

**2001 SUMMARY REPORT**  
**of**  
**BUFFALO CREEK RESERVOIR**  
**Lake County, Illinois**

*Prepared by the*

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## **LAKE IDENTIFICATION AND LOCATION**

**Lake Name:** Buffalo Creek Reservoir

**County:** Lake

**Nearest Municipality:** Buffalo Grove

**Location:** T43N, R11E, Section 31

**Watershed:** Des Plaines River

**Sub-Basin:** Buffalo Creek

**Major Tributaries:** Buffalo Creek

**Receiving Water Body:** Buffalo Creek eventually into Des Plaines River

**Surface Area:** 34.8 acres

**Shoreline Length:** Approximately 3.0 miles

**Maximum Depth:** 6.0 feet (variable, depending on rain events)

**Mean Depth:** 3.0 feet (estimated)

**Volume:** Approximately 700 acre-feet (maximum storage capacity)

**Lake Type:** Reservoir created in 1984, expanded in 1989

**Elevation:** Approximately 700 feet above mean sea level

## EXECUTIVE SUMMARY

The water quality in Buffalo Creek Reservoir was poor. Many of the values recorded were above the county averages of other lakes in the county. The water clarity, as measured by Secchi disk transparency readings, averaged 1.1 feet, which is significantly below water clarity measurements in other county lakes. Corresponding with the poor Secchi readings were high levels of all solids measured (total solids, total dissolved solids, total volatile solids, and total suspended solids).

The average total phosphorus reading of 0.155 mg/L is over three times higher than most of the other lakes in the county (median = 0.047 mg/L) and five times higher than the value considered to cause nuisance algae blooms (0.03 mg/L).

Total conductivity readings (average = 1.0658 milliSiemens/cm) in the reservoir were significantly higher than the county average (0.7557 milliSiemens/cm). The high readings for total dissolved solids and total suspended solids correlate with these conductivity readings.

Water levels in Buffalo Creek Reservoir fluctuated throughout the season. Due to the design and purpose of the reservoir, fluctuating water levels are expected. These fluctuating water levels may have impacted some aspects of the study.

The phosphorus trophic state index (TSI) for Buffalo Creek Reservoir classified it as a hypereutrophic lake (TSI=76.9). Buffalo Creek Reservoir is currently #92 of 103 in a ranking of average TSI values for Lake County lakes.

Throughout the sampling season minimal amounts of aquatic vegetation were observed. Six aquatic plant species and several emergent shoreline plants were found. Curlyleaf pondweed was the most common species in the reservoir, followed by sago pondweed.

The majority of the shoreline around the reservoir was classified as prairie (71%), followed by shrub (27%), and rip-rap (2%). Some areas with mature trees were found near the shoreline, but not at the water/land interface.

Erosion does not appear to be a major problem at this time. Moderate erosion was found along two sections of the reservoir, which comprised approximately 5% of the shoreline.

Several exotic species were noted growing along the shoreline of Buffalo Creek Reservoir. Most notably were small patches of buckthorn, common reed, multiflora rose, purple loosestrife, and reed canary grass.

## LIMNOLOGICAL DATA – WATER QUALITY

Water samples were collected monthly from May - September at the deep-hole location near the reservoir's center (Figure 1). See Appendix B for water sampling methods.

The water quality in Buffalo Creek Reservoir was poor. Many of the values recorded were above the county averages of other lakes in the county. Several findings are noteworthy.

The water clarity, as measured by Secchi disk transparency readings, averaged 1.1 feet, which is significantly below water clarity measurements in other county lakes. The county median (where 50% of the lakes are above and below this value; data from 1995-2001) is 4.18 feet. The 2001 average is slightly higher than the 1998 VLMP average of 10 inches or 0.83 feet. Corresponding with the poor Secchi readings were high levels of all solids measured (total solids, total dissolved solids [TDS], total volatile solids, total suspended solids [TSS]). All these values were considerably higher in Buffalo Creek Reservoir than in other county lakes. For example, the reservoir average for TSS in the reservoir was 34.7 mg/L, which is over five times the county median (5.7 mg/L).

Exacerbating the water clarity problem is the presence of carp. Carp activity in this shallow body of water likely contributes to the turbid conditions, as well as resuspending nutrients and sediment into the water column.

Total phosphorus (TP) concentrations were high as well. The average TP reading of 0.155 mg/L is over three times higher than most of the other lakes in the county (median = 0.047 mg/L) and five times higher than the value considered to cause nuisance algae blooms (0.03 mg/L). High TP levels are due to the large watershed that drains into the reservoir coupled with the fact that much of the watershed is residential.

