

APPENDIX E — WATER RESOURCE VALUES (WRVs) ASSESSMENT

Water Resource Values (WRVs) Assessment

The State Water Resources Implementation Rule (Rule 62-40.473, *Florida Administrative Code* [F.A.C.]) requires the SJRWMD consider “environmental values associated with coastal, estuarine, riverine, spring, aquatic, and wetlands ecology” when establishing MFLs. Consequently, SJRWMD considered 10 environmental values (also called water resource values [WRVs]) identified in Rule 62-40.473, F.A.C. SJRWMD uses the following working definitions when considering these 10 environmental values:

1. Recreation in and on the water—The active use of water resources and associated natural systems for personal activity and enjoyment. These legal water sports and activities may include, but are not limited to swimming, scuba diving, water skiing, boating, fishing, and hunting.
2. Fish and wildlife habitat and the passage of fish—Aquatic and wetland environments required by fish and wildlife, including endangered, endemic, listed, regionally rare, recreationally or commercially important, or keystone species to live, grow, and migrate. These environments include hydrologic magnitudes, frequencies, and durations sufficient to support the life cycles of wetland and wetland-dependent species.
3. Estuarine resources—Coastal systems and their associated natural resources that depend on the habitat where oceanic saltwater meets freshwater. These highly productive aquatic systems have properties that usually fluctuate between those of marine and freshwater habitats.
4. Transfer of detrital material—The movement by surface water of loose organic material and associated biota.
5. Maintenance of freshwater storage and supply—The purpose of this environmental value is to protect, from significant harm due to water withdrawal, an adequate amount of freshwater for non-consumptive uses and environmental values associated with coastal, estuarine, riverine, spring, aquatic, and wetlands ecology. This value encompasses all other environmental values identified in Rule 62-40.473 F.A.C. Because the overall purpose of the MFL is protect environmental resources, and other non-consumptive beneficial uses while also providing for consumptive uses, this environmental value is considered protected if the remaining relevant values are protected.
6. Aesthetic and scenic attributes—Those features of a natural or modified waterscape usually associated with passive uses, such as birdwatching, sightseeing, hiking, photography, contemplation, painting, and other forms of relaxation, that usually result in well-being and contentment.

7. Filtration and absorption of nutrients and other pollutants—The reduction in concentration of nutrients and other pollutants through the process of filtration and absorption (i.e., removal of suspended and dissolved materials) as these substances move through the water column, soil or substrate, and associated organisms.
8. Sediment loads—The transport of inorganic material, suspended in water, which may settle or rise. These processes are often dependent upon the volume and velocity of surface water moving through the system.
9. Water quality—The chemical and physical properties of the aqueous phase (i.e., water) of a waterbody (lentic) or a watercourse (lotic) not included in definition number 7 (i.e., nutrients and other pollutants).
10. Navigation—The safe passage of watercraft (e.g., boats and ships), which is dependent upon adequate water depth and channel width.

Consideration of these values is meant to ensure that recommended MFLs protect the full range of water-related functions that provide beneficial use to humans and ecological communities. However, all 10 WRVs are typically not applicable to a specific priority water body because of the varying hydrologic characteristics (e.g., riverine vs. lake systems or the presence/absence of tidal influence). The suite of 10 WRVs listed above were divided into the following three groups based on relevance to Lake Prevat and are also based on whether they protect ecological versus non-ecological structure and function.

- Group 1: WRVs 3, 8, and 10
- Group 2: WRVs 2, 4, 5, and 7
- Group 3: WRVs 1, 6, and 9

An exceedance curve based on the MFLs condition timeseries was created and compared to the no-pumping condition exceedance curve to assess whether WRVs are protected (Figure E-1). The MFLs condition and no-pumping exceedance curves were created using the respective daily lake level timeseries. The no-pumping condition time series was simulated using the Lake Prevat HSPF model with the no-pumping groundwater level time series as an input (see Appendix B). The MFLs condition lake level time series was simulated by adjusting groundwater levels incrementally in the surface water model until the model produced a lake level time series that just meets the most constraining MFLs metric (i.e., the ≥ 5 -ft open water hydroperiod tool metric).

