acre	Frequency (%)	Species Quantity	Vegetation Strata/ Species Name	Common Name	Spacing Type	size	Individual spacing (ft.)	Unit	Unit Cost	Total Cost
		5	1		Blue vervain	seed	N/A	N/A	sq yrd	1.10	$1.54
		100	**28**		**Total Native Seed**						**$250.00**
12	303				SHORELINE TREES (Hummock wetland 1.8 acres)						
		15	15		green ash	Random	2-3 ft	25	each	7.00	$106.05
		15	15		black gum	Random	2-3 ft	25	each	7.00	$106.05
		15	15		sweet gum	Random	2-3 ft	25	each	7.00	$106.05
		15	15		sycamore	Random	2-3 ft	25	each	7.00	$106.05
		15	15		swamp white oak	Random	2-3 ft	25	each	7.00	$106.05
		15	15		red maple	Random	2-3 ft	25	each	7.00	$106.05
		10	10		pin oak	Random	2-3 ft	25	each	7.00	$70.70
		100	**101**		**Total Shoreline Trees**						**$707.00**
EMERGENT WETLANDS .31 ACRES											
3	4840				GRASSES, SEDGES, & RUSHES						
		15	363		Canada bluejoint	Random	2" plug	8	each	1.00	$363.00
		15	363		Lurid sedge	Random	2" plug	8	each	1.00	$363.00
		15	363		Fox sedge	Random	2" plug	8	each	1.00	$363.00
		15	363		Fowl mannagrass	Random	2" plug	8	each	1.00	$363.00
		15	363		Softrush	Random	2" plug	8	each	1.00	$363.00
		10	242		Great bullrush	Random	2" plug	8	each	1.00	$242.00
		15	363		Woolgrass	Random	2" plug	9	each	1.00	$363.00
		100	**2420**		**Total G,S,& R**						**$2,420.00**
3	4840				HERBACEOUS PLANTS						
		10	242		Swamp milkweed	Random	quart	9		2.00	$484.00
		10	242		New York aster	Random	quart	9		2.00	$484.00
		15	363		Boneset	Random	2" plug	8		1.00	$363.00
		5	121		Swamp rose mallow	Random	quart	13		2.00	$242.00
		10	242		Cardinal flower	Random	2" plug	9		1.00	$242.00
		10	242		Common monkey flower	Random	2" plug	9		1.00	$242.00
		15	363		Tall coneflower	Random	quart	8		2.00	$726.00
		15	363		Blue vervain	Random	2" plug	8		1.00	$363.00
		10	242		New York ironweed	Random	2" plug	9		1.00	$242.00
		100	**2420**		**Total Herbaceous Plants**						**$3,388.00**

TABLE 17
North Park Dredge Placement Site
Vegetation Survey Waypoints
25 July and 1 August, 2003

Date	Transect #	Placement Site	Transect Direction	Approximate Transect Length (ft)	Location
25-Jul-03	1	Roundtop	South to North	1000	from Roundtop Grove, through woodland, down slope to Wildwood site
25-Jul-2003	**2**	Wildwood	West to East	800	From the crest of the reclaimed area, east towards the Pine Creek valley, through reclaimed area
25-Jul-2003	**3**	Wildwood	South to North	1500	Through reclaimed area, running parallel to the Pine Creek valley
25-Jul-2003	**4**	Deer Pen	East to Northwest	300	Diagonal across site, included cursory survey of woodlands along North Fork of Pine Creek
25-Jul-2003	**5**	Bull Pen	North to South	500	Through vegetated east edge of site, parallel to cleared area, included cursory survey of woodlands along west side of site
1-Aug-2003	**6**	Latodami	East to West	1500	Crossed the south end of the site, included cursory survey of 200 ft of woodlands along east side of transect
1-Aug-2003	**7**	Latodami	East to Northwest	1700	Crossed the middle of the site, included the hedge row, cursory survey of woodlands along both east and west ends of the transect, and approximately 100 feet of flower field planted in 2002 with “native prairie” species
1-Aug-2003	**8**	Latodami	East to West	1500	Crossed the north end of the site, included cursory survey of 200 ft of woodlands along the west end of the transect and approximately 100 feet of flower field planted in 2002 with “native prairie” species
1-Aug-2003	**9**	County	North to South	500	Crossed through the middle of the site, included woodlands along the north end, regularly mowed access areas, and a center swale.

TABLE 18
North Park Lake Aternative Dredge Material Placement Site Vegetation Survey by Transect and Vegetation Community
July 25 and August 1, 2003

Scientific Name		Common Name	Relative Abundance																			
			All Sites & communities	Round Top	Wildwood			Deer Pen	Bull Pen		Latodami											
				1	2	3	2 & 3	4	5		6			7			8			6, 7, & 8		
				woodland	old field		old field	old field	woodland	old field	woodland	wildflower field	old field	woodland	wildflower field	old field	woodland	wildflower field	old field	woodland	wildflower field	old field
POLYPODIACEAE																						
		light green fern	L. dom	L. dom																		
Dyopteris intermedia	(Muhl.) A. Gray	evergreen wood fern	L. ab	L ab										mod?						mod		
LYCOPODIACEAE																						
Lycopodium clavatum	L.	common clubmoss	L. ab						L. ab													
Onoclea sensibilis	L.	sensitive fern	occ	L. ab									occ			occ						occ
PINACEAE																						
Picea abies	(L.) H. Karst.	Norway spruce	few											few ?						few		
Pinus strobus	L.	eastern white pine	L. mod						mod					ab						ab		
ACERACEAE																						
Acer negundo	L.	box-elder	mod					mod														
Acer rubrum	L.	red maple	dom	ab				dom	dom				few imm									few
ANACARDIACEAE																						
Rhus typhina	L.	staghorn sumac	few																			
Toxicodendron (Rhus) radicans	(L.) Kuntze	poison-ivy	mod					mod			mod		occ, mod			occ			few	mod		occ
APIACEAE																						
Conium maculatum	L.	poison hemlock	L. ab						L. ab	L. ab												
Daucus carota	L	Queen-Anne's-lace; wild car	mod			occ	occ	ab	mod				ab			occ		mod	dom		mod	dom
APOCYNACEAE																						
Apocynum cannabinum	L.	Indian hemp	mod			L. ab	L. ab					few	ab		mod	ab	mod	L. dom	dom	mod	L. dom	ab
ARALIACEAE																						
Aralia spinosa	L.	Hercules'-club	L. dom	dom																		
ASCLEPIADACEAE																						
Asclepias incarnata	L.	swamp milkweed	L. ab										L. ab									few
Asclepias syriaca	L.	common milkweed	few										few									few
Asclepias tuberosa	L.	butterfly-weed	few										few			L. mod						few
ASTERACEAE																						
Achillea millefolium	L.	common yarrow	mod	mod		scat	scat	dom	ab													
Ambrosia artemisiifolia	L.	common ragweed	dom	occ				few				dom	dom		dom	dom		dom	mod		dom	dom
Anaphalis margaritacea	(L.) Benth. & Hook	pearly everlasting	mod									mod	mod			occ		ab			mod	occ
Arctium minus	(Hill) Bernh.	common burdock	few							mod												
Artemisia vulgaris	L.	common mugwort	L. dom																			
Aster sp.		aster	occ			occ	occ															
Aster lanceolata (simplex)	Willd.	Panicled aster	dom									dom	dom		few	dom		ab	dom		ab	dom
Aster lateriflorus	(L.) Britton	calico aster; starved aster	occ										occ									occ
Aster pilosus	Willd.	white heath aster	dom										dom			dom			dom			dom
Bidens frondosa	L.	beggar ticks; stick-tights	few		few	few	few															

dom=dominant
a=abundant
mod=moderate
scat=scattered
occ=occasional
L. = locally

yellow =exotic invasive
orange =exotic
gray=Family
imm=immature
?= uncertain
= # observed

TABLE 18
North Park Lake Aternative Dredge Material Placement Site Vegetation Survey by Transect and Vegetation Community
July 25 and August 1, 2003

Scientific Name		Common Name	Relative Abundance																			
			All Sites & communities	Round Top	Wildwood			Deer Pen	Bull Pen		Latodami											
				1	2	3	2 & 3	4	5		6			7			8			6, 7, & 8		
				woodland	old field		old field	old field	woodland	old field	woodland	wildflower field	old field	woodland	wildflower field	old field	woodland	wildflower field	old field	woodland	wildflower field	old field
Bidens vulgata	Greene	beggar ticks; stick-tights	occ	occ																		
Chrysanthemum Leucanthemum	L.	ox-eye daisy	mod		few	occ	occ	ab	ab	mod			few, ab			mod	occ		mod	occ		mod
Cirsium arvense	(L.) Scop.	Canada thistle	dom					L. dom		dom		ab	dom		dom	dom		dom	dom		dom	dom
Cirsium vulgare	(Savi) Ten.	bull thistle	dom			occ	occ	mod		dom			dom		dom	dom		ab	dom		dom	dom
Conyza canadensis	(L.) Cronquist	horseweed	mod									dom	mod, L. ab			few		few	ab		ab	ab
Echinacea purpurea	(L.) Moench	purple coneflower	few									few ?			one			one ?			few 1	
Erechtites hieracifolia	(L.) Raf. Ex DC.	pilewort	occ	few		occ	occ						occ, L. ab		occ	occ					occ	occ
Eupatorium perfoliatum	L.	boneset	L. mod	mod																		
Eupatorium rugosum	Houtt.	white snakeroot	dom	dom	ab		ab	mod	ab		dom	dom	dom, ab		dom	dom	dom	dom	dom	dom	dom	dom
Eupatorium serotinium	Michx.	late eupatorium	few			few	few						few									few
Euthamia graminifolia	(L) Nutt.	grass-leaved goldenrod	ab		occ	L. ab	L. ab					ab	L. ab, ab			dom		occ	dom		mod	dom
Gaillardia x grandiflora	Van Houtte	blanket-flower	few									three						few			few	
Gnaphalium ulginosum	L.	low cudweed	few																			
Helianthus decapetalus	L.	thin-leaved sunflower	few												two						few-2	
Helianthus annuus	L.	common sunflower	few												one			few			few - 1	
Hieracium flagellare	Willd.	hawkweed	occ					ab					occ						few			occ
Lactuca canadensis	L.	wild lettuce	few										few			few ?						few
Rudbeckia hurta	L.	black-eyed-susan	mod									mod?			mod			mod			mod	
Rudbeckia triloba	L.	three-lobed sunflower	few									few ?									few	
Rudbeckia laciniata	L.	tall or cutleaf coneflower	few												few						few	
Solidago altissima (canadensis)	L.	Canada (tall) goldenrod	mod	occ		few	few						mod			mod			ab			mod
Solidago gigantea	Aiton	smooth goldenrod	mod										L. mod			few			mod			mod
Solidago juncea	Aiton	early goldenrod	ab			few	few									ab			ab			ab
Solidago rugosa	Mill.	wrinkle-leaf goldenrod	ab			occ	occ						mod	ab		dom		mod	ab	ab	mod	ab
Sonchus asper	(L.) Hill	spiny-leaved sow-thistle	occ																			
Taraxacum officinale	Weber	common dandelion	L. dom					dom														
Verbesina alternifolia	(L.) Britton	wingstem	L. dom					L. mod	dom													
Veronia noveboracensis	(L.) Michx.	New York ironweed	few																few			few
Xanthium strumarium	L.	common cocklebur	few							few												
BALSMINACEAE																						
Impatiens capensis	Meerb.	Jewelweed; spotted touch-m	L. dom	L. dom																		
Impatiens pallida	nutt.	pale jewelweed; touch-me-n	L. dom	dom																		
BERBERIDACEAEI																						
Berberis thunbergii	DC.	Japanese barberry	few									few		few						few	few	
Podophyllum peltatum	L.	mayapple	occ	ab							occ									occ		
BETULACEAE																						
Betula alleghaniensis (lutea)	Britton	yellow birch	L. ab	L. ab																		

