2005 Dannelly Reservoir Report

Rivers and Reservoirs Monitoring Program

Alabama Department of Environmental Management

Field Operations Division
Environmental Indicators Section
Aquatic Assessment Unit
January 29, 2010

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2005

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INTRODUCTION

The Alabama Department of Environmental Management (ADEM) monitored Dannelly Reservoir as part of the 2005 assessment of the Alabama, Coosa, and Tallapoosa (ACT) River basins under the Rivers and Reservoirs Monitoring Program (RRMP). Implemented in 1990, the objectives of this program were to provide data that can be used to assess current water quality conditions, identify trends in water quality conditions, and to develop Total Maximum Daily Loads (TMDLs) and water quality criteria.

Specific water quality criteria for nutrient management were implemented in 2004 at one location on Dannelly Reservoir which has been monitored by ADEM since 1985 (Table 1). These criteria represent the maximum growing season mean (April-October) chlorophyll *a* (chl *a*) concentration allowable while still fully supporting the reservoir's designated uses.

The purpose of this report is to summarize data collected at eight stations in Dannelly Reservoir during the 2005 growing season and to evaluate trends in mean lake trophic status and nutrient concentrations using ADEM's historic dataset. Monthly and mean concentrations of nutrients (total nitrogen (TN); total phosphorus (TP)), algal biomass/productivity (chl *a*; algal growth potential testing (AGPT)), sediment (total suspended solids (TSS)), and trophic state (Carlson's trophic state index (TSI)) were compared to ADEM's historical data and established criteria.

METHODS

Sampling stations were determined using historical data and previous assessments (Fig. 1). Specific station location information can be found in Table 1. Dannelly was sampled in the dam forebay, mid reservoir, upper reservoir, and Alabama River mile 220. Four tributary embayments were also monitored, with selection of embayments reflecting a range of landuses.

Water quality assessments were conducted at monthly intervals April-October. All samples were collected, preserved, stored, and transported according to procedures in the ADEM Field Operations Division Standard Operating Procedures (SOP), Surface Water Quality Assurance Project Plan (QAPP), and Quality Management Plan (QMP).