A significant harm threshold of 15% was used as the maximum allowable change, for a specific WRV, between the MFLs condition and the no-pumping condition. A threshold of 15% reduction in exceedance of critical elevations has been peer reviewed numerous times and has been the basis for many adopted MFLs within Florida (Munson and Delfino 2007; Mouzon et al. 2018, Sutherland et al. 2021). The WRVs assessment results indicate that none of the WRVs metrics assessed exceed the 15% reduction threshold and therefore all are protected by the MFLs condition, as discussed below.

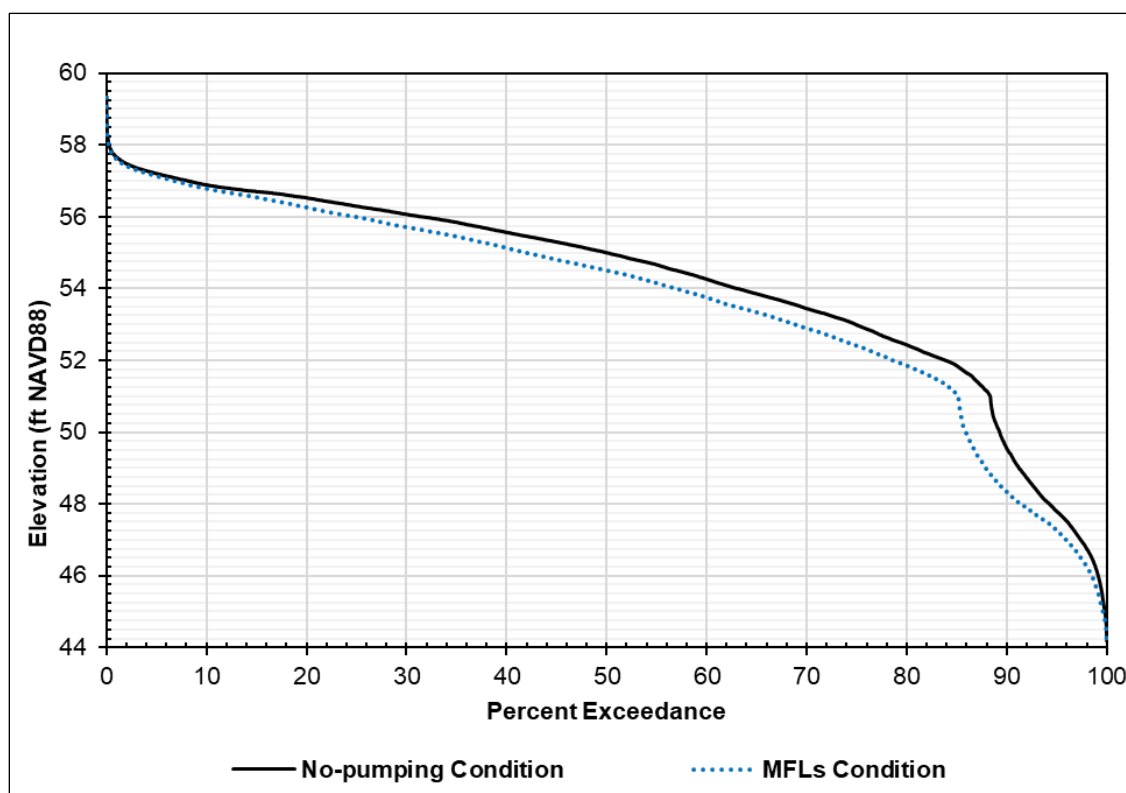


Figure E-1. No-pumping condition (black, solid) and MFLs condition (blue, dotted) exceedance curves for Lake Prevatt. The MFLs condition is based on the allowable 15% reduction in open water area.

Group 1: WRV 3, WRV 8, and WRV 10

The three WRVs in Group 1 were determined not applicable and thus were not considered as part of this assessment.

WRV 3 – Estuarine resources:

This environmental value is not relevant because the lake is land-locked and generally has no surface water connection to any estuarine resources. Therefore, WRV 3 was not considered in this evaluation.

WRV 8 – Sediment loads: Transport of inorganic materials as bed load is considered relevant only in flowing systems where riverine fluvial dynamics are critical to maintenance of geomorphic features (i.e. bed forms and the floodplain) and their associated ecological communities. Lakes serve as links instead of sources of sediment load, and therefore WRV 8 was not considered in this evaluation.