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				1	2	3	2 & 3	4	5		6			7			8			6, 7, & 8		
				woodland	old field		old field	old field	woodland	old field	woodland	wildflower field	old field	woodland	wildflower field	old field	woodland	wildflower field	old field	woodland	wildflower field	old field
Betula lenta	L.	sweet or black birch	L. ab	L. ab																		
Carpinus caroliniana	L.	hornbeam, ironwood	few	occ																		
BIGNONIACEAE																						
Catalpa bignonioides	Walter	catalpa; Indian-bean	L. dom		dom		dom															
BORAGINACEAE																						
Hackelia virginiana	(L.) I.M. Jonst.	beggar's-lice; stickseed	occ	occ									few			few						few
Myosotis arvensis	(L.) Hill	forget-me-not	few							few												
BRASSICACEAE																						
Alliaria petiolata (officinalis)	(M. Bieb.) Cavra & Grande	garlic-mustard	dom	dom						dom	dom	L. dom	dom	dom	ab	dom		dom	dom	dom	dom	dom
Brassica rapa	L.	field mustard	mod							dom			occ					mod	occ		mod	occ
Lepidium virginicum	L.	poor-man's pepper; wild pep	dom							few		dom	dom		dom	dom		dom	dom		dom	dom
Rorppia austriacas	(Crantz) Besser	field yellowcress	few																			
Rorppia sylvestris	(L.) Besser	creeping yellowcress	L. mod																			
CAMPANULACEAE																						
Lobelia inflata	L.	indian-tobacco	occ	mod				occ					few						few			few
CAPRIFOLIACEAE																						
Lonicera japonica	Thunb.	Japanese honeysuckle	occ		occ		occ															
Lonicera morrowi	A. Gray	Morrow's honeysuckle	few	few									few						few			few
Sambucus canadensis	L	common elder; American eld	few	few																		
Viburnum recognitum	Fernald	smooth (northern) arrow-wo	L. dom	dom					dom										few			few
CARYOPHYLLACEAE																						
Cerastium arvense	L.	field chickweed	mod					few ?										mod	occ		mod	occ
Dianthus armeria	L.	Deptford pink	mod		mod	mod	mod		occ													
Paronychia canadensis	(L.) Wood	forked chickweed	occ	occ							occ									occ		
Silene latifolia	Poir.	white campion	occ		mod	occ	mod					mod	occ			occ		occ			mod	occ
Stellaria graminea	L.	lesser stichwort	few		few		few															
Stellaria media	(L.) Vill.	common chickweed	few	few	few		few	few														
CELASTRACEAE																						
Celastrus orbiculatus	Thunb.	oriental bittersweet	dom									occ	dom	dom		dom		ab	dom	dom	ab	dom
CLUSIACEA																						
Hypericum mutilum	L.	dwarf saint John's-wort	dom									few	dom		occ				dom		occ	dom
Hypericum perforatum	L.	common Saint John's-wort	occ		scat	occ	occ	few	few			scat	dom		few	few			ab		scat	ab
Hypericum prolificum	L.	shrubby St. John's-wort	few																three			few-3
Hypericum punctatum	Lam.	spotted Saint John's-wort	occ	occ									ab									mod
CONVOLVULACEAE																						
Calystegia sepium	(L.) R. Br.	hedge bindweed	mod										occ					mod	mod		mod	occ
Ipomoea purpurea	(L.) Roth	common morning-glory	few						few													

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CORNACEAE																						
Cornus amomum	Mill.	kinnikinik; red-willow	L. dom																			
Cornus florida	L.	flowering dogwood	L. dom														dom			dom		
Cornus racemosa	Lam.	panicled dogwood; swamp d	dom								mod		dom			dom			ab imm	mod		dom
Nyssa sylvatica	Marshall	blackgum	L. dom	dom																		
CUSCUTACEAE																						
Cuscuta grovonii	Willd. Ex Schultz	common dodder	occ	occ																		
DIPSACACEAE																						
Dipsacus sylvestris	Huds.	common teasel	dom						mod	mod					occ			L. dom	dom		L. dom	dom
ELEAGNACEAE																						
Elaeagnus umbellata	Thunb.	autumn-olive	ab								few	scat	ab			occ	dom	occ	dom	mod	occ	dom
EUPHORBIACEAE																						
Acalypha virginica	L.	three-seeded mercury	occ										occ									occ
Euphorbia corollata	L.	flowering spurge	occ										occ									occ
FABACEAE																						
Coronilla varia	L.	crown-vetch	dom		dom	dom	dom		L. ab	L. ab			dom			dom			dom			dom
Lepedeza intermedia	(S. Watson) Britton	bush-clover	occ		occ		occ															
Lupinus perennis	L.	blue lupine	few									one									few 1	
Lotus corniculatus	L.	bird's-foot-trefoil	dom		dom	dom	dom		L. ab													
Medicago lupulina	L.	black medic	dom			dom, occ	dom	dom	few	dom			occ									occ
Medicago sativa	L.	alfalfa	occ		occ		occ															
Meliotus alba	Medick.	white sweet-clover	mod	few		dom, occ	dom															
Meliotus officinalis	(L.) Pall.	yellow sweet-clover	L. dom		dom		dom															
Robinia pseudo-acacia	L.	black locust	dom			dom	dom						few									few
Trifolium hybridum	L.	alsike clover	dom		dom	dom	dom	dom	occ	dom			mod			few						mod
Trifolium repens	L.	white clover	mod		occ	dom	dom	mod					occ									occ
Wisteria sinensis	(Sims) Sweet	Chinese wisteria	few	few																		
FAGACEAE																						
Quercus alba	L.	white oak	dom	dom					ab		dom						dom			dom		
Querqus imbricaria	Michx.	shingle oak	few								mod		few							mod		few
Querqus montana	Willd.	chestnut oak	few	few																		
Quercus rubra	L.	northern red oak	ab	dom					ab		dom						ab			dom		
Querqus silicifolia	wansenh.	scrub oak	L. dom	dom																		
Querqus velutina	Lam.	black oak	few						mod													
JUGLANDACEAE																						
Carya glabra	(Mill.) Sweet	pignut	few														few			few		
LAMIACEAE																						

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Clinopodium vulgare	L.	wild basil	occ		few	few	few						occ			occ			occ			occ
Glechoma hederacea	L.	gill-over-the-ground; ground	mod					dom														
Hedeoma pulegioides	(L.) Pers.	American pennyroyal	few									few	L. ab								few	few
Lycopus americanus	Muhl. Ex. W. Bartram	water-horehound	L. mod																			
Monarda fistulosa	L.	wild bergamot	few									three			9			few			few 12	
Prunella vulgaris	L.	heal-all; self-heal	mod			ab	ab	dom				L. ab			ab	mod		few	mod		ab	mod
LAURACEAE																						
Sassafras albidum	(Nutt.) Nrees	sassafras	ab	dom					dom										occ			occ
LYTHRACEAE																						
Lythrum salicaria	L.	purple loosestrife	L. ab																			
MAGNOLIACEAE																						
Liriodendron tulipifera	L.	tuliptree; yellow poplar	L. ab	ab																		
OLEACEAE																						
Fraxinus americana	L.	white ash	ab	dom					ab			few imm									few	
Fraxinus pennsylvanica	Marshall	green ash, red ash	L. ab	ab																		
Ligustrum vulgare	L.	common privet	L. dom	L. dom							dom									dom		
ONAGRACEAE																						
Circaea lutetiana (quadrisulcata)	L.	enchanter's-nightshade	few	few																		
Epilobium coloratum	Biehller	purple-leaved willow-herb	L. dom																			
Epilobium parviflorum	Schreb.	willow-herb	L. mod																			
Ludwigia palustris	(L.) Elliot.	marsh-purslane	few																			
Oenothera biennis	L.	common evening-primrose	mod							dom			occ									occ
OXALIDACEAE																						
Oxalis stricta (europea)	L.	common yellow wood-sorrel	dom	occ				dom			dom	ab	dom					dom	dom	dom	dom	dom
PHYTOLACCACEAE																						
Phytolacca americana	L.	pokeweed	few	dom									few			few						few
PLANTAGINACEAE																						
Plantago lanceolata	L.	English plantain; ribgrass	ab		occ	occ	occ	ab				ab	ab			ab		mod	ab		ab	ab
Plantago major	L.	broadleaf plantain	occ		occ		occ	mod	occ				occ									occ
PLATANACEAE																						
Platanus occidentalis	L.	sycamore; buttonwood	few										few imm									few
POLYGONACEAE																						
Polygonum aviculare	L.	knotweed	L. mod							mod												
Polygonum caespitosum	Blume	Asiatic water pepper, low sm	scat	dom				few			scat		mod	scat					few	scat		few
polygonum convolvulus	L.	black bindweed	few	few																		
Polygonum hydropiper	L.	water-pepper	L. ab					L. ab														
Polygonum lapathifolium	L.	dock-leaf smartweed	L. dom							dom												

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Polygonum pensylvanicum	L.	Pennsylvania smartweed	L. ab																			
Polygonum persicaria	L.	lady's-thumb; heart's-ease	mod	dom																		
Polygonum sachalinense	F.W. Schmidt ex Maxim	giant knotweed	L. dom							dom												
Polygonum sagittatum	L.	arrow-leaved tearthumb	few					ab		few												
Polygonum virginianum	L.	Virginia knotweed; jumpsee	L. mod	mod																		
Rumex acetellosa	L.	sheep sorrel, sourgrass	dom	dom	dom		dom	few				dom	dom		ab	dom		ab	ab		dom	dom
Rumex crispus	L	curly dock	mod	mod	few	few	few	dom		occ						few		few	mod		few	mod
Rumex obtusifolius	L.	broad-leaf dock; bitter dock	occ			few	few	few		ab									occ			occ
PRIMULACEAE																						
Lysimachia quadrifolia	L.	whorled loosestrife	few	occ																		
RANUNCULACEAE																						
Ranunculus repens	L.	creeping buttercup	mod						ab													
RHAMNACEAE																						
Rhamnus frangula	L.	alder buckthorn	dom	dom	dom	dom	dom	dom	dom	dom												
ROSACEAE																						
Agrimonia parviflora	Aiton	southern agrimony	few										few									few
Crategus sp.		hawthorn	mod						mod				occ			few						few
Geum canadense	Jacq.	white avens	few	few																		
Malus pumilia	Mill.	apple	few						occ													
Potentilla canadensis	L.	cinquefoil	few	few												few						few
Potentilla norvegica	L.	strawberry-weed	few																			
Potentilla recta	L.	sulfur cinquefoil	dom		dom	dom	dom	dom				ab	dom			occ			dom		ab	dom
Potentilla simplex	Michx.	old-field cinquefoil	few																			
Prunus serotina	Ehrh.	wild black cherry	dom	dom				dom	dom		dom		dom	dom			dom		dom	dom		dom
Rosa sp.		small leaved rose	few	few		few	few															
Rosa sp.		big leaves	few	few																		
Rosa multiflora	Thunb. ex Murray	multiflora rose	dom	L. ab							dom		dom	dom		dom	dom	few	dom	dom	few	dom
Rubus sp.		blackberry	occ	occ									L. ab						few			mod
Rubus allegheniensis	Porter	common blackberry	dom	dom		dom	dom							ab		dom				ab		dom
Rubus flagellaris	Willd.	northern dewberry	mod					occ					ab			mod	dom		dom	dom		ab
Rubus occidentalis	L.	black-cap; black raspberry	mod		occ		occ							mod					few	mod		few
Spiraea tomentosa	L.	hardhack	occ	few		occ	occ		occ				L. ab			occ						occ
RUBIACEAE																						
Galium mollugo	L.	wild madder	L. ab			L. ab	L. ab															
Galium vernum ?	L.	yellow bedstraw	few			few	few															
SALICACEAE																						
Populus grandidentata	Michx.	large-toothed aspen	L. ab		L. ab	L. ab	L. ab															

