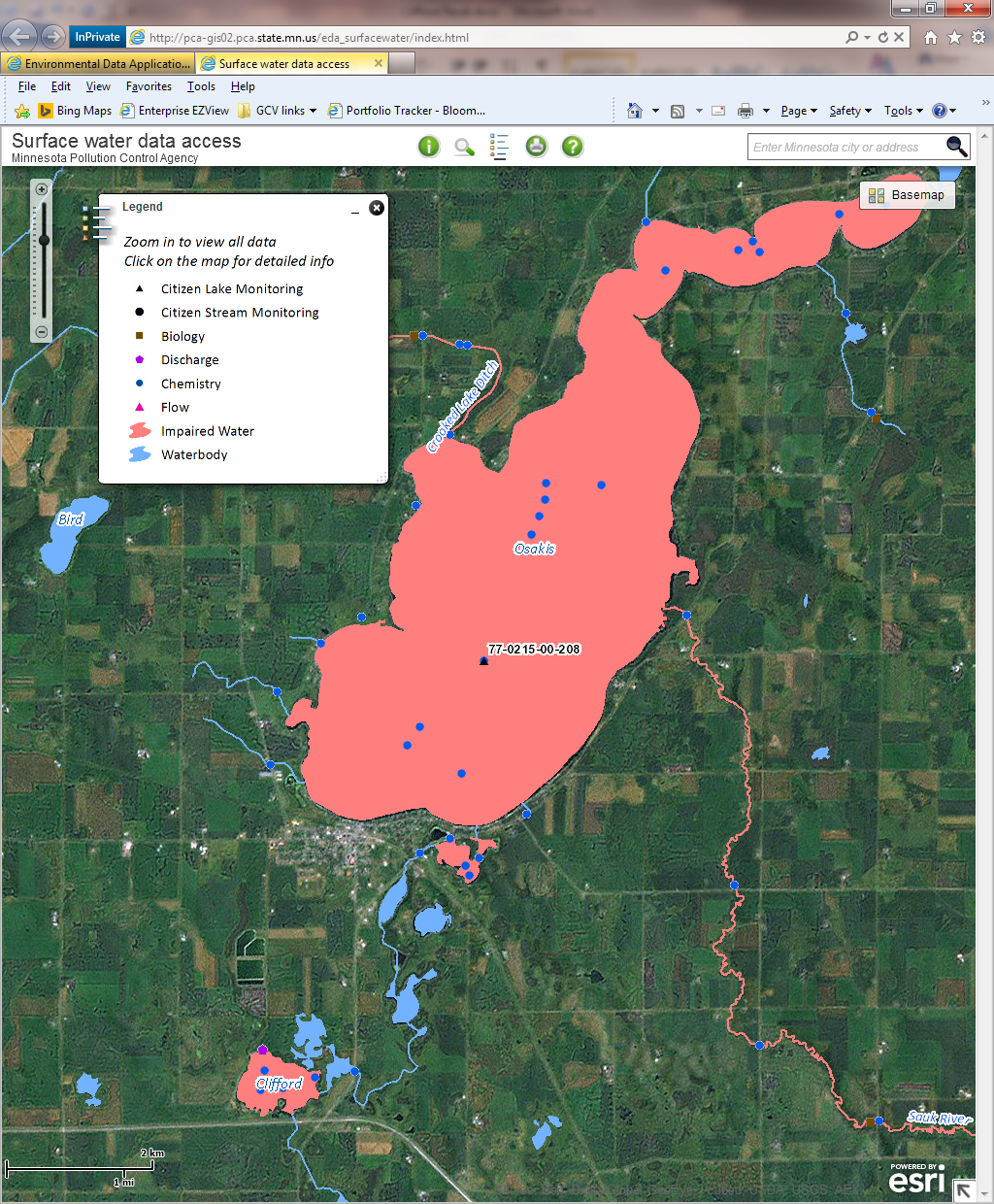
**Clifford Lake recatorization:**

Clifford lake is an impaired water in Western MN (Todd and Douglas Counties) which I believe should be re-classified as wetland.

Clifford lake Location (note smaller waterbody in lower left)



**background:**

Clifford Lake’s (21-0003) characteristics are detailed in the Table 1 below compared to many typical wetland versus lake characteristics. The is currently listed as impaired for excess nutrients and also discharge into two other impaired lakes-(Faille Lake & Lake Osakis).

Clifford Lake is very shallow, consisting of essentially an open water wetland, ringed with emergent vegetation. The lack of contour information from which to calculate a more accurate volume lead me to do a survey the basin based on a point intercept survey on the ice recently and some of that data is shown in the figure below (2/8/12) and the max depth was determined to only be 3.5 feet. The survey points and map can be seen in the Google Earth .kmz file included, as well as

I believe they should be reclassified as wetlands based on the weight of evidence below:

1. Very shallow (Max depth 3.5ft Clifford, Mean 2.3 ft)
2. Made up of unconsolidated, mucky sediments
3. Does not have any water level control structures
4. Does not have any residences nor beach or dockage.
5. Documented uses are primarily waterfowl hunting.
6. Dominated by emergent vegetation and various amounts of submerged vegetation.
7. Does not have or had any fisheries management plans or utilization for fisheries, except for small amount of rough fish which may reach this area in the spring for some spawning, and would not be affected by changes either.
8. There are no plans in the works for development and most of the area is simply managed for waterfowl habitat and wetland species.
9. Diurnal dissolved oxygen is consistent with wetland conditions.
10. Waterbody does not have an abundance of submersed aquatic plants, primarily due to the low water clarity dominated by algal blooms and disturbance generated by non-native roughfish populations.