WRV 10 – Navigation: The primary navigation on Lake Prevatt is by recreational kayakers and canoeists. As such, this WRV is addressed under WRV 1 (Recreation in and on the water).

Group 2: WRV 2, WRV 4, WRV 5, and WRV 7

The four WRVs in Group 2 are closely associated with and depend on the ecological functions and biochemical processes provided by the wetland communities surrounding Lake Prevatt. The event-based MFLs are designed to protect these important ecological functions and biochemical processes by protecting the resident wetland communities from significant harm. The two Lake Prevatt event-based minimum levels (FH and MA) were developed to ensure protection of the entire hydrologic regime and are based on the protection of 1) transitional shrub communities and associated wildlife habitat values; 2) organic soils and seasonally flooded wetland habitat; and 3) shallow and deep marsh habitats.

The MFLs condition (based on a 15% reduction in open water area) results in less than a 15% change in area for all other hydroperiod tool metrics (i.e., the four nearshore metrics; Table E – 1). The MFLs condition also ensures that the FH and MA are met because the available water for the MFLs condition (0.9 ft) is less than that available with the FH (2.5 ft) or MA (2.1 ft). The MFLs condition of 15% reduction in open water area therefore provides protection for each of the four WRVs in this group.

Table E-1. Percent change in habitat area relative to NP condition for each habitat type based on the most constraining environmental metric (15% in open water area).

Environmental Criterion	NP Condition area (acres)	Percent change in NP condition area based on most constraining metric
Small wading bird forage habitat	4.6	0.3
Large wading bird forage habitat	10.7	1.1
Game fish spawning habitat	36.0	2.5
Emergent marsh vegetation	70.0	4.8
Open water (≥ 5 ft)	27.2	14.2

WRV 2 – Fish and wildlife habitat and the passage of fish:

WRV 2 is meant to ensure the consideration and protection of aquatic and wetland environments required by fish and wildlife including endangered, endemic, listed, regionally rare, recreationally or commercially important, or keystone species. The recommended MFLs for Lake Prevatt are based on the protection of fish and wildlife habitats in nearshore and deep-water habitats, as well as fringing wetlands. These wetlands include extensive shallow and deep marsh habitats that provide important refuge habitat for small forage fish and juveniles of game fish that form the base of production for larger fish, birds, and other wildlife. Shallow marshes provide important refugia and forage habitat for invertebrates, fish, mammals, birds,

and other wildlife. Therefore, compliance with the primary environmental metrics evaluated will provide protection of “fish and wildlife habitats and the passage of fish” for Lake Prevatt.

WRV 4 – The transfer of detrital material:

WRV 4 is meant to ensure consideration of the movement by water of loose organic material and debris and associated decomposing biota. Detrital material is an important component of aquatic food webs (Mitsch and Gosselink 2015). Wetland communities, such as transitional shrub swamp, shrub swamp, shallow marsh, and deep marsh are important sources of detrital material for the Lake Prevatt system. For this analysis, the transport of detritus is defined as the movement by water of loose organic material or debris and associated decomposing biota. The organic particles consist of decomposing vegetation, including leaves and wood, processed by microbes (e.g., bacteria and fungus).

A significant portion of detrital transfer occurs during high-water events, when accumulated detrital materials in floodplain wetlands are moved to the aquatic system. The FH is based on providing a sufficient number of high-water (flooding) events to protect floodplain wetlands and associated wildlife habitat values. Maintaining sufficient high-water events will also ensure that detrital material, that has accumulated during drier periods, is transported to aquatic habitats downslope. Compliance with the recommended FH provides for the protection of flooding events necessary for the transfer of detrital material in Lake Prevatt. As the MFLs condition, based on the 15% allowable reduction in open water area, is more constraining than the FH metric, the “transfer of detrital material” is considered to be protected by the MFLs condition.

WRV 5 – The maintenance of freshwater storage and supply:

The maintenance of freshwater storage and supply (WRV 5) is also included in this group. The purpose of this environmental value is to protect, from significant harm due to water withdrawal, an adequate amount of freshwater for non-consumptive uses and environmental values associated with coastal, estuarine, riverine, spring, aquatic, and wetlands ecology. This environmental value encompasses all other environmental values identified in Rule 62- 40.473 F.A.C. Because the overall purpose of the MFL is to protect environmental resources, and other non-consumptive beneficial uses, while also providing for consumptive uses, this environmental value is considered protected if the remaining relevant values are protected.