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Populus tremuloides	Michx.	quaking aspen	L. dom			dom	dom						dom									ab
Salix interior (exigua)	Rowlee	sandbar willow	L. mod																			
Salix nigra	Marshall	black willow	few																			
SAXIFRAGACEAE																						
Penthorum sedoides	L.	ditch stonecrop	L. mod																			
SCROPHULARIACEAE																						
Linaria vulgaris	Hill	butter-and-eggs	dom						mod				dom			dom		ab	dom		ab	dom
Lindernia dubia	L.	false pimpernel	L. dom																			
Verbascum blattaria	L.	moth mullein	occ		few	scat	few					mod	occ			few			occ		mod	occ
Verbascum thapsus	L.	common mullein	dom	scat		few	few					dom	dom, occ		dom	dom		dom	mod		dom	dom
Veronica officinalis	L.	common speedwell	mod										occ			mod		mod	few		mod	mod
SIMAROUBACEAE																						
Ailanthus altissima	(Mill.) Swingle	tree of heaven	dom			dom	dom			dom			occ						dom			dom
SOLANACEAE																						
Physalis heterophylla	Nees.	clammy ground-cherry	few															few			few	
Solanum carolinense	L.	horse-nettle	ab					occ				ab	ab		occ	ab		ab	mod		ab	ab
Solanum dulcamara	L.	deadly nightshade; bitterswe	occ							occ												
Solanum nigrum	L.	black nightshade	occ							occ												
VERBENACEAE																						
Verbina hastata	L.	blue vervain	occ							occ		few	occ		few	occ					few	occ
Verbena urticifolia	L.	white vervain	occ	occ		occ	occ					occ	occ					mod	occ		mod	occ
VIOLACEA																						
Viola sororia	Willd.	common blue violet	few								occ					few				occ		few
VITACEAE																						
Ampelopsis brevipedunculata	(Maxim.) Trautv.	porcelain-berry	L. dom																			
Parthenocissus quinquefolia	(L.) Planch.	Virginia creeper	few	mod							few									few		
Vitus aestivalis	Michx.	summer grape	L. dom	dom		occ, edge	few										dom			dom		
Vitus labrusca	L.	fox grape	L. mod	ab					dom	few												
CYPERACEAE																						
Carex sp.			dom			dom	dom															
Carex annectens	(E.P Bicknell) E. P. Bicknell	sedge	dom	dom		dom	dom	dom														
Carex normalis	Mack.	sedge	L. ab																			
Carex projecta	Mack.	sedge	few																			
Carex scoparia	Schkohr ex Willd.	broom sedge	ab					scat														
Carex vulpinoidea	Michx.	foxtail sedge	occ					occ	scat													
Cyperus strigosus	L.	galingale; false nutsedge	L. dom					dom														
Eleocharis obtusa	(Willd.) Schult.	spike-rush	L. ab					L. ab								occ						few

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Scirpus cyperinus	(L.) Kunth	wool-grass	few					scat														
Scirpus polyphyllus	Vahl	bulrush	L. ab					L. ab														
IRIDACEAE																						
Iris pseudoacorus	L.	yellow iris	L. mod																			
JUNEACEAE																						
Juncus effusus	L.	soft rush, common rush	few					few					L. mod									few
Juncus tenuis	Willd.	yard rush; path rush	dom	few		ab	ab	dom	dom				L. ab			occ			mod			mod
LILIACEAE																						
Allium vineale	L.	field garlic	occ										occ			L. mod			occ			occ
POACEAE																						
Agrostis gigantea	Roth	redtop	dom		dom	dom	dom		dom		mod		occ			ab			ab	mod		ab
Agrostis perennans	(Walter) Tuck.	autumn bent	dom	dom	scat	occ	occ	dom	dom			few	L. ab			dom			dom		few	dom
Andropogon virginicus	L.	broom-sedge	dom	few	dom	dom	dom												few			few
Anthoxanthum aristatum	Boiss.	sweet vernalgrass	dom		dom		dom	few	dom			few	mod			dom			dom		few	dom
Anthoxanthum odoratum	L.	sweet vernalgrass	ab										dom			few			ab			ab
Avena fatua	L.	wild oats	few							L. mod												
Bromus commutatus	Schrad.	hairy chess	L. dom						dom										occ			occ
Bromus intermis	Leyss.	smooth broome	occ			occ	occ															
Bromus japonicus	Thunb. Ex Murray	Japanese chess	occ			dom	dom			occ												
Cinna arundinacea	L.	wood reedgrass	L. ab	L. ab																		
Dactylis glomerata	L.	orchard grass	dom	ab	dom	dom	dom				few		dom			dom	mod		dom	mod		dom
Danthonia spicata	(L.) P. Beauv. Ex Roem. & Schult.	poverty grass	dom	dom	occ		occ	dom				few									few	
Digitaria ischaemum	(Schreb. Ex. Schweigg) Schreb. Ex. Muhl.	smooth crabgrass	mod							mod												
Digitaria sanguinalis	(L.) Scop.	northern crabgrass	occ		occ		occ															
Echinochloa crusgalii	(L.) Beauv.	barnyard grass	L. ab							ab												
Elytrigia repens	(L.) Desv. Ex Nevski	quackgrass	dom		dom	dom	dom			mod		occ	dom			dom	mod		dom	mod	occ	dom
Eragrostis hypnoides	(Lam.) Britton, Stearns, & Poggenb.	creeping lovegrass	L. ab																			
Festuca elatior	L.	tall fescue	dom		dom	dom	dom		mod				mod			dom						dom
Festuca obtusa	Biehler	nodding fescue	occ	occ																		
Holcus lanatus	L.	velvetgrass	dom		dom	dom	dom	dom		mod			occ					occ			occ	occ
Leersia virginica	Willd.	white grass	L. dom								dom									dom		
Lolium multiflorum	Lam.	annual ryegrass	mod						occ	mod												
Muhlenbergia frondosa	(Poir.) Fernald	wirestem muhly	L. ab					ab														
Panicum acuminatum	sw.	panic grass	mod	mod					mod													
Panicum boscii	Poir	panic grass	L. dom	dom																		
Panicum capillare	L.	witchgrass	occ										occ			few						occ
Panicum clandestinum	L.	deer-tongue grass	dom	dom	L. ab	few	L. ab		dom		dom		dom			L. ab	dom			dom		dom

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			All Sites & communities	Round Top	Wildwood			Deer Pen	Bull Pen		Latodami											
				1	2	3	2 & 3	4	5		6			7			8			6, 7, & 8		
				woodland	old field		old field	old field	woodland	old field	woodland	wildflower field	old field	woodland	wildflower field	old field	woodland	wildflower field	old field	woodland	wildflower field	old field
Panicum latifolium	L.	panic grass	L. dom	dom																		
Panicum microcarpon	Muhl.	panic grass	L. dom	dom																		
Panicum virgatum	L.	switchgrass	occ			few	few						occ									occ
Phalaris arundinacea	L.	reed canary grass	L. ab						L. ab	occ												
Phleum pratense	L.	timothy	dom		dom	dom	dom	dom					dom			dom			ab			dom
Poa palustris	L.	fowl bluegrass	L. mod																			
Poa sylvestris	A. Gray	woodland bluegrass	dom	dom					dom								mod			mod		
Secale cereale	L.	rye	occ		occ		occ															
Setaria glauca	(L.) Beauv.	yellow foxtail	few										few		few	few			few		few	few
Setaria viridis	(L.) P. Beauv.	green foxtail	dom		dom		dom			dom		dom	dom		dom	dom		dom	dom		dom	dom
Tridens flavus (Triodia flava)	(L.) A. Hitchc.	purpletop	occ							mod			occ									
Total # species			**248**	**79**	**42**	**57**	**73**	**51**	**44**	**37**	**21**	**39**	**93**	**12**	**25**	**66**	**16**	**39**	**69**	**42**	**57**	**109**
Total # native species			**143**	**61**	**10**	**23**	**27**	**22**	**21**	**5**	**13**	**18**	**49**	**6**	**11**	**32**	**11**	**12**	**26**	**29**	**24**	**59**
Total # exotic species			**105**	**18**	**32**	**34**	**46**	**29**	**23**	**32**	**8**	**21**	**44**	**6**	**14**	**34**	**5**	**27**	**43**	**13**	**33**	**50**
Total # exotic invasive species			**17**	**5**	**3**	**4**	**5**	**3**	**3**	**7**	**4**	**5**	**10**	**4**	**4**	**8**	**2**	**6**	**10**	**6**	**8**	**10**

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L. = locally

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TABLE 18
North Park Lake Aternative Dredge Material Placement Site Vegetation Survey by Transect and Vegetation Community
July 25 and August 1, 2003

Scientific Name		Common Name	County Site 9			Origin	Habitat	Wetland Indicator	PA Status
			woodland	mowed	swale				
POLYPODIACEAE									
		light green fern							
Dyopteris intermedia	(Muhl.) A. Gray	evergreen wood fern				native			
LYCOPODIACEAE									
Lycopodium clavatum	L.	common clubmoss				native	open woods	none	common throughout
Onoclea sensibilis	L.	sensitive fern				native	moist places	FACW	throughout
PINACEAE									
Picea abies	(L.) H. Karst.	Norway spruce				Europe	cultivated sites	none	throughout
Pinus strobus	L.	eastern white pine				native	forests	FACU	throughout
ACERACEAE									
Acer negundo	L.	box-elder				native	stream banks	FAC+	throughout
Acer rubrum	L.	red maple		dom imm	dom	native	wet woods, moist areas	FACW	throughout
ANACARDIACEAE									
Rhus typhina	L.	staghorn sumac			few	native	open hillsides	UPL	throughout
Toxicodendron (Rhus) radicans	(L.) Kuntze	poison-ivy				native	floodplains	FAC	throughout
APIACEAE									
Conium maculatum	L.	poison hemlock				Europe	floodplains, moist woods	FACW	throughout
Daucus carota	L	Queen-Anne's-lace; wild car			few	Eurasia	waste places	UPL	throughout
APOCYNACEAE									
Apocynum cannabinum	L.	Indian hemp			few	native	thickets, fields, waste places	FACU	throughout
ARALIACEAE									
Aralia spinosa	L.	Hercules'-club				native	moist woods, stream banks	FAC	occasional, mostly W
ASCLEPIADACEAE									
Asclepias incarnata	L.	swamp milkweed				native	floodplains, wet meadows	OBL	throughout
Asclepias syriaca	L.	common milkweed				native	fields, waste places	FACU-	throughout
Asclepias tuberosa	L.	butterfly-weed				native	dry fields	none	frequent
ASTERACEAE									
Achillea millefolium	L.	common yarrow				Europe	waste places	FACU	throughout
Ambrosia artemisiifolia	L.	common ragweed				Europe	waste places	FACU	throughout
Anaphalis margaritacea	(L.) Benth. & Hook	pearly everlasting				native	dry fields, woods, edges	none	more common N
Arctium minus	(Hill) Bernh.	common burdock	few	ab	few	Eurasia	waste places	FACU-	throughout
Artemisia vulgaris	L.	common mugwort	dom			Eurasia	waste places	UPL	throughout
Aster sp.		aster							
Aster lanceolata (simplex)	Willd.	Panicled aster	mod			native	old fields	FACW	throughout
Aster lateriflorus	(L.) Britton	calico aster; starved aster				native	old fields, waste places	FACW-	throughout
Aster pilosus	Willd.	white heath aster				native	waste places	UPL	common
Bidens frondosa	L.	beggar ticks; stick-tights				native	low waste places	FACW	throughout

