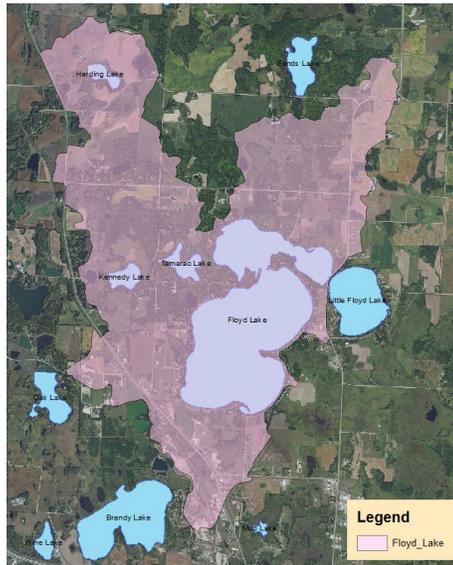


Overall Strategy:
Improve Water Quality (North Floyd); Maintain Water Quality (Big Floyd)

Impairment: Listed Impaired for mercury

Drainage Area Land Cover:
21.7% open water
4.9 % wetlands,
15.5% cropland,
17.7% grassland,
31.4% forest,
8.7% developed



Water Quality Big Floyd	10-Year Average June - Sept (2008-2017)	Trend
Secchi (clarity)	12 ft.	Stable
Total Phosphorus	14 µg/L	Stable
Ortho Phosphate	3.0 µg/L	Stable
Chlorophyll-a	4.5 µg/L	Stable

Short Term Goals - 2025

- Maintain the 5- year mean summer phosphorus levels below 20µg/L
- Maintain mean (5yr) Secchi depth no less than 10 feet

Long-term Goals – Year 2035

- Achieve a 5-year mean summer phosphorus level below 15µg/L
- Maintain mean secchi (5yr) depth no less than 11 feet

Water Quality North Floyd	10-Year Average June - Sept (2008-2017)	Trend
Secchi (clarity)	8.5 ft.	Stable
Total Phosphorus	34 µg/L	Stable
Ortho Phosphate	5 µg/L	Stable
Chlorophyll-a	16 µg/L	Stable

Short Term Goals - 2025

- Maintain 5- year mean summer phosphorus levels below 35µg/L
- Maintain mean Secchi depths no less than 8 feet

Long-term Goals – Year 2035

- Achieve a 5-year mean summer phosphorus level below 30µg/L
- Maintain a 5-year mean Secchi depth no less than 9 feet

Basic Facts

DNR ID/Becker No	MN03-0387-00 / 387
Township(s)	Detroit (Sec 3, 4, 9, 10, 15, 16)
Lake Classification	General Development
Lake Area – Big	862 acres
North	298 acres
Littoral Area	861 acres (73.1 %)
Sub-watershed Area	6281.3 acres
Shoreline Length	
Big	5.5 miles/29,000 ft
North	3.6 miles/18,850 ft
Inlet(s)	Campbell Creek and Tamarac Lake flowage
Outlet(s)	Pelican River (Becker CSAH 21 culvert)
Control Structures	None (Level controlled by Little Floyd Lake Dam)
Highest Recorded*	1356.5 feet (7/29/1993)
Lowest Recorded*	1353.61 feet (10/23/1956)
Ordinary High Water Level*	1354.8 feet
Recorded Range*	2.89 feet
Maximum Depth	26 feet (“Big” Floyd), 34 feet (“North” Floyd)
Water Residence	271 days-North Floyd N/A- Big Floyd
Main Fish Species	Black Crappie, Bluegill, Pumpkinseed, Largemouth Bass, Rock Bass, Walleye
Secondary Fish Species	Bowfin, Hybrid Sunfish, Tullibee Black/Brown/Yellow Bullhead
Fish Stocking & Management	Walleye;
Aquatic Invasive Species (2015)	None listed
Public Access Sites	Big Floyd SE Shore (DNR)
Marinas	None
Public Beach	None
References	DNR Lake Finder, Becker County