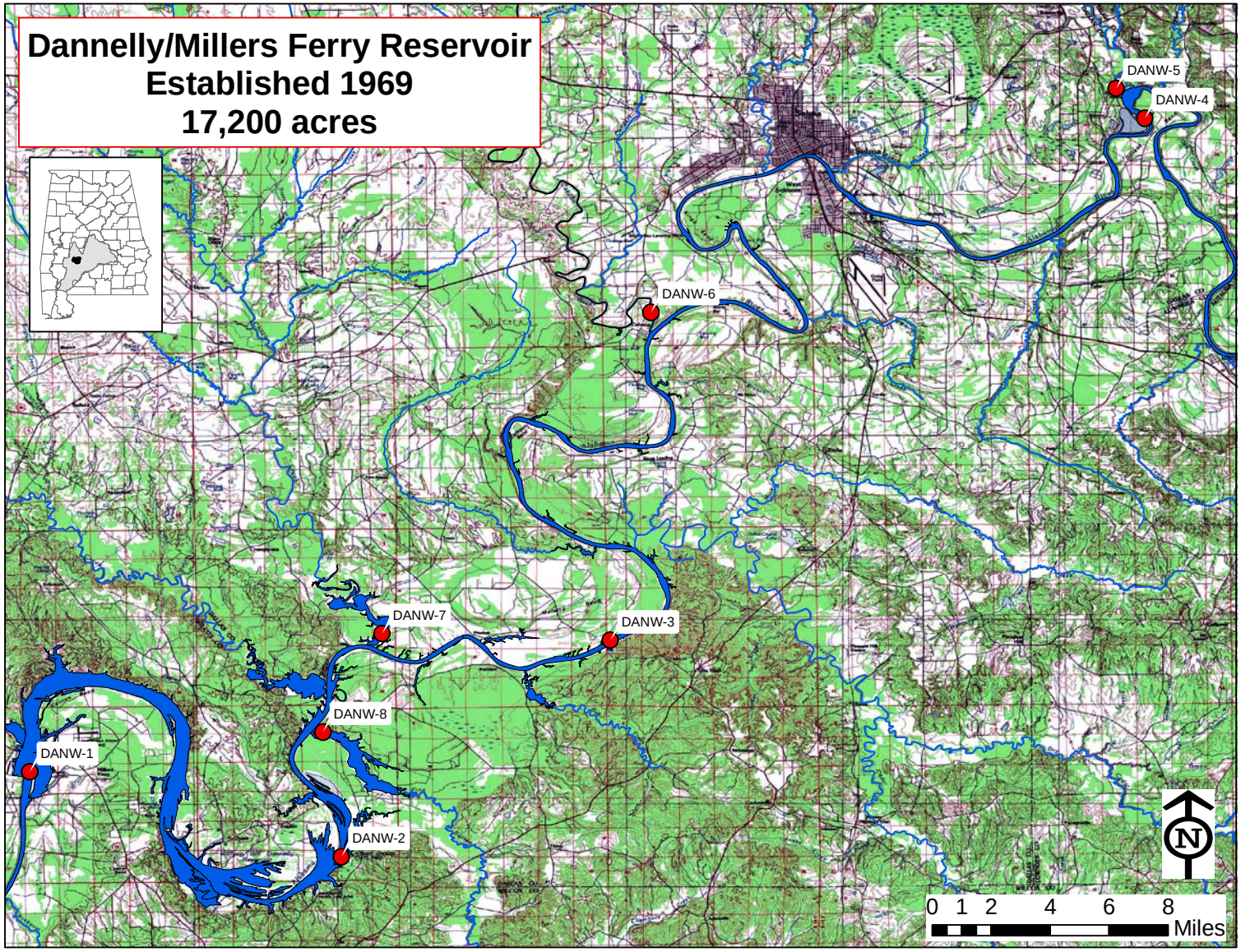


Figure 1. Dannelly Reservoir sampling locations, 2005.

Table 1. Descriptions for the monitoring stations in 2005 for Dannelly Reservoir.

Sub-watershed	County	Station Number	Report Designation	Waterbody Name	Station Description	Chl *a* Criteria	Latitude	Longitude
Dannelly Reservoir								
Upper Alabama (0315-0201)								
1204	Dallas	DANW-4	ARM 220	Alabama R	ARM 220. Deepest point, main river channel, upstream of paper mill discharge.		32.4240	-86.8514
1005	Dallas	DANW-5	Mullberry Cr	Mulberry Cr	Deepest point, main creek channel, Mulberry Creek embayment, approximately 0.5 miles upstream of lake confluence.		32.4386	-86.8655
Lower Cahaba (0315-0202)								
0902	Dallas	DANW-6	Cahaba R	Cahaba R	Deepest point, main river channel, Cahaba River embayment, approximately 0.5 miles upstream of lake confluence.		32.3289	-87.0937
Middle Alabama (0315-0203)								
0701	Wilcox	DANW-1	Lower	Alabama R	Lower reservoir. Deepest point, main river channel, dam forebay.	17 ug/L	32.1035	-87.3986
0701	Wilcox	DANW-2	Mid	Alabama R	Mid reservoir. Deepest point, main river channel, immediately. upstream of Roland Cooper State Park.		32.0619	-87.2457
0203	Dallas	DANW-3	Upper	Alabama R	Upper reservoir. Deepest point, main river channel, immediately upstream of Elm Bluff Park.		32.1680	-87.1136
0308	Dallas	DANW-7	Bogue Chitto Cr	Bogue Chitto Cr	Deepest point, main creek channel of Bogue Chitto Creek embayment, approximately 0.5 miles upstream of lake confluence.		32.1713	-87.2257
0506	Dallas	DANW-8	Pine Barren Cr	Pine Barren Cr	Deepest point, main creek channel, Pine Barrens Creek embayment, approximately 0.5 miles upstream of lake confluence.		32.1231	-87.2548

RESULTS

Summary statistics of all data collected during 2005 are presented in Appendix Table 1. The table contains the min, max, median, average, and standard deviation of each parameter analyzed.