WRV 7 – The filtration and absorption of nutrients and other pollutants:

WRV 7 is meant to ensure consideration of nutrient and pollution filtration and absorption (i.e., the removal of suspended and dissolved materials as these substances move through the water column, soil, or substrate and associated organisms). Existing wetlands around Lake Prevatt include transitional shrub, shrub swamp, shallow marsh, and deep marsh communities which provide for filtration and absorption of excess nutrients and other pollutants. The purpose of the FH is to ensure the long-term maintenance of these wetland communities. Therefore, by

protecting the open water metric, which is more constraining than the FH, existing wetlands are protected, providing protection for WRV 7.

Group 3: WRV 1, WRV 6, and WRV 9

The three WRVs in Group 3 are closely related to lake area and depth; in addition to these, WRV 6 is also related to the condition of wetland vegetation communities in and around the lake. The determination of whether these WRVs are protected was based on whether there was significant harm (i.e., defined as 15% reduction; Figure E - 1) from the no-pumping condition to the MFLs condition, for specific criteria evaluated for each WRV. The MFLs condition represents the minimum hydrologic regime necessary to protect all the minimum levels (i.e., it is based on the most constraining levels for Lake Prevatt). The WRVs assessment results indicate that all three WRVs in this group do not exceed the 15% reduction threshold and are therefore protected by the MFLs condition, as discussed below.

WRV 1 – Recreation in and on the water:

The purpose of WRV 1 is to protect, from significant harm due to water withdrawal, the active use of water resources and associated natural systems for personal activity and enjoyment. Recreational activities supported at Lake Prevatt include bird watching, canoeing and kayaking. Recreational activities associated with wildlife are protected by WRV 2, but canoeing and kayaking are considered under WRV 1. Canoe and kayak access to Lake Prevatt is either by shore or by floating dock that moves with fluctuating water levels.

The MFLs condition is based on the open water area metric. Compliance with the MFLs condition will ensure that there is no more than a 15% reduction from the no-pumping condition in open water area and that it is safe for recreational activities such as canoeing and kayaking. A protective paddling water depth of 20 inches was defined in 1990 by the Florida Department of Natural Resources (FDNR 1990). As the area available for canoeing is only reduced by 8.0% under the MFLs condition, protection of the MFLs condition will provide protection for paddling depths both in shallow (based on nearshore metrics) and deep (open-water area metric) portions of Lake Prevatt.

WRV 6 – Aesthetics and scenic attributes:

The purpose of this environmental value is to protect, from significant harm due to water withdrawal, those features of a waterbody typically associated with passive uses, such as birdwatching, sightseeing, hiking, photography, contemplation, painting and other forms of relaxation.

This WRV was evaluated based on the change to total lake area (nearshore and open water area) from the no-pumping condition. The hydroperiod tool output was used to determine the relationship between water level and total lake area for these two conditions. Average (over the POR) total lake area for Lake Prevatt under the no-pumping condition is 85.7 acres. Average total lake area under the MFLs condition, based on protecting deep water habitat, is 80.0 acres which equates to a 6.6% reduction. The MFLs condition also represents a 3% reduction in total

area at the median (P50) lake level, relative to the no-pumping condition. The reduction in average total lake acreage and median total lake acreage are both less than the 15% threshold used for the hydroperiod tool metrics. Therefore, this WRV is considered protected by the recommended MFLs condition.

WRV 9 – Water quality:

The purpose of this environmental value is to protect, from significant harm due to water withdrawal, the ambient chemical and physical properties of a waterbody. To date, water quality data for Lake Prevatt include 52 data points for total nitrogen (TN) and 53 points for total phosphorus (TP) and dissolved oxygen (DO) available between 1981 and 2016 (USF Water Institute). Thirty-four data points for chlorophyll-a (Chl-a) are available between 1998 and 2016 (Table E-2). Periodic monitoring of nutrient concentrations is essential to calculate an annual geometric mean to assess if Lake Prevatt meets Class III surface water quality standards as defined in Florida's Numeric Nutrient Standards (Rule 62-302.531, *F.A.C.*; Table E-3). Further water quality data collection is needed to determine if Lake Prevatt is impaired for nutrients by these nutrient standards.