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Bidens vulgata	Greene	beggar ticks; stick-tights			mod	native	wet fields, moist woods, stream banks	none	common throughout
Chrysanthemum Leucanthemum	L.	ox-eye daisy		ab		Europe	waste places, woods, meadows	woods, fields	common throughout
Cirsium arvense	(L.) Scop.	Canada thistle	dom	dom	dom	Eurasia	waste places	FACU	noxious weed
Cirsium vulgare	(Savi) Ten.	bull thistle				Eurasia	pastures, meadows, roadsides	FACU-	noxious weed
Conyza canadensis	(L.) Cronquist	horseweed			mod	native	fields, waste ground	none	throughout
Echinacea purpurea	(L.) Moench	purple coneflower				mid-western US	cultivated fields, waste ground	none	rarely escaped
Erechtites hieracifolia	(L.) Raf. Ex DC.	pilewort				native	disturbed ground	FACU	throughout
Eupatorium perfoliatum	L.	boneset				native	floodplains, stream banks, wet meadows	FACW+	throughout
Eupatorium rugosum	Houtt.	white snakeroot				native	rich woods	none	throughout
Eupatorium serotinium	Michx.	late eupatorium				native west	adventives, ballast, alluvial areas	FAC-	increasing
Euthamia graminifolia	(L) Nutt.	grass-leaved goldenrod			dom	native	moist fields, shores	FAC	throughout
Gaillardia x grandiflora	Van Houtte	blanket-flower				Western North	cultivated, old fields, roadsides	none	occasionally naturalized
Gnaphalium ulginosum	L.	low cudweed			few	Europe	moist woods, stream banks	FAC	throughout
Helianthus decapetalus	L.	thin-leaved sunflower				native	bottomlands, streambanks	FACU	throughout
Helianthus annuus	L.	common sunflower				western N America	roadsides, vacant lots	FAC-	frequently escaped
Hieracium flagellare	Willd.	hawkweed				Europe	fields, lawns, roadsides, seed mixtures	none	throughout
Lactuca canadensis	L.	wild lettuce				native	meadows, fields	FACU	frequent throughout
Rudbeckia hurta	L.	black-eyed-susan				native	fields, meadows, wildflower mixes	FACU-	throughout
Rudbeckia triloba	L.	three-lobed sunflower				native	old fields, rocky slopes	FACU	scattered throughout
Rudbeckia laciniata	L.	tall or cutleaf coneflower				native	floodplains, stream banks	FACW	throughout
Solidago altissima (canadensis)	L.	Canada (tall) goldenrod				native	low waste places	FACU	throughout
Solidago gigantea	Aiton	smooth goldenrod	dom	dom		native	moist fields, meadows, banks, ditches	FACW	throughout
Solidago juncea	Aiton	early goldenrod		ab		native	fields, meadows	none	common throughout
Solidago rugosa	Mill.	wrinkle-leaf goldenrod				native	floodplains, waste places	FAC	throughout
Sonchus asper	(L.) Hill	spiny-leaved sow-thistle			occ	Europe	roadsides, waste ground	FACU	throughout
Taraxacum officinale	Weber	common dandelion				Europe	waste places	FACU-	throughout
Verbesina alternifolia	(L.) Britton	wingstem	dom			native	riverbanks, floodplains	FAC	frequent
Veronia noveboracensis	(L.) Michx.	New York ironweed				native	floodplains, meadows	FACW+	throughout
Xanthium strumarium	L.	common cocklebur				Europe	waste places	FACU	throughout
BALSMINACEAE									
Impatiens capensis	Meerb.	Jewelweed; spotted touch-m				native	stream banks, moist ground	FACW	throughout
Impatiens pallida	nutt.	pale jewelweed; touch-me-n				native	stream banks, moist woods	FACW	throughout
BERBERIDACEAEI									
Berberis thunbergii	DC.	Japanese barberry				Japan	woods, old fields	none	frequently naturalized
Podophyllum peltatum	L.	mayapple				native	mesic woods	UPL	common
BETULACEAE									
Betula alleghaniensis (lutea)	Britton	yellow birch				native	cool, moist woods	FAC	N. higher elevations

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			woodland	mowed	swale				
Betula lenta	L.	sweet or black birch				native	streambanks	FACU	throughout
Carpinus caroliniana	L.	hornbeam, ironwood				native	moist woods	FAC	throughout
BIGNONIACEAE									
Catalpa bignonioides	Walter	catalpa; Indian-bean				south US	naturalized disturbed woods, waste ground, fields	UPL	escaped, mostly south
BORAGINACEAE									
Hackelia virginiana	(L.) I.M. Jonst.	beggar's-lice; stickseed				native	moist woods, wooded slopes	FACU	common throughout
Myosotis arvensis	(L.) Hill	forget-me-not				Eurasia	fields, waste ground	UPL	scatered, escaped
BRASSICACEAE									
Alliaria petiolata (officinalis)	(M. Bieb.) Cavra & Grande	garlic-mustard	dom			Europe	floodplains, waste places	FACU-	invasive
Brassica rapa	L.	field mustard				Europe	waste ground, fields	none	throughout
Lepidium virginicum	L.	poor-man's pepper; wild pep			few	Europe	waste places	FACU-	throughout
Rorppia austriacas	(Crantz) Besser	field yellowcress	few ?			Europe	fields, roadsides	FAC-	rarely established
Rorppia sylvestris	(L.) Besser	creeping yellowcress			mod	Europe	stream banks, waste places	FACW	throughout
CAMPANULACEAE									
Lobelia inflata	L.	indian-tobacco				native	old fields, meadows	FACU	throughout
CAPRIFOLIACEAE									
Lonicera japonica	Thunb.	Japanese honeysuckle	ab			Asia	disturbed woods, banks	FAC-	invasive
Lonicera morrowi	A. Gray	Morrow's honeysuckle				Japan	disturbed floodplains, old fields	FACU	invasive
Sambucus canadensis	L	common elder; American eld				native	rich moist soil, stream banks	FACW-	throughout
Viburnum recognitum	Fernald	smooth (northern) arrow-wo				native	stream banks	FACW-	throughout
CARYOPHYLLACEAE									
Cerastium arvense	L.	field chickweed	occ	mod		Eurasia	rocky slopes, sandy fields	none	occasional
Dianthus armeria	L.	Deptford pink				Europe	waste ground	UPL	throughout
Paronychia canadensis	(L.) Wood	forked chickweed				native	open dry rocky woods	none	throughout
Silene latifolia	Poir.	white campion				Europe	waste places, fields	none	throughout
Stellaria graminea	L.	lesser stichwort				Europe	moist meadows, stream banks	FACU-	throughout
Stellaria media	(L.) Vill.	common chickweed				Europe	fields, gardens	UPL	throughout
CELASTRACEAE									
Celastrus orbiculatus	Thunb.	oriental bittersweet				Japan, China	disturbed woods, fields	UPL	wildly naturlized
CLUSIACEA									
Hypericum mutilum	L.	dwarf saint John's-wort				native	stream banks, ditches, moist fields	FACW	throughout
Hypericum perforatum	L.	common Saint John's-wort				Europe	waste places, fields	none	throughout
Hypericum prolificum	L.	shrubby St. John's-wort				native	low fields, swamps	FACU	occasional, mostly SW
Hypericum punctatum	Lam.	spotted Saint John's-wort				native	floodplains, moist fields	FAC-	throughout
CONVOLVULACEAE									
Calystegia sepium	(L.) R. Br.	hedge bindweed				Europe/native	waste places	FAC-	throughout
Ipomoea purpurea	(L.) Roth	common morning-glory				tropical America	fields, roadsides	UPL	throughout

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CORNACEAE									
Cornus amomum	Mill.	kinnikinik; red-willow			dom	native	swamps, streams	FACW	throughout
Cornus florida	L.	flowering dogwood				native	edges	FACU-	throughout, not N
Cornus racemosa	Lam.	panicled dogwood; swamp d				native	swampy meadows, moist fields	FAC-	throughout
Nyssa sylvatica	Marshall	blackgum				native	moist woods	FAC	throughout
CUSCUTACEAE									
Cuscuta grovonii	Willd. Ex Schultz	common dodder				native	low wet areas	none	throughout
DIPSACACEAE									
Dipsacus sylvestris	Huds.	common teasel	dom	dom	dom	Europe	waste places	FACU-	throughout
ELEAGNACEAE									
Elaeagnus umbellata	Thunb.	autumn-olive				Asia	open ground	none	serious weed
EUPHORBIACEAE									
Acalypha virginica	L.	three-seeded mercury				native	dry or moist fields, stream banks, waste ground	none	frequent
Euphorbia corollata	L.	flowering spurge				native	fields, waste ground	none	throughout
FABACEAE									
Coronilla varia	L.	crown-vetch	dom	dom	dom	Europe	planted highways	none	invasive
Lepedeza intermedia	(S. Watson) Britton	bush-clover				native	dry, rocky thickets	none	throughout
Lupinus perennis	L.	blue lupine				native	open fields, wood edges	FACU-	rare, planted
Lotus corniculatus	L.	bird's-foot-trefoil				Europe	roadsides, disturbed areas	FACU-	throughout
Medicago lupulina	L.	black medic		ab		Eurasia	roadsides, wasteplaces	none	throughout
Medicago sativa	L.	alfalfa				Eurasia	disturbed areas escaped	none	throughout
Meliotus alba	Medick.	white sweet-clover				Eurasia	roadsides, old fields	FACU	throughout
Meliotus officinalis	(L.) Pall.	yellow sweet-clover				Eurasia	waste ground, roadsides	FACU	throughout
Robinia pseudo-acacia	L.	black locust	dom			native	floodplains, open woods & thickets	FACU-	throughout
Trifolium hybridum	L.	alsike clover				Eurasia	fields, clearings	FACU	throughout
Trifolium repens	L.	white clover		ab		Europe	lawns, fields	FACU-	throughout
Wisteria sinensis	(Sims) Sweet	Chinese wisteria				China	disturbed woods	none	occasionally naturalized
FAGACEAE									
Quercus alba	L.	white oak				native	rich moist woods	FACU	throughout
Querqus imbricaria	Michx.	shingle oak				native	moist woods	FAC	frequent
Querqus montana	Willd.	chestnut oak				native	dry woods, rocky slopes	UPL	throughout
Quercus rubra	L.	northern red oak		few imm		native	woods	FACU-	throughout
Querqus silicifolia	wansenh.	scrub oak				native	dry to wet woods	none	throughout
Querqus velutina	Lam.	black oak				native	dry woods, rocky slopes	none	common throughout
JUGLANDACEAE									
Carya glabra	(Mill.) Sweet	pignut				native	upland forests	FACU-	common
LAMIACEAE									