The mean TN concentrations in Dannelly Reservoir embayments ranged from 0.32 mg/l at the Cahaba R embayment station to 0.65 mg/l at the Bogue Chitto Cr embayment station (Fig. 2). Mean TN concentrations at Dannelly Reservoir mainstem stations ranged from 0.49 mg/l at the ARM 220 station to 0.61 mg/l at the mid reservoir station. Monthly TN concentrations at the upper mainstem reservoir station ranged from 0.16 mg/l in May to 0.75 mg/l in September (Fig. 3). Monthly TN concentrations at the mid and lower mainstem reservoir stations ranged from 0.36 mg/l and 0.14 mg/l in May, to 0.76 mg/l and 0.94 mg/l in June, respectively (Fig. 4 & 5). Monthly TN concentrations for May at the upper and lower mainstem Dannelly Reservoir stations were the lowest in ADEM's dataset for those stations. Monthly TN concentrations at the mid Dannelly Reservoir station were the highest in ADEM's dataset for the months of April and September for that station.

Mean TP concentrations in Dannelly Reservoir embayments ranged from 0.035 mg/l at the Cahaba R embayment station to 0.061 mg/l at the Bogue Chitto Cr embayment station (Fig. 2). Mean TP concentrations at mainstem stations ranged from 0.038 mg/l at the mid station to 0.054 mg/l at the upper station. TP concentrations over 0.025 mg/l can indicate eutrophic conditions within a lake or reservoir. Monthly TP concentrations at the upper mainstem station ranged from 0.030 mg/l in June to 0.073 mg/l in April (Fig. 3). Monthly TP concentrations at the mid mainstem station ranged from 0.015 mg/l in August to 0.062 mg/l in September, while concentrations at the lower mainstem station ranged from 0.006 mg/l in October to 0.061 mg/l in September (Fig. 4 & 5). Monthly TP concentrations at the upper, mid, and lower Dannelly Reservoir mainstem stations were the highest in ADEM's dataset for the month of May at these stations. TP concentrations at the mid reservoir station for the month of September, and the lower station for the month of April, were also the highest in ADEM's dataset for these stations. Monthly TP concentrations at the mid reservoir station for the months of April and October, and

the lower station for the months of June and October, were the lowest in ADEM's dataset for these stations.

Mean chl *a* concentrations in Dannelly Reservoir embayments ranged from 2.62 ug/l at the Mulberry Cr embayment station to 20.06 ug/l at the Bogue Chitto Cr embayment station (Fig. 2). Mean chl *a* concentrations at mainstem Dannelly Reservoir stations ranged from 8.90 ug/l at the mid reservoir station to 14.14 ug/l at the upper station. Monthly chl *a* concentrations at the upper station ranged from 6.41 ug/l in October to 26.70 ug/l in May (Fig. 3). Monthly chl *a* concentrations at the mid and lower mainstem reservoir stations ranged from 4.27 ug/l and 6.41 ug/l in October, to 13.17 ug/l and 16.55 ug/l in July, respectively (Fig. 4 & 5). All monthly chl *a* concentrations at mainstem Dannelly Reservoir stations were near or below historic means for all months monitored except the upper station in May and the lower station in July and September. Specific water quality criteria for nutrient management have been established for Dannelly Reservoir at the lower station. These criteria were not exceeded during 2005 (Fig. 6).

Mean TSS concentrations in Dannelly Reservoir embayment stations ranged from 15.43 mg/l at Pine Barrens Cr to 55.14 mg/l at Mulberry Cr (Fig. 2). Mean TSS concentrations in mainstem stations ranged from 9.14 mg/l at the mid station to15.43 mg/l at the lower station. Monthly TSS concentrations at the mainstem reservoir stations showed little variation, ranging from 9 mg/l to 12 mg/l at the upper station, 8 mg/l to 13 mg/l at the mid station, and 10 mg/l to 19 mg/l at the lower station (Fig. 3, 4, & 5).

AGPT results indicated the entire reservoir was phosphorus limited, differing from results obtained in 2000 when the entire reservoir was nitrogen limited (Table 2). Mean standing crop (MSC) values ranged from 6.61 mg/l at the lower station to 9.79 mg/l at the ARM 220 station, with concentrations decreasing from the riverine sections of the reservoir upstream to the more lacustrine areas downstream. Five mg/l MSC has been defined as protective of reservoir and lake systems (Raschke and Schultz 1987), and 20 mg/l MSC has been defined as protective of flowing streams and rivers (Raschke et al. 1996).