The most recent water quality data for Lake Prevatt were collected in 2016. According to the most recent sample, the Trophic State Index (TSI) classifies Lake Prevatt as having “fair” quality with high productivity. TSI is an indicator of lake integrity, and is calculated using total phosphorus (TP), total nitrogen (TN) and chlorophyll-a (Chl-a) data, with values above 70 considered poor water quality, 60-69 considered fair water quality, and values 59 or below considered good water quality (Friedemann and Hand, 1989). From the limited data available, Lake Prevatt has a mean TSI value of 50 and a most recent value of 62.

Table E-2. Summary statistics of primary water quality parameters at Lake Prevatt.

Parameter	Minimum	Average	Maximum	Most Recent (10/11/2016)	N	POR
TSI	29	50	80	62	35	5/2008 – 10/2016
Color (PCU)	4.0	89.4	190.0	130	38	3/1998 – 10/2016
Chl-a µg/L	1.5	21.2	154.7	22.3	34	3/1998 – 10/2016
TP mg/L	0.01	0.05	0.16	0.08	53	6/1981 – 10/2016
TN mg/L	0.3	1.3	2.9	1.6	52	6/1981 – 10/2016
DO mg/L	0.0	4.8	29.4	1.0	53	6/1981 – 10/2016

Table E-3. Florida's Numeric Nutrient Standards (Rule 62-302.531, F.A.C).

Long Term Geometric Mean Lake Color	Annual Geometric Mean Chlorophyll-a	Minimum calculated numeric interpretation		Maximum calculated numeric interpretation	
		Annual Geometric Mean Total Phosphorus	Annual Geometric Mean Total Nitrogen	Annual Geometric Mean Total Phosphorus	Annual Geometric Mean Total Nitrogen
> 40 Platinum Cobalt Units	20 µg/L	0.05 mg/L	1.27mg/L	0.16 mg/L	2.23 mg/L

Total phosphorus and total nitrogen are negatively correlated with water level in many Florida lakes and lakes around world (Kratzer and Brezonik 1984; Nöges et al. 2003; Liu et al. 2016). At Lake Prevatt, however, lake levels show no correlation with TSI ($p > 0.05$, $\rho = 0.09$; Figure E-2), TP ($p > 0.05$, $\rho = 0.11$; Figure E-3), TN ($p > 0.05$, $\rho = -0.07$; Figure E-4), Chl-a ($p > 0.05$, $\rho = 0.24$; Figure E-5), or Dissolved Oxygen (DO; $p > 0.05$, $\rho = 0.11$; Figure E-6). This suggests that lake level reductions would not have a significant effect on main water quality parameters. Based on these results, this WRV is considered protected under the recommended MFL hydrologic regime.