Overall Assessment

Floyd Lake, a 1,178 acre, general development lake with heavily developed shoreline located north of the City of Detroit Lakes. The lake is divided into two distinct basins, known locally as Big Floyd and North Floyd. The lakes are heavily used for game fishing, boating, and other summer and winter recreational activities. The larger of the two basins, Big Floyd is 862 acres in size, reaches a maximum depth of 25 feet, and has approximately 5.5 miles of shoreline. The littoral area (<15 ft) of the lake accounts for nearly 70% of the lake area and emergent aquatic plants are common. "North" Floyd is smaller with 316 acres of surface area, 2.2 miles of shoreline, and has a maximum depth of 34 feet. North Floyd littoral area (<15 ft) coverage is approximately 60%. There is one MN DNR owned public access located on the southeast side of Big Floyd. North Floyd Lake does not have a public access.

The major water source into North Floyd is Becker County Drainage Ditch 12/Campbell Creek along with two minor inlets located on the west side of North Floyd and on the southwest side of Big Floyd. Campbell Creek is an intermittent, high gradient stream and is the major nutrient source to North Floyd Lake. Sections of Campbell Creek were ditched and straightened in the early 1900s for agricultural benefit and included partially drawing down Campbell Lake and draining surrounding wetland areas. Becker County Ditch 11-12 discharges into Campbell Creek, a natural channel which drops almost 80 feet in 2 miles before reaching North Floyd. Through the lower reach, Campbell Creek passes through eroding and highly erodible soils, and carries a heavy sediment load to North Floyd. It appears that most of the time Big Floyd also contributes some flow to North Floyd, although it is thought the source of this water is mainly from groundwater. Other minor water sources include overland flows and groundwater seeps and springs. The outflow is located on the east side of North Floyd and connects to Little Floyd through Becker CSAH21 road culvert.

The Floyd Lake drainage area is 4,916 acres, extending to the west and north. Much of the land cover, excluding open water, in the drainage area is forested (40%) and grassland (23%). Cultivated land crops account for 20% of land cover and are primarily located in the upstream Campbell Creek drainage area. Developed land (11%) in the area consists of shoreline residential housing and a few commercial storage businesses.

Both lakes have undergone increased development pressure in the past 15 years. Big Floyd underwent conversions of seasonal cabins to permanent year-round residential use and second-tier development. In 2017, the Ironman Golf Course, located between Big and Little Floyd Lakes was converted to residential housing. Big Floyd's shoreline is extensively developed with approximately 76% of 300 parcels exhibiting moderate to significant shoreline modification. In the mid-2000's, the north side of North Floyd was converted from agriculture pasture to residential lots. Since the conversion, approximately 12% of North Floyd's 67 parcels have moderate to significant shoreline modification. Utilization of rip-rap, vegetation/tree removal, sand blankets and retaining walls are prominent alteration practices.

North and Big Floyd parcels mainly utilize septic systems, with a few parcels using holding tanks. It is anticipated parts of Big Floyd may be annexed into the City of Detroit Lakes as it is an area identified in the "Future Utility Extension/Annexation Area" of the City of Detroit Lakes Comprehensive Plan. This area is also within the City of Detroit Lakes "extra territorial" 2-mile area which means it has influence on the specifics of new developments.

Both Big and Floyd Lakes have sufficient depth for the lake water column to vertically stratify into different layers of water temperature. Cold water is generally heavier than warm water and will collect near the bottom, while the lighter, warmer water will form the upper layers. North and Big Floyd are dimictic lakes, a process in which twice a year the stratified lake water column will "turn over" completely during seasonal temperature changes in the spring and fall. This process carries much needed oxygen into the lake depths.

Most of the time, Big Floyd's water is clear, with moderate phosphorus and algae concentrations, good game fish populations, and will moderate aquatic plant growth. Big Floyd exhibits above average water quality in comparison with other District Lakes and is considered mesotrophic with annual averages of 12.5 feet of water clarity and 18 ppb in-lake phosphorus concentrations. In comparison, North Floyd is a significantly damaged lake, suffering poor clarity, high phosphorus and severe algal blooms as a result of almost of 100 years of elevated phosphorus and sediment loading from ditched Campbell Creek. In North Floyd, there is a phenomena occurring known as "internal phosphorus loading" which recycles and releases phosphorus back into the water column causing algae blooms. This is due to decades of legacy phosphorus that has accumulated in the lake sediment. In late summer, after water "turnover", North Floyd experiences occasional algae blooms caused by the release of phosphorus from the enriched lake sediments. North

Floyd is considered borderline eutrophic as the annual average of in-lake phosphorus concentrations have remained in the 32-34 ppb range.