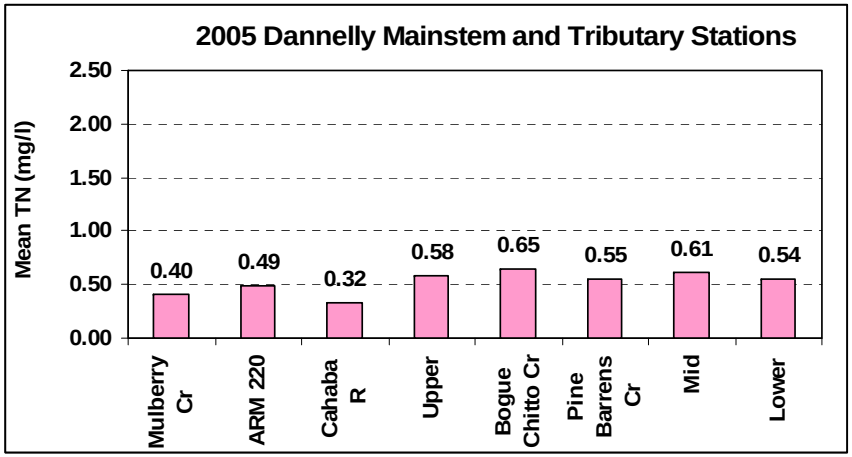
The dissolved oxygen concentration in Pine Barrens Cr was <5.0 mg/l at a depth of 5.0 feet during July (Fig. 8). All other measurements of dissolved oxygen concentrations were above the

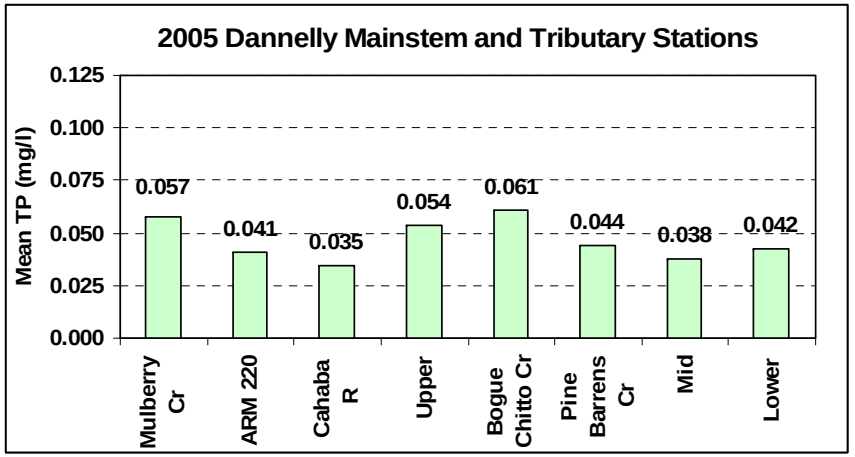
ADEM Criteria (ADEM Admin. Code R. 335-6-10-.09) limit of 5.0 mg/l (Fig. 7 & 8) at this depth. Dissolved oxygen profiles of the mainstem stations show no thermal stratification during June-September (Fig. 7). Warmest mainstem reservoir water temperatures were measured in August.

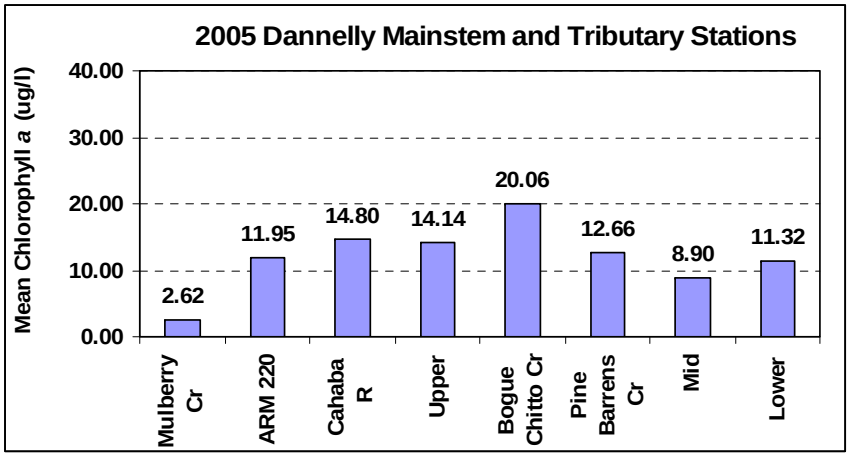
Carlson's TSI was calculated from the corrected chl *a* concentrations. The ARM 220, upper, and lower Dannelly Reservoir mainstem stations remained eutrophic April through September and declined to low eutrophic/high mesotrophic in October (Fig.9). The mid reservoir station was eutrophic all months monitored except June and October when it was mesotrophic. TSI values for the Mulberry Cr embayment station indicate it was eutrophic in May, and oligotrophic all other months monitored. The Cahaba R embayment station TSI values indicate eutrophic conditions all months April through October except July when it was mesotrophic. Both Bogue Chitto Cr and Pine Barrens Cr embayments were eutrophic April through October.