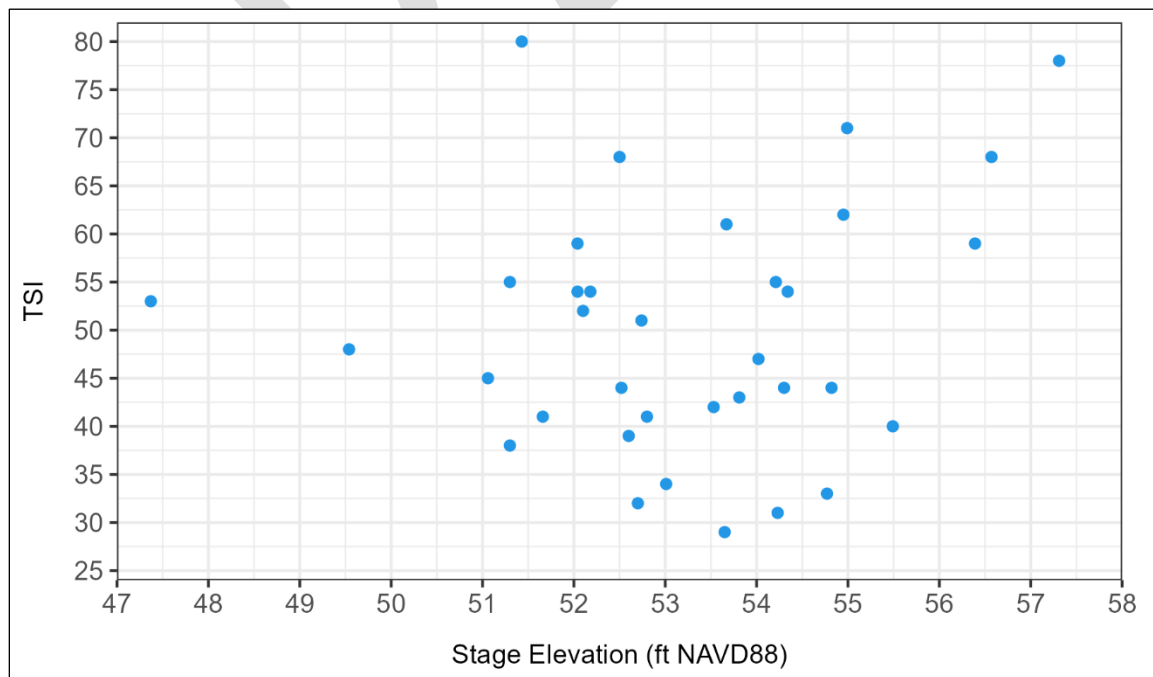


Figure E-2. Lake Prevatt observed lake level vs TSI from 1981 – 2016.

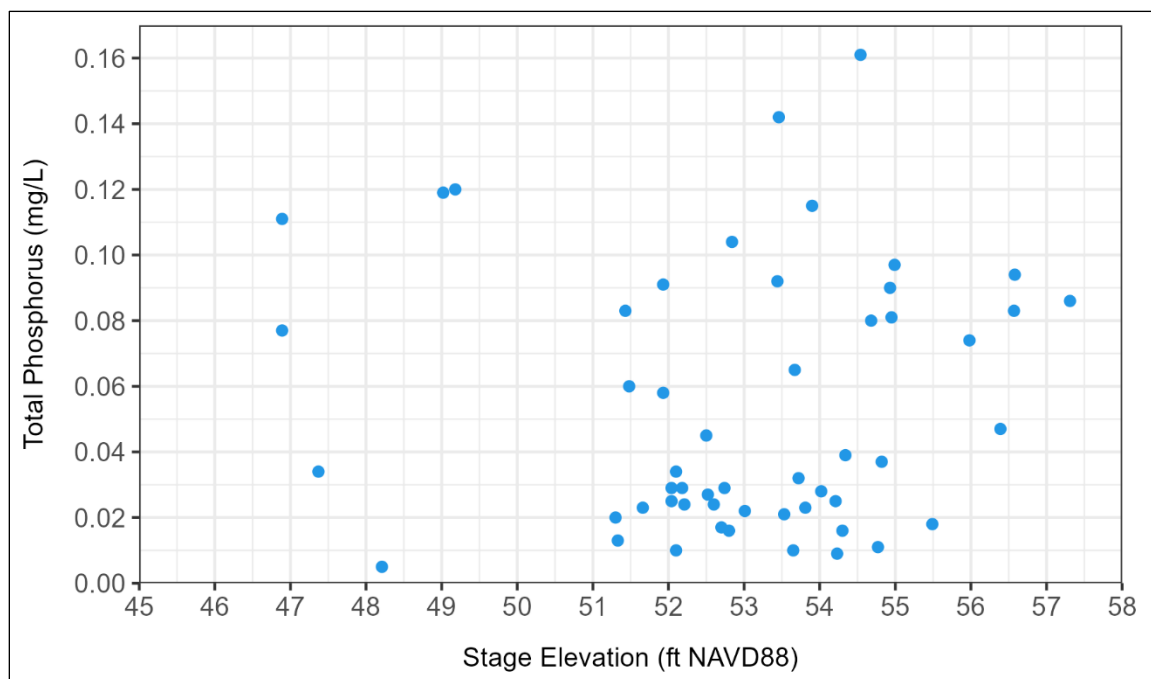


Figure E-3. Lake Prevatt observed lake level vs Total Phosphorus from 1981 – 2016.