The ratio between average total nitrogen and average total phosphorus for Buffalo Creek Reservoir was 9:1, indicating a nitrogen-limited system. Nitrogen, as well as carbon, naturally occur in high concentrations and come from a variety of sources (soil, air, etc.) which are more difficult to control than sources of phosphorus. Lakes that are phosphorus-limited may be easier to manage, since controlling phosphorus is more feasible than controlling nitrogen or carbon.

A small sewage treatment plant at the Alden Long Grove Rehabilitation and Health Care facility in Long Grove discharges its effluent into an unnamed tributary of Buffalo Creek, upstream from the reservoir. This plant's contribution to the nutrient loading into Buffalo Creek Reservoir is probably minimal due to the low flow and nutrients in the effluent. Although specific phosphorus loading from this plant is not monitored, a conservative estimated of the loading was calculated using 1.0 mg/L as the daily load being discharged. Based on the 0.015 million gallons per day flow rate, approximately 45.7 pounds of phosphorus enters the tributary each year. TSS concentrations entering the lake average 1,679 pounds per year.

Figure 1.

Total conductivity readings (average = 1.0658 milliSiemens/cm) in the reservoir were significantly higher than the county average (0.7557 milliSiemens/cm). The high readings for TDS and TSS correlate with these conductivity readings. Sediment, nutrients, or road salt coming in from upstream increase the conductance of the water. The long-term impact of high conductivity readings is unknown.

Water levels in Buffalo Creek Reservoir fluctuated throughout the season. LCHD staff noted evidence of significant water level fluctuations during the season, particularly between the April and May visits to the lake. Due to the design and purpose of the reservoir, fluctuating water levels are expected. These fluctuating water levels may have impacted some aspects of the study. The reservoir is designed to handle a peak flow of approximately 200-300 ft<sup>3</sup>/second.

Rain events probably contributed additional sediment or nutrients (like phosphorus) to the reservoir, which may have influenced the water sample results. Rain occurred within 48 hours prior to water sampling in June (0.02 inches), July (0.49 inches), and August (0.67 inches) as recorded at the Lake County Stormwater Management Commission rain gauge in Buffalo Creek. Although no rain was recorded 48 hours prior to sampling in May, a total of 2.95 inches were recorded approximately one week prior to sampling (May 6 – 11). This may explain the signs of high water seen, including the loss of many of the Canada geese nests.

Clearly, Buffalo Creek Reservoir receives a large volume of water during the year. Along with that water comes large amounts of sediment, nutrients, and other material from upstream sources, much of it urbanized. Due to its nature as a detention water body, the high concentrations of all parameters measured found in 2001 are not surprising. Little improvement in water quality is likely as long as the reservoir continues to serve in this capacity.

Based on data collected in 2001, standard classification indices compiled by the Illinois Environmental Protection Agency (IEPA) were used to determine the current condition of Buffalo Creek Reservoir. A general overall index that is commonly used is called a trophic state index or TSI. The TSI index classifies the lake into one of four categories: oligotrophic (nutrient-poor, biologically unproductive), mesotrophic (intermediate nutrient availability and biological productivity), eutrophic (nutrient-rich, highly productive), or hypereutrophic (extremely nutrient-rich productive). This index is calculated using total phosphorus values obtained at or near the surface. The phosphorus TSI for Buffalo Creek Reservoir classified it as a hypereutrophic lake (TSI=76.9). Eutrophic lakes are the most common types of lakes throughout the lower Midwest, and they are particularly common among man-made lakes. See Table 2 in Appendix A for a ranking of average TSI values for Lake County lakes (Buffalo Creek Reservoir is currently #92). This ranking is only a relative assessment of the lakes in the county. The current rank of a lake is dependent upon many factors including lake origin, water source, nutrient loads, and morphometric features (volume, depth, substrate, etc.). Thus a small shallow manmade lake with high nutrient loads could not expect to achieve a high ranking even with intensive management.

In the reservoir, the IEPA aquatic life impairment index indicated a partial degree of support for all aquatic organisms in the lake. Due to high nutrient levels (particularly phosphorus) and poor water clarity, the swimming index was classified as nonsupport, while the recreation use index and the overall support index showed a partial impairment. The Health Department did not test for bacteria or other harmful pathogens on Buffalo Creek Reservoir in 2001.

## LIMNOLOGICAL DATA – AQUATIC PLANT ASSESSMENT

Aquatic plant species presence and distribution in Buffalo Creek Reservoir were assessed monthly from May through September 2001 (see Appendix B for methods). Throughout the sampling season minimal amounts of aquatic vegetation were observed. Six aquatic plant species and several emergent shoreline plants were found (see Table 3).