August TSI values at all Dannelly Reservoir mainstem stations were eutrophic throughout the historic record, 1985-2005 (Fig. 10).

Figure 2. Mean total nitrogen (TN), mean total phosphorus (TP), mean chlorophyll *a* (Chl *a*) and mean total suspended solids (TSS) measured throughout Dannelly Reservoir, April-October 2005. Bar graphs consist of multiple stations, illustrated from upstream to downstream as the graph is read from left to right.







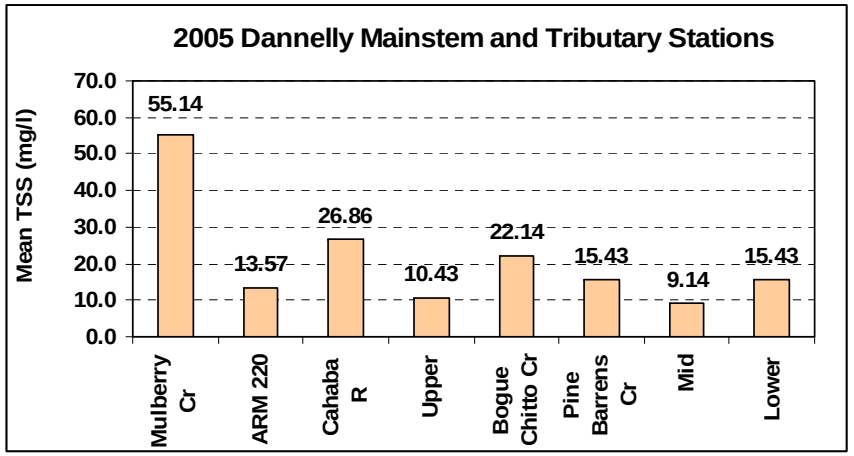


Figure 3. Total nitrogen (TN), total phosphorus (TP), chlorophyll *a* (Chl *a*), and total suspended solids (TSS) of the upper station in Dannelly Reservoir, April-October 2005. Each bar graph depicts monthly changes in the variables at the upper station. The historic mean and min/max range are also displayed for comparison when there was at least 3 data points. Nutrients and TSS were plotted vs. discharge (USACE Mobile District gauge data, Dannelly/Millers Ferry Reservoir).