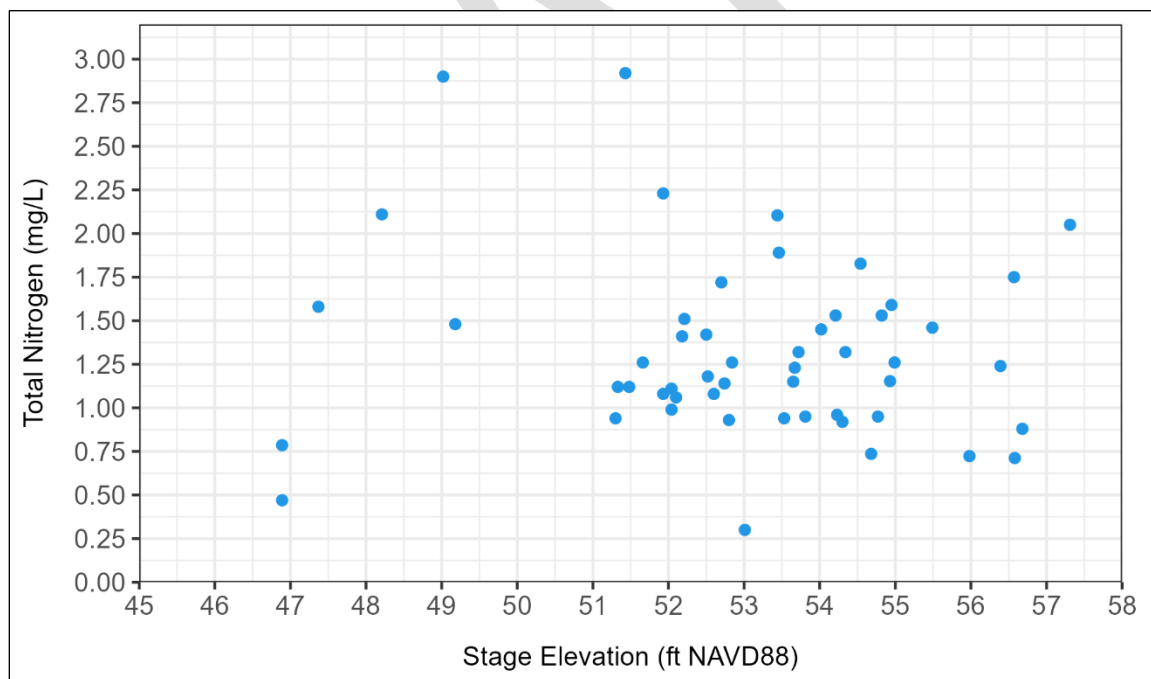


Figure E-4. Lake Prevatt observed lake level vs Total Nitrogen from 1981 – 2016.