This waterbody is also associated with several approved TMDL Faille Lake and Lake Osakis and some of these concerns surfaced while looking at that TMDL.

Table 1. Comparison of water body characteristics

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Factor** | **Lakes** | **Shallow lakes** | **Wetlands** | **Clifford 21-0003** |
| **Protected Waters Inventory Code** | Typically coded as “L or LP” in PWI | May be coded as either “L, LP or LW” in PWI | Typically coded as a “LW” in PWI | P |
| **Depth, maximum** | Typically >15 feet | Typically < 15 feet | Typically < 7 feet | 3.5ft recent survey |
| **Littoral area** | Typically <80% | Typically >80% | Typically 100% | 100% |
| **Area (minimum)** | > 10 acres (Bulletin 25) | > 10 acres (Bulletin 25) | No minimum | 151ac (Bulletin 25) 174ac recent survey |
| **Thermal stratification (summer)** | Stratification common but dependant upon depth, size and fetch | Typically do not thermally stratify | Typically do not stratify. | Does not thermally stratify |
| **Fetch** | Significant fetch depending on size & shape; | Fetch is variable depending on size & shape; | Rarely has a significant fetch; | 0.74 miles |
| **Substrate** | Consolidated sand/silt/gravel | Consolidated to mucky | Mucky to unconsolidated | Mucky, not consolidated |
| **Shoreline features** | Generally wave formed, often sand, gravel or rock | Generally wave formed, often sand, gravel or rock | Generally dominated by emergents | Dominated by emergents |
| **Emergent vegetation & relative amount of open water** | Shoreline may have ring of emergents; vast majority of basin open water. | Emergents common, may cover much of fringe of lake; basin often has high percentage of open water. | Emergents often dominate much of basin; often minimal open water. | Emergents common, cover much of fringe of lake; basin has high percentage of open water. |
| **Submergent vegetation** | Common in littoral fringe, extent dependant on transparency | Abundant in clear lakes; however may be lacking in algal-dominated turbid lakes. | Common unless dominated by an emergent like cattail. | Dominated by emergents "cattails" Also algal bloom limited |
| **Dissolved Oxygen** | Aerobic epilimnion; hypolimnion often anoxic by midsummer | Aerobic epilimnion but wide diurnal flux possible | Diurnal flux & anaerobic conditions common | no data avail, assumption is "yes" to Diurnal flux & anaerobic conditions common |
| **Fishery** | Typically managed for a sport/game fishery. May be stocked. MDNR fishery assessments typically available. | May or may not be managed for a sport fishery. If so, fishery assessment should be available. Winter aeration often used to minimize winterkill potential. | Typically not managed for a sport fishery. Little or no MDNR fishery information. Seldom aerated May be managed to remove fish & promote waterfowl. | Not managed for a sport fishery. Little or no MDNR fishery information. Limited use by fish as spawning habitat |
| **Uses** | Wide range of uses including boating, swimming, skiing, fishing; boat ramps & beaches common | Boating, fishing, waterfowl production, hunting, aesthetics; limited swimming; may have boat ramp, beaches uncommon | Waterfowl & wildlife production, hunting, aesthetics. Unimproved boat ramp if any. No beaches. | Waterfowl & wildlife production, hunting, aesthetics. No boat ramp if any. No beaches. |



Figure 1. Clifford Lake, 2012 survey points, Mean Depth <~3 ft\*

\*This survey formed the basis for the change in physical characteristics of the water body to a maximum depth of 3.5 feet and mean depth of 2.3 feet.

**Note:**

Leading up to this decision I had modeled the water quality of the water body and the reductions and changes which would be necessary to improve the water quality to a point where it would meet state shallow lake criteria. That attempt also re-enforced the idea that the shallow lake standard and criteria was not applicable standard for a water body of these characteristics. I also had John Erdman review and assess the modeling I had done earlier and his numbers also confirmed some of the same issues. Discussing this with John Erdmann, Steve Heiskary, John Gernes and others several times we arrived at the conclusion that lake water quality criteria were not applicable to water body.

Using potential modeled reductions and even going so far as to be impractical we find that it appears the lake might meet current standards, but only a condition which appears to unachievable in practical terms. Allowing for some very limited inputs into Clifford Lake would require the watershed exports to be reduced to a level which is considered unachievable as well as very tight control of internal loading within the lake.

So with that in mind you have several conclusions:

1. The current WQ criteria do not fit this lake, the lake exhibits and behaves as a wetland.
2. Current Lake modeling also does not do a good job of predicting this type of water body (ie. This lake is outside of the Model development lakes), although we do not have either wetland WQ models and or better alternative typical lake model.
3. The water body should be delisted due to being recatergorized as a wetland and postponed until such a time that we have applicable wetland nutrient standards which could be used.