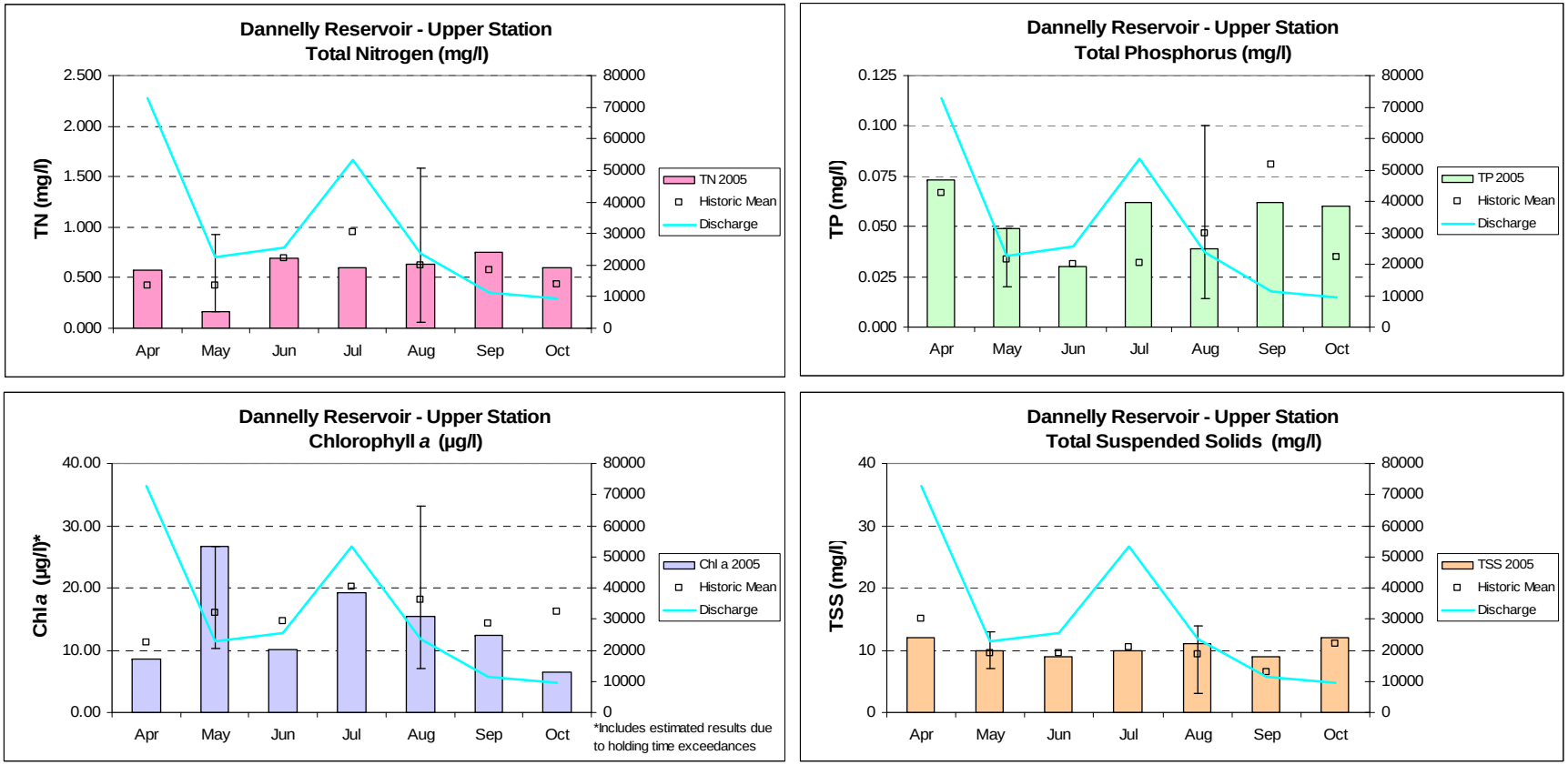
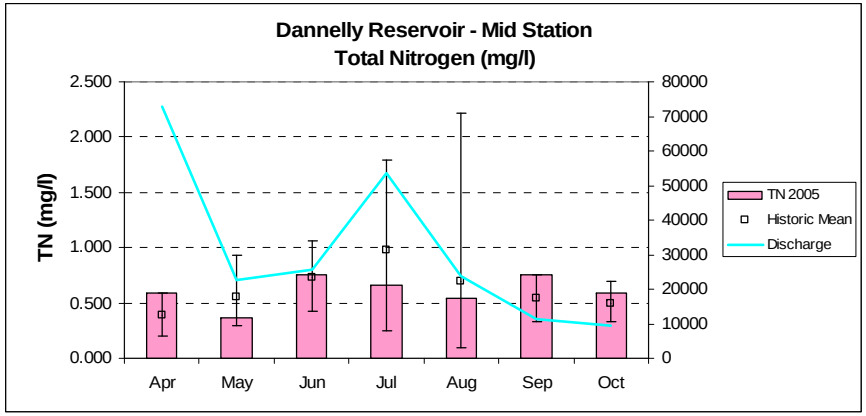
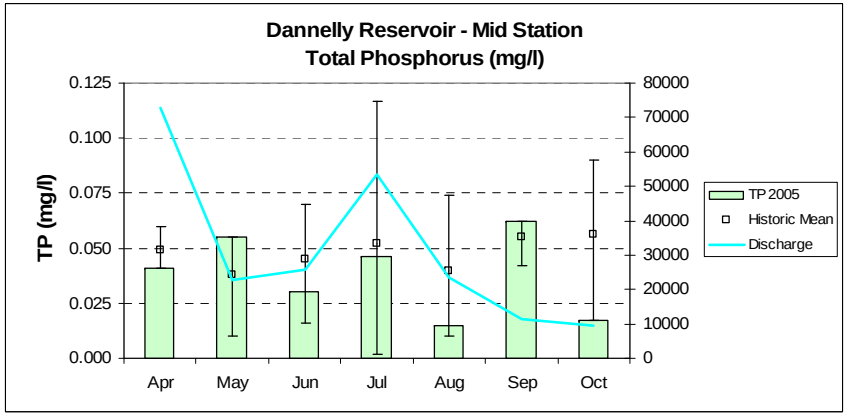
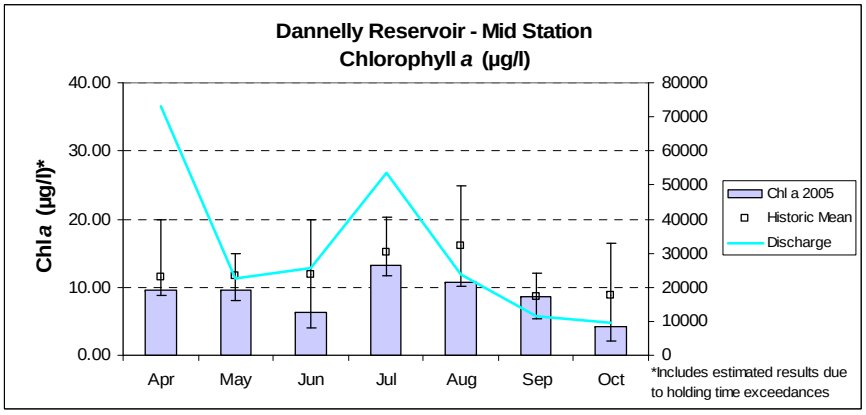