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Clinopodium vulgare	L.	wild basil				Europe	open woods fields	none	throughout
Glechoma hederacea	L.	gill-over-the-ground; ground	mod			Eurasia	waste places	FACU	throughout
Hedeoma pulegioides	(L.) Pers.	American pennyroyal				native	dry pastures, woods	none	throughout
Lycopus americanus	Muhl. Ex. W. Bartram	water-horehound			mod	native	moist thickets, swamps	OBL	throughout
Monarda fistulosa	L.	wild bergamot				native	fields, thickets	UPL	throughout
Prunella vulgaris	L.	heal-all; self-heal		mod	few	Europe	waste places	FACU+	throughout
LAURACEAE									
Sassafras albidum	(Nutt.) Nrees	sassafras				native	edges, thickets	FACU-	throughout
LYTHRACEAE									
Lythrum salicaria	L.	purple loosestrife			ab, scat	Europe	swamps, wet meadows, shores	FACW+	noxious weed PA
MAGNOLIACEAE									
Liriodendron tulipifera	L.	tuliptree; yellow poplar				native	rich soil	FACU	throughout not north
OLEACEAE									
Fraxinus americana	L.	white ash				native	rich moist woods	FACU	throughout
Fraxinus pennsylvanica	Marshall	green ash, red ash	few			native	alluvial woods,stream banks	FACW	throughout
Ligustrum vulgare	L.	common privet				Europe	disturbed	FACU	invasive
ONAGRACEAE									
Circaea lutetiana (quadrisulcata)	L.	enchanter's-nightshade				native	floodplains	FACU	throughout
Epilobium coloratum	Biehller	purple-leaved willow-herb			dom	native	floodplains	FACW+	throughout
Epilobium parviflorum	Schreb.	willow-herb			L. mod	Europe	moist shores	nonr	rare NW
Ludwigia palustris	(L.) Elliot.	marsh-purslane			few	native	muddy shores, shallow water	OBL	throughout
Oenothera biennis	L.	common evening-primrose			dom	native	cultivated fields, waste places	FACU-	throughout
OXALIDACEAE									
Oxalis stricta (europea)	L.	common yellow wood-sorrel				Europe/native	lawns, gardens, fields	UPL	throughout
PHYTOLACCACEAE									
Phytolacca americana	L.	pokeweed				native	open ground	FACU+	throughout
PLANTAGINACEAE									
Plantago lanceolata	L.	English plantain; ribgrass		mod		Europe	waste places	UPL	throughout
Plantago major	L.	broadleaf plantain				Europe	waste places	FACU	throughout
PLATANACEAE									
Platanus occidentalis	L.	sycamore; buttonwood				native	river banks, floodplains	FACW-	throughout
POLYGONACEAE									
Polygonum aviculare	L.	knotweed				Europe	fields and roadsides	FACU	common throughout
Polygonum caespitosum	Blume	Asiatic water pepper, low sm				Asia	waste places	FACU	throughout
polygonum convolvulus	L.	black bindweed				Europe	lots, fields	FACU	throughout
Polygonum hydropiper	L.	water-pepper				Europe	stream edges	OBL	common
Polygonum lapathifolium	L.	dock-leaf smartweed			dom	Europe	waste places, clearings	FACW+	throughout

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Polygonum pensylvanicum	L.	Pennsylvania smartweed			ab	native	meadows, waste places	FACW	throughout
Polygonum persicaria	L.	lady's-thumb; heart's-ease			mod	Europe	waste places	FACW	ubiquitous weed
Polygonum sachalinense	F.W. Schmidt ex Maxim	giant knotweed				Asia	disturbed sites, escaped	UPL	escaped
Polygonum sagittatum	L.	arrow-leaved tearthumb				native	wet places, wet meadows	OBL	throughout
Polygonum virginianum	L.	Virginia knotweed; jumpsee				native	rich woods, floodplains	FAC	throughout
Rumex acetellosa	L.	sheep sorrel, sourgrass				Eurasia	ubiquitous weed	UPL	throughout
Rumex crispus	L	curly dock	few	mod	ab	Europe	waste places, fields	FACU	common weed
Rumex obtusifolius	L.	broad-leaf dock; bitter dock		few		Europe	waste places	FACU-	common weed
PRIMULACEAE									
Lysimachia quadrifolia	L.	whorled loosestrife				native	dry open woods	FACU-	common throughout
RANUNCULACEAE									
Ranunculus repens	L.	creeping buttercup	mod			Europe	meadows, stream banks, waste places	FAC	throughout
RHAMNACEAE									
Rhamnus frangula	L.	alder buckthorn	few	dom	L. ab imm	Europe	escaped, wet	FAC	invasive
ROSACEAE									
Agrimonia parviflora	Aiton	southern agrimony				native	moist woods	FACW	south
Crategus sp.		hawthorn				native			
Geum canadense	Jacq.	white avens	few			native	woods, roadsides	FACU+	throughout
Malus pumilia	Mill.	apple				Eurasia	escaped, old fields	UPL	frequent
Potentilla canadensis	L.	cinquefoil				native	open dry woods and fields	none	throughout
Potentilla norvegica	L.	strawberry-weed			few ?	native	waste ground	FACU	throughout
Potentilla recta	L.	sulfur cinquefoil				Europe	waste ground, dry fields	none	throughout
Potentilla simplex	Michx.	old-field cinquefoil			few	native	woods, old fields	FACU-	throughout
Prunus serotina	Ehrh.	wild black cherry				native	woods	FACU	throughout
Rosa sp.		small leaved rose							
Rosa sp.		big leaves							
Rosa multiflora	Thunb. ex Murray	multiflora rose				Asia	escaped, thickets	FACU	noxious weed PA
Rubus sp.		blackberry				native			
Rubus allegheniensis	Porter	common blackberry				native	old fields, clearings	FACU-	throughout
Rubus flagellaris	Willd.	northern dewberry				native	shaly slopes, fields	FACU	throughout
Rubus occidentalis	L.	black-cap; black raspberry				native	woods, old fields	none	throughout
Spiraea tomentosa	L.	hardhack				native	old fields, swamps	FACW-	throughout
RUBIACEAE									
Galium mollugo	L.	wild madder				Eurasia	waste ground, fields	none	throughout
Galium vernum ?	L.	yellow bedstraw				Eurasia	waste ground	none	occasionally naturalizec
SALICACEAE									
Populus grandidentata	Michx.	large-toothed aspen				native	early successional forests	FACU-	throughout

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gray=Family
imm=immature
?= uncertain
= # observed

TABLE 18
North Park Lake Aternative Dredge Material Placement Site Vegetation Survey by Transect and Vegetation Community
July 25 and August 1, 2003

Scientific Name		Common Name	County Site 9			Origin	Habitat	Wetland Indicator	PA Status
			woodland	mowed	swale				
Populus tremuloides	Michx.	quaking aspen				native	disturbed wet open woods	none	throughout
Salix interior (exigua)	Rowlee	sandbar willow			mod	native	sandy bars, shores	OBL	throughout
Salix nigra	Marshall	black willow	few		dom	native	stream banks, alluvial soils	FACW+	throughout
SAXIFRAGACEAE									
Penthorum sedoides	L.	ditch stonecrop			mod	native	low wet ground, ditches	OBL	throughout
SCROPHULARIACEAE									
Linaria vulgaris	Hill	butter-and-eggs				Eurasia	fields, waste ground	none	common throughout
Lindernia dubia	L.	false pimpernel			dom	native	muddy shores, shallow water	OBL	throughout
Verbascum blattaria	L.	moth mullein				Eurasia	waste ground	UPL	common throughout
Verbascum thapsus	L.	common mullein				Europe	dry waste ground	none	throughout
Veronica officinalis	L.	common speedwell				Europe	fields, woods, lawns	FACU-	common throughout
SIMAROUBACEAE									
Ailanthus altissima	(Mill.) Swingle	tree of heaven				Asia	disturbed areas	none	widely naturalized
SOLANACEAE									
Physalis heterophylla	Nees.	clammy ground-cherry				native	fields, cultivated areas	none	throughout
Solanum carolinense	L.	horse-nettle				native	fields, stream banks	UPL	throughout
Solanum dulcamara	L.	deadly nightshade; bitterswe			few	Eurasia	moist waste places	FACU	common
Solanum nigrum	L.	black nightshade				Europe	fields, roadsides, disturbed ground	none	mostly S
VERBENACEAE									
Verbina hastata	L.	blue vervain			dom	native	floodplains, moist places	FACW+	throughout
Verbena urticifolia	L.	white vervain		occ		native	moist meadows, waste places	FACU	common throughout
VIOLACEA									
Viola sororia	Willd.	common blue violet				native	moist woods, swamps	FAC	throughout
VITACEAE									
Ampelopsis brevipedunculata	(Maxim.) Trautv.	porcelain-berry	dom			Asia	escaped	none	serious weed
Parthenocissus quinquefolia	(L.) Planch.	Virginia creeper				native	woods, fields, edges	FACU	throughout
Vitus aestivalis	Michx.	summer grape	mod			native	wooded slopes	FACU	common throughout
Vitus labrusca	L.	fox grape				native	stream banks, rocky woods, moist thickets	FACU	throughout not N
CYPERACEAE									
Carex sp.									
Carex annectens	(E.P Bicknell) E. P. Bicknell	sedge				native	moist fields, open woods, ditches	FACW	common throughout
Carex normalis	Mack.	sedge			ab	native	moist woods, meadows	FACU	throughout
Carex projecta	Mack.	sedge	few ?			native	wet woods	FACW	occassional yhroughout
Carex scoparia	Schkohr ex Willd.	broom sedge		ab	dom	native	wet places, ditches	FACW	throughout
Carex vulpinoidea	Michx.	foxtail sedge			ab	native	swampy places, ditches	OBL	throughout
Cyperus strigosus	L.	galingale; false nutsedge		ab	dom	native	damp places, stream banks	FACW	throughout
Eleocharis obtusa	(Willd.) Schult.	spike-rush			mod	native	muddy places	OBL	throughout

dom=dominant
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mod=moderate
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occ=occasional
L. = locally

yellow =exotic invasive
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TABLE 18
North Park Lake Aternative Dredge Material Placement Site Vegetation Survey by Transect and Vegetation Community
July 25 and August 1, 2003