Curlyleaf pondweed was the most common species in the reservoir, followed by sago pondweed (Table 4, Appendix A). However, only scattered plants were found throughout the entire reservoir (areal coverage was estimated at 5%). The western part of the reservoir harbored the most plants, including all six species.

Due to the poor water clarity and potentially dramatic water fluctuations in the reservoir, aquatic plants can not grow well. The 1% light level (where plant photosynthesis ceases) was deepest in September at four feet. Most of the season the 1% light level was less than three feet. Thus, light penetration sufficient for plant growth was only reaching about three feet into the water. This correlates with the maximum depth at which plants were found in the reservoir (3.5 feet). Aquatic plant growth is not expected to be a high priority for this body of water. However, additional plants may help increase water clarity and provide habitat for fish and wildlife.

High nutrient levels described in the **Water Quality** section above contributed to several algae blooms noted during the season on the reservoir. Due to the nature of the lake and the presence of high nutrients, particularly phosphorus, Buffalo Creek Reservoir will likely remain an algae-dominated lake.

Floristic quality index (FQI; Swink and Wilhelm 1994) is an assessment tool designed to evaluate the closeness that the flora of an area is to that of undisturbed conditions. It can be used to: 1) identify natural areas, 2) compare the quality of different sites or different locations within a single site, 3) monitor long-term floristic trends, and 4) monitor habitat restoration efforts. Each aquatic plant in a lake is assigned a number between 1 and 10 (10 indicating the plant species most sensitive to disturbance). This is done for only floating and submersed plants found in the lake. These numbers are averaged and multiplied by the square root of the number of species present to calculate an FQI. A high FQI number indicates that there are a large number of sensitive, high quality plant species present in the lake. Non-native species were counted in the FQI calculations for Lake



County lakes. In 2001, Buffalo Creek Reservoir had a FQI of 13.1. The average FQI of lakes studied by the Lake County Health Department in 2000-2001 was 14.0.

**Table 3. Aquatic and shoreline plants on Buffalo Creek Reservoir, May - September 2001.**

Aquatic Plants

Coontail	<i>Ceratophyllum demersum</i>
Curlyleaf Pondweed	<i>Potamogeton crispus</i>
Leafy Pondweed	<i>Potamogeton foliosus</i>
Small Pondweed	<i>Potamogeton pusillus</i>
Flatstem Pondweed	<i>Potamogeton zosterifomis</i>
Sago Pondweed	<i>Stuckenia pectinatus</i>

Shoreline Plants

Big Bluestem	<i>Andropogon gerardii</i>
Dogbane	<i>Apocynum cannabinum</i>
Crown-vetch	<i>Coronilla varia</i>
Spikerush	<i>Eleocharis spp.</i>
Purple Loosestrife	<i>Lythrum salicaria</i>
Reed Canary Grass	<i>Phalaris arundinacea</i>
Common Reed	<i>Phragmites australis</i>
Buckthorn	<i>Rhamnus cathartica</i>
Multiflora Rose	<i>Rosa multiflora</i>
Willow	<i>Salix spp.</i>
Cattail	<i>Typha sp.</i>

**LIMNOLOGICAL DATA – SHORELINE ASSESSMENT**

A shoreline assessment was conducted in May 2001 to determine the condition of the lake shoreline (see Appendix B for methods). Of particular interest was the condition of the shoreline at the water/land interface.

The majority of the shoreline around the reservoir was classified as prairie (71%), followed by shrub (27%), and rip-rap (2%; Figure 2). Some areas with mature trees were found near the shoreline, but not at the water/land interface.

Erosion does not appear to be a major problem at this time. Moderate erosion was found along two sections of the reservoir, which comprised approximately 5% of the shoreline (see Figure 3). One of the sections is approximately 672 feet in length and located along the channel at the reservoir outlet. The other section is approximately 63 feet in length located along the north shoreline where the western part of the reservoir drains into the eastern part. No severe erosion was observed along the shoreline in 2001.

Figure 2.

Figure 3

Several exotic species were noted growing along the shoreline of Buffalo Creek Reservoir. Most notably were small patches of buckthorn, common reed, multiflora rose, purple loosestrife, and reed canary grass. None of these exotics are currently dominant, but controlling and preventing their spread is recommended.

## LIMNOLOGICAL DATA – WILDLIFE ASSESSMENT

Good numbers of wildlife, particularly birds, were noted on and around Buffalo Creek Reservoir. See Appendix B for methods. Several of the species listed in Table 5 (below) were seen during spring or fall migration and were assumed not to be nesting around the lake. No amphibians, mammals, or reptiles were seen, although qualitative sampling for these animals was not conducted.