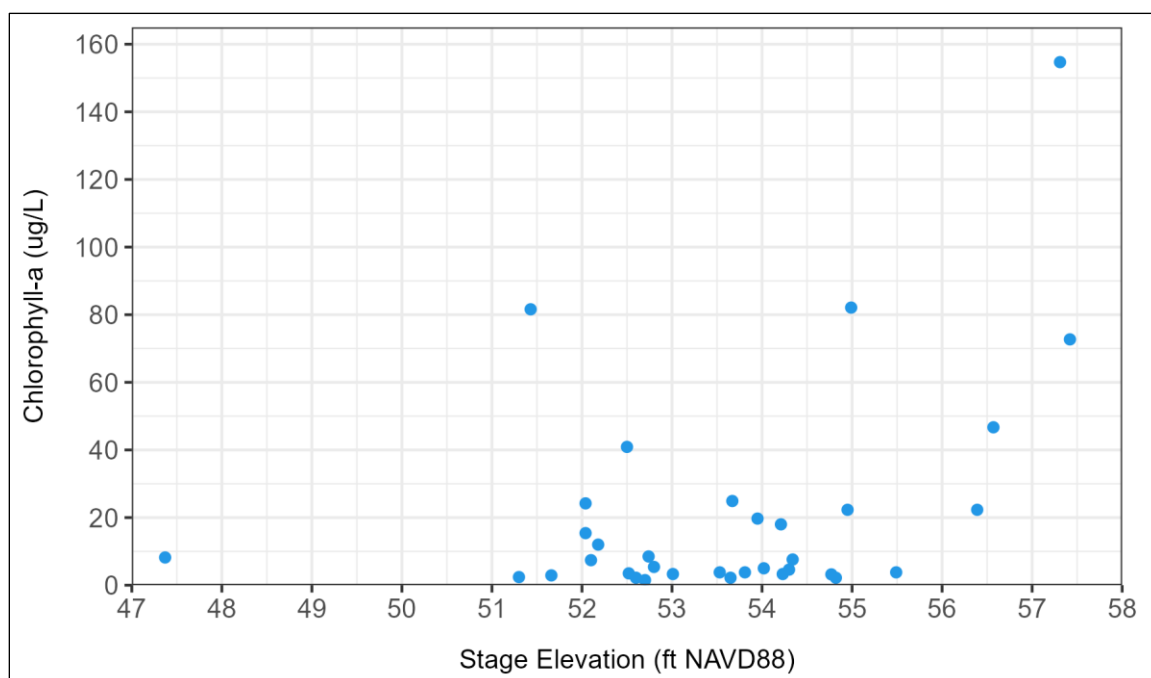


Figure E-5. Lake Prevatt observed lake level vs Chlorophyll-a 1981 – 2016.

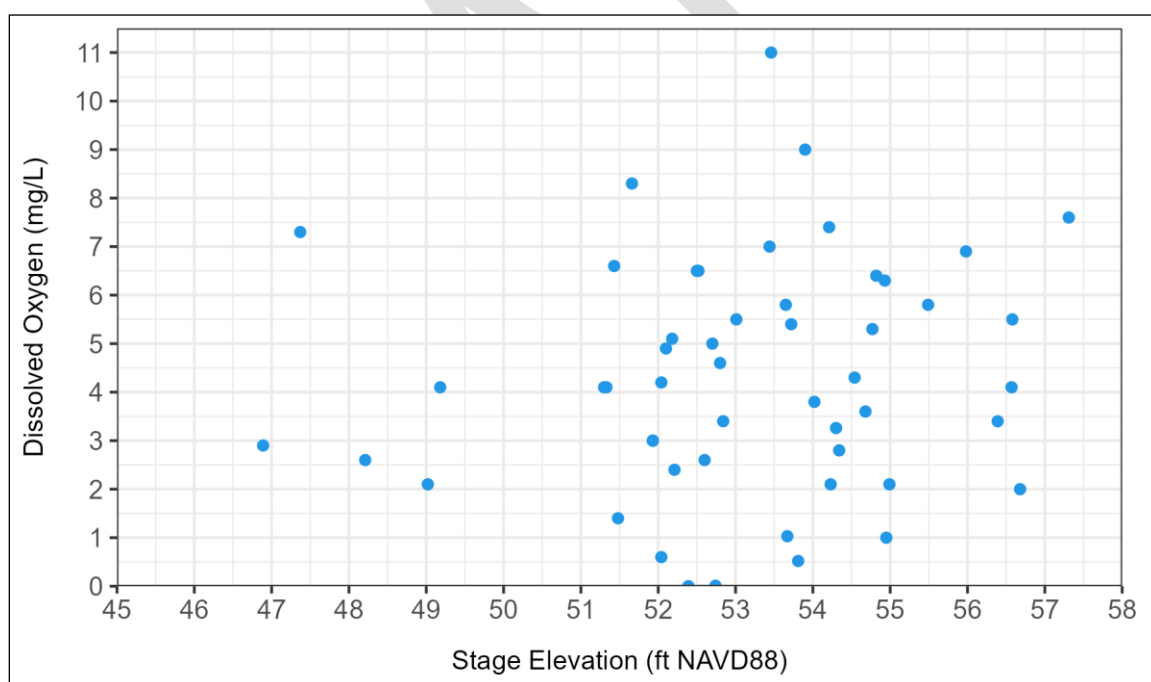


Figure E-6. Lake Prevatt observed lake level vs Dissolved Oxygen 1981 – 2016.

Summary

As discussed above, the Lake Prevatt MFLs condition, based on protection of open water area (area ≥ 5 feet deep), will provide protection for all relevant environmental values identified in rule 62-40.473, *F.A.C.*

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