Scientific Name		Common Name	County Site 9			Origin	Habitat	Wetland Indicator	PA Status
			woodland	mowed	swale				
Scirpus cyperinus	(L.) Kunth	wool-grass				native	swamps, wet meadows, shores	FACW+	throughout
Scirpus polyphyllus	Vahl	bulrush				native	wooded streams	OBL	throughout
IRIDACEAE									
Iris pseudoacorus	L.	yellow iris			mod	Europe	moist shores, shallow water	OBL	frequent
JUNEACEAE									
Juncus effusus	L.	soft rush, common rush			dom	native	floodplains, shores	OBL	throughout
Juncus tenuis	Willd.	yard rush; path rush		dom	dom	native	disturbed areas	FAC-	throughout
LILIACEAE									
Allium vineale	L.	field garlic				Europe	disturbed ground	FACU-	common throughout
POACEAE									
Agrostis gigantea	Roth	redtop				Europe	waste ground, moist fields	FACW-	throughout
Agrostis perennans	(Walter) Tuck.	autumn bent			dom	native	low ground	FACU	throughout
Andropogon virginicus	L.	broom-sedge				native	waste places	FACU	mostly South
Anthoxanthum aristatum	Boiss.	sweet vernalgrass				Europe	cultivated, escaped	none	scatered
Anthoxanthum odoratum	L.	sweet vernalgrass				Eurasia	fields, meadows, roadsides	none	common throughout
Avena fatua	L.	wild oats				Europe	waste ground	none	scatered throughout
Bromus commutatus	Schrad.	hairy chess				Europe	waste ground	none	common throughout
Bromus intermis	Leyss.	smooth broome				Europe	cultivated, escaped	none	throughout
Bromus japonicus	Thunb. Ex Murray	Japanese chess				Eurasia	waste ground	FACU-	common throughout
Cinna arundinacea	L.	wood reedgrass				native	swamps, wet woods	FACW	throughout
Dactylis glomerata	L.	orchard grass				Europe	waste places	FACU	common throughout
Danthonia spicata	(L.) P. Beauv. Ex Roem. & Schult.	poverty grass				native	sandy, gravely soil	none	common throughout
Digitaria ischaemum	(Schreb. Ex. Schweigg) Schreb. Ex. Muhl.	smooth crabgrass				Eurasia	waste places	UPL	common throughout
Digitaria sanguinalis	(L.) Scop.	northern crabgrass				Europe	waste places	FACU-	common throughout
Echinochloa crusgalii	(L.) Beauv.	barnyard grass			dom	Eurasia	weed, moist fields	FACU	common throughout
Elytrigia repens	(L.) Desv. Ex Nevski	quackgrass	occ	occ		Eurasia	waste places	none	common throughout
Eragrostis hypnoides	(Lam.) Britton, Stearns, & Poggenb.	creeping lovegrass			ab	native	wet shores, mudflats	OBL	occasional
Festuca elatior	L.	tall fescue				Europe	fields, open ground	FACU-	throughout
Festuca obtusa	Biehler	nodding fescue				native	moist woods, clearings	FACU	throughout
Holcus lanatus	L.	velvetgrass				Europe	meadows, old fields, river shores	FACU	common throughout
Leersia virginica	Willd.	white grass				native	swamps, moist woods, streams	FACW	throughout
Lolium multiflorum	Lam.	annual ryegrass				Europe	cultivated frequently escaped	FACU-	throughout
Muhlenbergia frondosa	(Poir.) Fernald	wirestem muhly		mod		native	moist woods, stream banks	FAC	common throughout
Panicum acuminatum	sw.	panic grass				native	dry woods, slopes, clearings	none	common throughout
Panicum boscii	Poir	panic grass				native	moist woodlands	moist woodlands	mostly S.
Panicum capillare	L.	witchgrass				native	fields, shores	FAC-	throughout
Panicum clandestinum	L.	deer-tongue grass				native	moist woods, edges	FAC+	throughout

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yellow =exotic invasive
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gray=Family
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= # observed

TABLE 18
North Park Lake Aternative Dredge Material Placement Site Vegetation Survey by Transect and Vegetation Community
July 25 and August 1, 2003

Scientific Name		Common Name	County Site 9			Origin	Habitat	Wetland Indicator	PA Status
			woodland	mowed	swale				
Panicum latifolium	L.	panic grass				native	shores,thickets	FACU-	throughout
Panicum microcarpon	Muhl.	panic grass				native	well drained woods	FACU	mostly S.
Panicum virgatum	L.	switchgrass				native	alluvium, banks	FAC	throughout
Phalaris arundinacea	L.	reed canary grass		L. mod	dom	Europe/native	alluvial meadows, shores	FACW	invasive
Phleum pratense	L.	timothy				Europe	fields, meadows	FACU	throughout
Poa palustris	L.	fowl bluegrass			mod	native	wet meadows, shores, thickets	FACW	mostly N
Poa sylvestris	A. Gray	woodland bluegrass	ab		mod	native	rich woods	FACW	mostly S & W
Secale cereale	L.	rye				Eurasia	cultivated, fallow land	none	throughout
Setaria glauca	(L.) Beauv.	yellow foxtail				Europe	waste places	FAC	throughout
Setaria viridis	(L.) P. Beauv.	green foxtail				Eurasia	waste ground, roadsides	FAC	throughout
Tridens flavus (Triodia flava)	(L.) A. Hitchc.	purpletop				native	old fields	FACU	mostly south
Total # species			**25**	**24**	**50**				
Total # native species			**10**	**9**	**30**				
Total # exotic species			**15**	**15**	**20**				
Total # exotic invasive species			**6**	**4**	**5**				

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L. = locally

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TABLE 19
North Park Lake Alternative Dredge Material Placement Site Vegetation Survey
Summary of Native, Exotic, and Invasive Vascular Plant Species
For All Species and All Dominant Species
July 25 and August 1, 2003

	All Sites	Placement Site Transect										
		Round Top	Wildwood	Deer Pen	Bull Pen		Latodami			County Site		
		1	2 & 3	4	5		6, 7, & 8			9		
		woodland	old field	old field	woodland	old field	woodland	wildflower field	old field	woodland	mowed	swale
All Species												
# Native Species	**143**	61	27	22	21	5	29	24	59	10	9	30
# Exotic Species	**105**	18	46	29	23	32	13	33	50	15	15	20
# Exotic Invasive Species	**17**	5	5	3	3	7	6	6	1	6	4	5
Total	**248**	79	73	51	44	37	42	57	109	25	24	50
% Native	**57.7**	77.2	37.0	43.1	47.7	13.5	69.0	42.1	54.1	40.0	37.5	60.0
% Exotic	**42.3**	22.8	63.0	56.9	52.3	86.5	31.0	57.9	45.9	60.0	62.5	40.0
% Exotic Invasive	**6.9**	6.3	6.8	5.9	6.8	18.9	14.3	10.5	0.9	24.0	16.7	10.0
% Total	**100.0**	31.9	29.4	20.6	17.7	14.9	16.9	23.0	44.0	10.1	9.7	20.2
Dominant Species												
# Native Species	**37**	24	6	7	10	1	9	2	4	3	3	13
# Exotic Species	**36**	6	21	13	4	11	5	10	23	6	4	6
# Exotic Invasive Species	**10**	3	3	2	1	5	4	3	8	4	3	3
Total	**73**	30	27	20	14	12	14	12	27	9	7	19
% Native	**50.7**	80.0	22.2	35.0	71.4	8.3	64.3	16.7	14.8	33.3	42.9	68.4
% Exotic	**49.3**	20.0	77.8	65.0	28.6	91.7	35.7	83.3	85.2	66.7	57.1	31.6
% Exotic Invasive	**13.7**	10.0	11.1	10.0	7.1	41.7	28.6	25.0	29.6	44.4	42.9	15.8
% Total	**100.0**	41.1	37.0	27.4	19.2	16.4	14.0	12.0	27.0	9.0	7.0	19.0
Wetland Indicator												
facultative									14			4
Facultative upland									31			15
Facultative wet									11			15
Obligate									2			10
none									23			4
upland									9			2
Total									109			50
# wetland (fac, fac wet, obl)									27			29
# upland									63			21
% wetland									24.77			58.00
% upland									57.80			42.00
# dominant wetland									5			16
# total dominant species									27			19
% dominant wetland									18.52			84.21

TABLE 21
North Park Lake Alternative Dredge Material Placement Site Vegetation Survey
Summary of Dominant Native and Exotic Vascular Plant Species By Location and Vegetation Community
July 25 and August 1, 2003

Origin	Scientific Name	Common Name	Dredge Material Placement Site and Transect										
			Round Top	Wildwood	Deer Pen	Bull Pen		Latodami			County Site		
			1	2 & 3	4	5		6, 7, & 8			9		
			woodland	old field	old field	woodland	old field	woodland	wildflower field	old field	woodland	mowed	swale
	Canopy												
exotic	Catalpa bignor Walter	catalpa; Indian-bean		X									
exotic	Ailanthus altissima (Mill.) Swingle	tree of heaven		X			X			X			
native	Robinia pseud L.	black locust		X							X		
native	Salix nigra Marshall	black willow											X
native	Nyssa sylvatic Marshall	blackgum	X										
native	Cornus florida L.	flowering dogwood						X					
native	Quercus rubra L.	northern red oak	X					X					
native	Populus tremu Michx.	quaking aspen		X									
native	Acer rubrum L.	red maple			X	X						X	X
native	Sassafras albid (Nutt.) Nrees	sassafras	X			X							
native	Querqus silicif wansenh.	scrub oak	X										
native	Fraxinus amer L.	white ash	X										
native	Quercus alba L.	white oak	X					X					
	Sub- Canopy												
exotic	Rhamnus fran L.	alder buckthorn	X	X	X	X	X					X	
exotic	Elaeagnus uml Thunb.	autumn-olive							X	X			
exotic	Ligustrum vul L.	common privet	X					X					
exotic	Rosa multiflor Thunb. ex Murray	multiflora rose						X		X			
exotic	Celastrus orbic Thunb.	oriental bittersweet						X		X			
exotic	Ampelopsis br (Maxim.) Trauty	porcelain-berry									X		
native	Rubus alleghe Porter	common blackberry	X	X						X			
native	Vitus labrusca L.	fox grape				X							
native	Aralia spinosa L.	Hercules'-club	X										
native	Cornus amom Mill.	kinnikinik; red-willow											X
native	Rubus flagellaris Willd.	northern dewberry						X					
native	Cornus raceme Lam.	panicled dogwood								X			
native	Phytolacca am L.	pokeweed	X										
native	Viburnum rec Fernald	smooth (northern) arrow-wood	X			X							

TABLE 21
North Park Lake Alternative Dredge Material Placement Site Vegetation Survey
Summary of Dominant Native and Exotic Vascular Plant Species By Location and Vegetation Community
July 25 and August 1, 2003

Origin	Scientific Name		Common Name	Dredge Material Placement Site and Transect										
				Round Top	Wildwood	Deer Pen	Bull Pen		Latodami			County Site		
				1	2 & 3	4	5		6, 7, & 8			9		
				woodland	old field	old field	woodland	old field	woodland	wildflower field	old field	woodland	mowed	swale
native	Vitus aestivali	Michx.	summer grape	X					X					
native	Prunus serotin	Ehrh.	wild black cherry	X		X	X		X		X			
native	Verbesina alte	(L.) Britton	wingstem				X					X		
	Herbaceous													
exotic	Trifolium hybridum	L.	alsike clover		X	X		X						
exotic	Polygonum ca	Blume	Asiatic water pepper, low smartweed	X										
exotic	Echinochloa c	(L.) Beauv.	barnyard grass											X
exotic	Lotus corniculatus	L.	bird's-foot-trefoil		X									
exotic	Medicago lupulina	L.	black medic		X	X		X						
exotic	Cirsium vulgare	(Savi) Ten.	bull thistle					X		X	X			
exotic	Linaria vulgaris	Hill	butter-and-eggs								X			
exotic	Cirsium arven	(L.) Scop.	Canada thistle			X		X		X	X	X	X	X
exotic	Taraxacum off	Weber	common dandelion			X								
exotic	Artemisia vulgaris	L.	common mugwort									X		
exotic	Verbascum thapsus	L.	common mullein							X	X			
exotic	Ambrosia arte	L.	common ragweed							X	X			
exotic	Dipsacus sylve	Huds.	common teasel							X	X	X	X	X
exotic	Achillea mille	L.	common yarrow			X								
exotic	Oxalis stricta (europea)	L.	common yellow wood-sorrel			X			X	X	X			
exotic	Coronilla varia	L.	crown-vetch		X						X	X	X	X
exotic	Rumex crispus	L	curly dock			X								
exotic	Polygonum lapathifolium	L.	dock-leaf smartweed					X						X
exotic	Brassica rapa	L.	field mustard					X						
exotic	Alliaria petiola	(M. Bieb.) Cavra &	garlic-mustard	X				X	X	X	X	X		
exotic	Polygonum sa	F.W. Schmidt ex Maxim	giant knotweed					X						
exotic	Glechoma hed	L.	gill-over-the-ground			X								
exotic	Setaria viridis	(L.) P. Beauv.	green foxtail		X			X		X	X			
exotic	Bromus commutatus	Schrad.	hairy chess				X							
exotic	Bromus japonicus	Thunb. Ex Murray	Japanese chess		X									