The dominant bird species found was the Canada goose. An estimated 80-90 goose nests were seen along the shoreline during an April visit. By the May sampling date less than 15 nests were still active. Many of the eggs were abandoned at the nest or lying on the ground away from nest. Since there was evidence of recent high water in the reservoir in the previous month (see **Water Quality** section), these nests were likely destroyed due to flooding.

One species observed, the common tern, is listed as endangered in Illinois. No effort was made to locate a nest, but likely this bird (seen only once) was moving through the area and not nesting around the reservoir.

Good habitats exist around the reservoir. Native prairie plants dominated and small woodland areas made for a good mix of habitats.

**Table 5. Wildlife species observed on Buffalo Creek Reservoir, May – September, 2001.**

*Birds*

Double Crested Cormorant	<i>Phalacrocorax auritus</i>
Canada Goose	<i>Branta canadensis</i>
Mallard	<i>Anas platyrhynchos</i>
American Coot	<i>Fulica americana</i>
Ring-billed Gull	<i>Larus delawarensis</i>
Common Tern*	<i>Sterna hirundo</i>
Great Egret	<i>Casmerodius albus</i>
Great Blue Heron	<i>Ardea herodias</i>
Killdeer	<i>Charadrius vociferus</i>
Spotted Sandpiper	<i>Actitis macularia</i>
Red-tailed Hawk	<i>Buteo jamaicensis</i>
Eastern Kingbird	<i>Tyrannus tyrannus</i>
Willow Flycatcher	<i>Empidonax traillii</i>

**Table 5. Wildlife species observed on Buffalo Creek Reservoir, May – September, 2001 (cont'd).**

Barn Swallow	<i>Hirundo rustica</i>
Tree Swallow	<i>Iridoprocne bicolor</i>
Chimney Swift	<i>Chaetura pelagica</i>
American Crow	<i>Corvus brachyrhynchos</i>
Catbird	<i>Dumetella carolinensis</i>
American Robin	<i>Turdus migratorius</i>
Cedar Waxwing	<i>Bombycilla cedrorum</i>
Warbling Vireo	<i>Vireo gilvus</i>
Yellow Warbler	<i>Dendroica petechia</i>
Common Yellowthroat	<i>Geothlypis trichas</i>
Red-winged Blackbird	<i>Agelaius phoeniceus</i>
Common Grackle	<i>Quiscalus quiscula</i>
Northern Oriole	<i>Icterus galbula</i>
Northern Cardinal	<i>Cardinalis cardinalis</i>
American Goldfinch	<i>Carduelis tristis</i>
Field Sparrow	<i>Spizella pusilla</i>
Song Sparrow	<i>Melospiza melodia</i>
Savannah Sparrow	<i>Passerculus sandwichensis</i>

*Amphibians, Mammals, and Reptiles*

None noted

*Insects*

Dragonfly

Cicada

Clouded Sulpher Butterfly

Monarch Butterfly

Red Admiral Butterfly

*Fish*

Common Carp

\* **Endangered in Illinois**

+**Threatened in Illinois**

## LAKE QUALITY HIGHLIGHTS, PROBLEMS AND RECOMMENDATIONS

Buffalo Creek Reservoir is a body of water used for detention of stormwater from upstream sources. As such, the reservoir receives large volumes of water and high amounts of sediment, nutrients, and other materials. The following “problems” are expected from a body of water such as this. If current uses of the reservoir continue, little to no improvement of water quality is expected.

- *Good Upland Habitat*

The prairie and shrub habitat found upland from the reservoir provides excellent habitat for many wildlife species and compliments the aesthetics of the walking/bike trails that surround the area.

- *Poor Water Clarity*

Secchi disk transparency and the 1% light levels indicate poor water clarity conditions in the reservoir. High levels of sediment and nutrients entering the reservoir, exacerbated by carp activity, are the probable causes for the turbidity.

- *High Nutrient and Solid Levels*

Total phosphorus and all solid parameters were significantly higher than the county medians. The large volume of water passing through Buffalo Creek Reservoir inputs large amounts of nutrients and sediment. Algae blooms seen during the season are the predictable result from a body of water with these high nutrient levels.

- *High Conductivity Readings*

Due to the high levels of total dissolved solids and total suspended solids, conductivity readings were significantly above county averages. Little is known about the long-term impacts of high conductivity readings or chloride concentrations.

- *Exotic Plant Species*

Several exotic plant species were found around the shoreline of Buffalo Creek Reservoir. Small patches of buckthorn, common reed, multiflora rose, purple loosestrife, and reed canary grass were found. None of these exotics were dominant at this time, but they should be monitored and if possible controlled or eliminated.

- *Carp*

Carp were frequently seen in the reservoir. Due to the shallow nature of the water, carp contributed to poor water clarity and to the high levels of nutrients seen during the season. Elimination of carp will be difficult due to upstream sources.