The District partnered with the Natural Resource Conservation Service (NRCS) to develop an Upper Pelican River Watershed Plan and Environmental Assessment (2007) to identify the major sources of nutrients and sediment loading in the Upper Pelican River reach including Campbell Creek and the Pelican River/Ditch 13 area from Little Floyd Lake to Detroit Lake. The plan recommended a strong non-degradation policy for Big Floyd; Campbell Creek short term reductions of 25% TP loading, 50% reductions long-term to North Floyd and to improve North Floyd water quality to 25ppb in-lake concentration to benefit downstream Little Floyd Lake water quality.

The District partnered with NRCS, Becker County Soil and Water Conservation Service, and landowners to prioritize and install over 25 agricultural BMPs in the upper Campbell Creek watershed in 2012 and 2013 including terrace/tile structures, stream bank buffers, and wetland restorations (cost share with Federal, State and local funding of over \$250,000). While these efforts resulted in reduction in farm field soil erosion, the lower portion of Campbell Creek's confined stream channel remains highly erodible. However, there has been some improvement in North Floyd annual water clarity in the past decade from 7.5 ft (1998-2007) to 8.5 ft (2008-2017), but no improvement in the phosphorus reductions. Campbell Creek and it's watershed, continues to be a source of nutrients and sediment to North Floyd Lake, especially during spring runoff and summertime high intensity rainfall events. The District will continue to assess and implement additional measures to reduce external and internal phosphorus inputs and sediment loading into North Floyd Lake. The non-degradation measures for Big Floyd include Stormwater management, shoreline enhancements, and septic treatment.

Past Studies

- Houston Engineering Inc. 1997. Proposal to Provide Engineering Services for Water and Sanitary Sewer Improvements along Big Floyd Lake to Detroit Township
- A.W. Research Laboratories. 1996. Proposal for the Septic/Point Source Detection Overflight Floyd and Little Floyd Lakes
- Wenck Associates Inc. 2008. Wastewater Treatment and Drinking Water Supply Alternative Analysis; Floyd Lake Chain of Lakes
- A.W. Research Laboratories. 1996. Proposal for the Aerial Lakeshore Analysis of Floyd Lake
- Wideth Smith Nolting. 1997. Water System Feasibility Study for Big Floyd Lake, Detroit Township, MN
- Wideth Smith Nolting. 1998. Wastewater Facility Plan for Big Floyd Lake, Detroit Township, MN
- 1998 Campbell Creek Comprehensive Plan
- Minnesota Pollution Control Agency, Water Quality Assessment of the Upper Pelican River Watershed, 2002, Clean Water Partnership Program
- NRCS. 2007. Upper Pelican River Watershed Plan and Environmental Assessment
- PRWD Shoreline Surveys 2004, 2009, 2016 (assessment of shoreline alteration and watercraft quantity/use)

Planned/Potential Projects

Cost Share Program for shoreline enhancements including buffers and soft armor installations.

Campbell Creek Ag BMP Installations and effectiveness monitoring

Buffers

Stream Bank stabilization and effectiveness monitoring

Evaluate the potential for restoration of altered wetlands near Campbell Creek.

**Priority Targeted Management....
Identify priority aquatic vegetation areas**

Assist with Prevention of AIS

Rapid Response to AIS infestations and conduct treatments

Conduct study to identify options for managing North Floyd phosphorus internal loading and implement most feasible options.

Work with the City of Detroit Lakes (Annexation areas)

Ongoing Projects & Programs

Water Quality Monitoring (levels and nutrients)

Shoreline surveys

Stormwater Management Rules

Continue to work with Becker County to conduct septic surveys and encourage adoption of Point of Sale upgrade requirements.

Encourage proper management of private wells.