TABLE 21
North Park Lake Alternative Dredge Material Placement Site Vegetation Survey
Summary of Dominant Native and Exotic Vascular Plant Species By Location and Vegetation Community
July 25 and August 1, 2003

Origin	Scientific Name		Common Name	Dredge Material Placement Site and Transect										
				Round Top	Wildwood	Deer Pen	Bull Pen		Latodami			County Site		
				1	2 & 3	4	5		6, 7, & 8			9		
				woodland	old field	old field	woodland	old field	woodland	wildflower field	old field	woodland	mowed	swale
exotic	Polygonum pe	L.	lady's-thumb; heart's-ease	X										
exotic	Dactylis glome	L.	orchard grass		X						X			
exotic	Lepidium virg	L.	poor-man's pepper							X	X			
exotic	Elytrigia repens	(L.) Desv. Ex Nevski	quackgrass		X						X			
exotic	Daucus carota	L	Queen-Anne's-lace;								X			
exotic	Agrostis gigantea	Roth	redtop		X		X							
exotic	Phalaris arundi	L.	reed canary grass											X
exotic	Rumex acetell	L.	sheep sorrel, sourgrass	X	X					X	X			
exotic	Potentilla recta	L.	sulfur cinquefoil		X	X					X			
exotic	Anthoxanthum aristatum	Boiss.	sweet vernalgrass		X		X				X			
exotic	Festuca elatior	L.	tall fescue		X						X			
exotic	Phleum pratense	L.	timothy		X	X					X			
exotic	Holcus lanatus	L.	velvetgrass		X	X								
exotic	Trifolium repens	L.	white clover		X									
exotic	Meliotus alba	Medick.	white sweet-clover		X									
exotic	Meliotus officinalis	(L.) Pall.	yellow sweet-clover		X									
native	Agrostis peren	(Walter) Tuck	autumn bent	X		X	X				X			X
native	Verbina hastat	L.	blue vervain											X
native	Carex scoparia	Schkohr ex Willd	broom sedge											X
native	Andropogon v	L.	broom-sedge		X									
native	Oenothera bie	L.	common evening-primrose					X						X
native	Hypericum pe	L.	common Saint John's-wort											
native	Panicum cland	L.	deer-tongue grass	X			X		X		X			
native	Hypericum mutilum	L.	dwarf saint John's-wort								X			
native	Lindernia dubia	L.	false pimpernel											X
native	Cyperus strigo	L.	galingale; false nutsedge			X								X
native	Euthamia gran	(L) Nutt.	grass-leaved goldenrod								X			X
native	Apocynum car	L.	Indian hemp							X				
native	Impatiens cape	Meerb.	jewelweed											

TABLE 21
North Park Lake Alternative Dredge Material Placement Site Vegetation Survey
Summary of Dominant Native and Exotic Vascular Plant Species By Location and Vegetation Community
July 25 and August 1, 2003

Origin	Scientific Name	Common Name	Dredge Material Placement Site and Transect										
			Round Top	Wildwood	Deer Pen	Bull Pen		Latodami			County Site		
			1	2 & 3	4	5		6, 7, & 8			9		
			woodland	old field	old field	woodland	old field	woodland	wildflower field	old field	woodland	mowed	swale
native	Impatiens pallida nutt.	pale jewelweed; touch-me-not	X										
native	Panicum boscii Poir	panic grass	X										
native	Panicum latifolium L.	panic grass	X										
native	Panicum microcarpon Muhl.	panic grass	X										
native	Aster lanceolatus Willd.	Panicled aster							X	X			
native	Danthonia spicata (L.) P. Beauv. Ex Roem. &	poverty grass	X		X								
native	Epilobium coloratum Biehlller	purple-leaved willow-herb											X
native	Carex annectens (E.P Bicknell) F	sedge	X	X	X								
native	Solidago gigantea Aiton	smooth goldenrod									X	X	
native	Juncus effusus L.	soft rush, common rush											X
native	Leersia virginica Willd.	white grass						X					
native	Aster pilosus Willd.	white heath aster								X			
native	Eupatorium rugosum Houtt.	white snakeroot	X					X	X	X			
native	Poa sylvestris A. Gray	woodland bluegrass	X			X							
native	Solidago rugosa Mill.	wrinkle-leaved goldenrod											
native	Juncus tenuis Willd.	yard rush; path rush			X	X						X	X
native	Carex sp.			X									
exotic	Prunella vulgaris L.	heal-all; self-heal			X								

TABLE 22

North Park Lake Alternative Dredge Material Placement Site Vegetation Survey, Ranking by Vegetation Community Quality and Diversity, Ordered from Least to Most Degraded, July 25 and August 1, 2003

Dredge Material Placement Site	Transect #	Vegetation Community	Quality Metrics								Diversity Metrics					All Metrics	
			% exotic species		% invasive exotic species		% of dominant species exotic		% of dominant species exotic invasive		Total # species	Total # native species		Total # dominant species native		average rank	Ranking from Least to Most Degraded
			value	rank	value	rank	value	rank	value	rank	value	value	rank	value	rank		
Round Top	1	woodland	22.8	1	6.3	2	20.0	1	10.0	2.5	**79**	61	1	24	1	1.42	1
Bull Pen	5	woodland	52.3	5	6.8	3	28.6	2	7.1	1	**44**	21	8	10	3.5	3.75	2
County Site	9	swale	20.6	3	10	6	31.6	3	15.8	5	**50**	30	3	13	2	3.67	3
Latodami	6,7,8	woodland	31	2	14.3	8	35.7	4	28.6	8	**42**	29	4	9	5	5.17	4
County Site	9	mowed	62.5	9	16.7	9	57.1	5	42.9	10	**24**	9	10	3	8.5	8.58	5
Deer Pen	4	old field	56.9	6	5.9	1	65.0	6	10.0	2.5	**51**	22	7	7	6	4.75	6
County Site	9	woodland	60	8	24	11	66.7	7	44.4	11	**25**	10	9	3	8.5	9.08	7
Latodami	6,7,8	old field	45.9	4	9.2	5	69.7	8	24.2	6	**109**	59	2	10	3.5	4.75	8
Wildwood	2,3	old field	63	10	6.8	4	77.8	9	11.1	4	**73**	27	5	6	7	6.50	9
Latodami	6,7,8	wildflower field	57.9	7	14	7	83.3	10	25.0	7	**57**	24	6	2	10	7.83	10
Bull Pen	5	old field	86.5	11	18.9	10	91.7	11	41.7	9	**37**	5	11	1	11	10.50	11

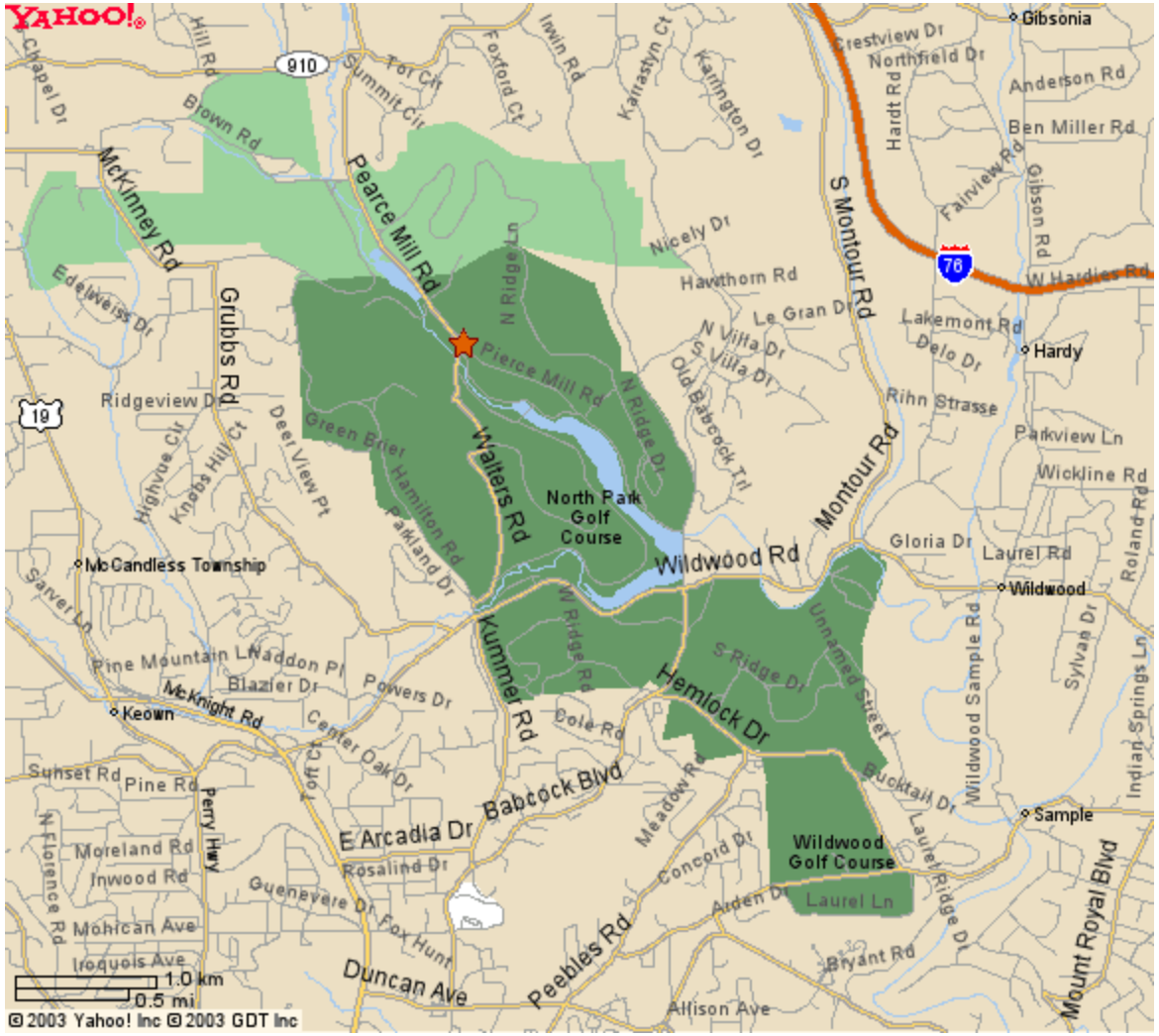

Figure 1
Pine Creek Basin, North Park Area Map

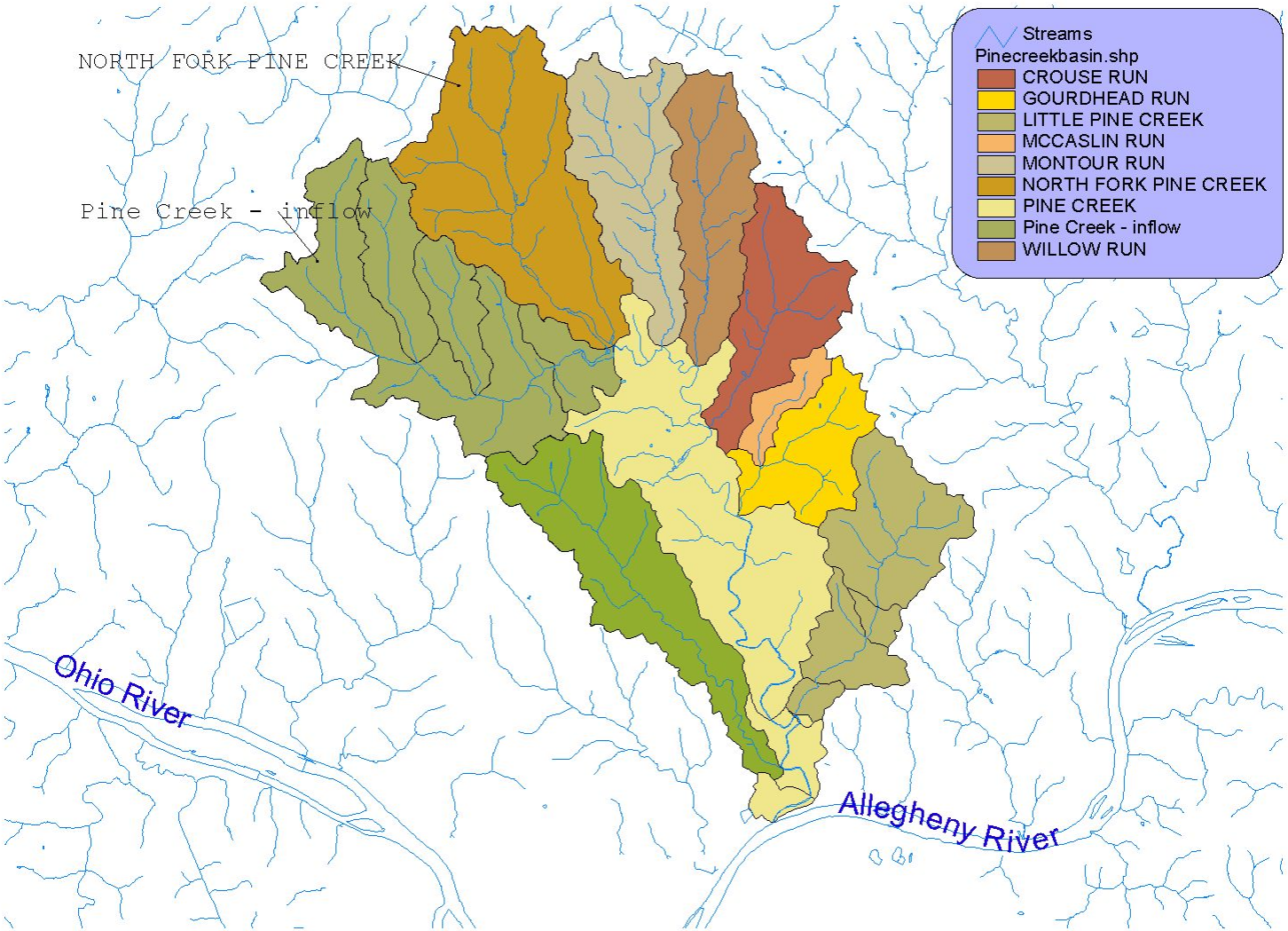

Figure 2
Pine Creek Sub-basin Map

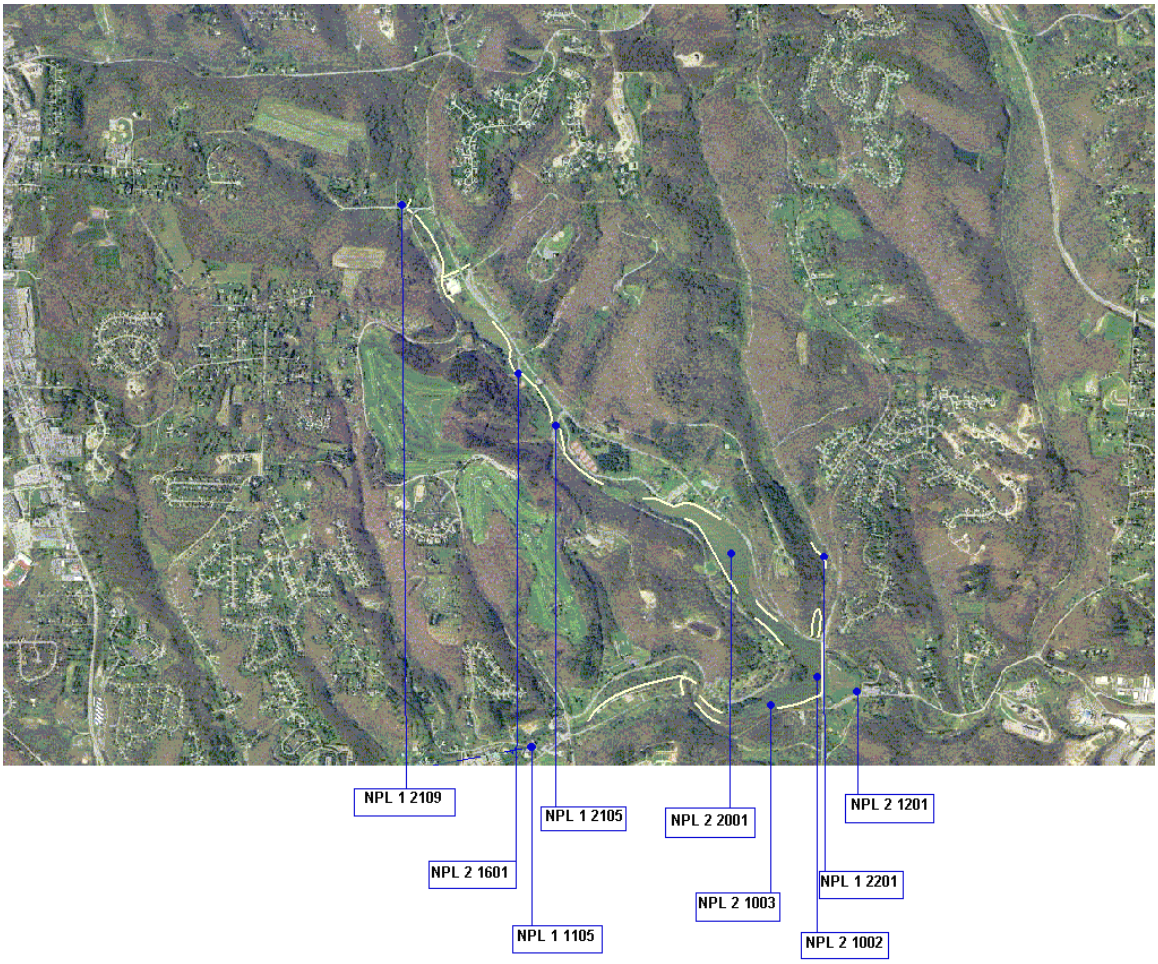

Figure 3

Pine Creek Basin, North Park Water Quality Sampling Stations
21 August 2002

Riparian Vegetation Survey Reaches Highlighted in Yellow

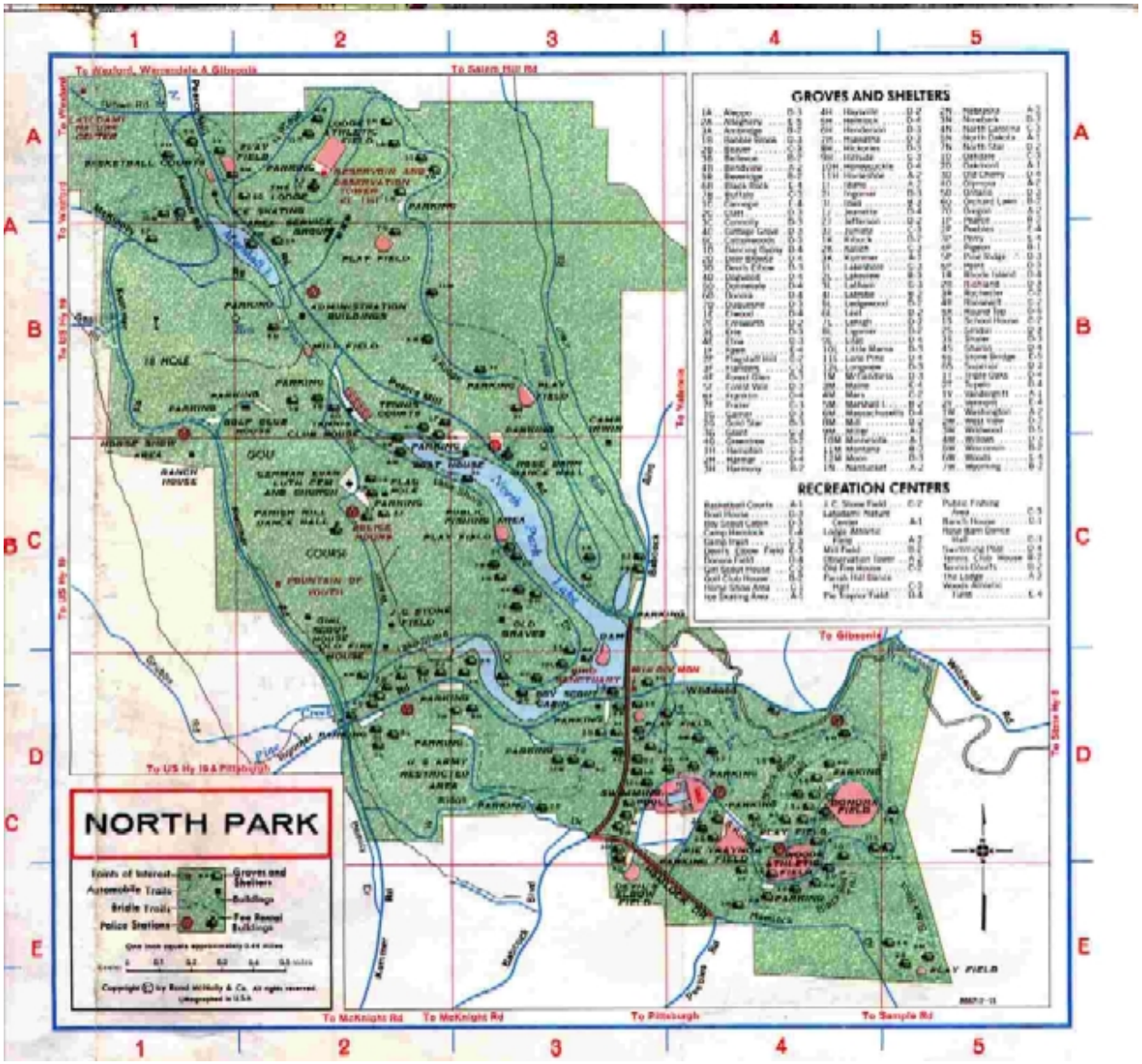

Figure 4
North Park Map