Figure 4. Total nitrogen (TN), total phosphorus (TP), chlorophyll *a* (Chl *a*), and total suspended solids (TSS) of the mid station in Dannelly Reservoir, April-October 2005. Each bar graph depicts monthly changes in the variables at the mid-reservoir station. The historic mean and min/max range are also displayed for comparison. Nutrients and TSS were plotted vs. discharge (USACE Mobile District gauge data, Dannelly/Millers Ferry Reservoir).







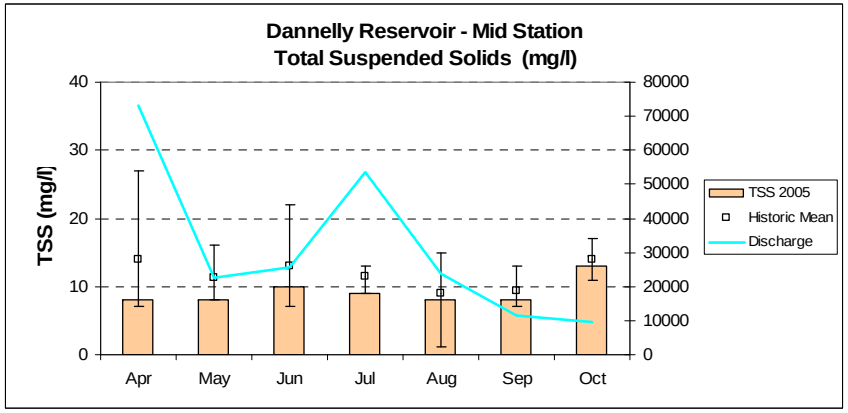
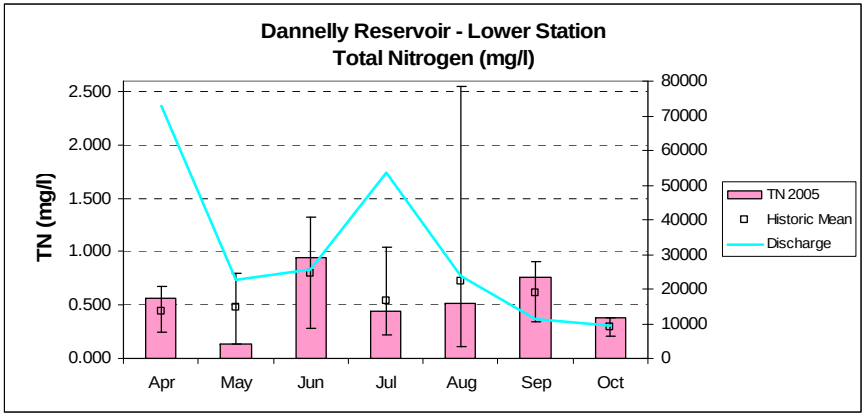
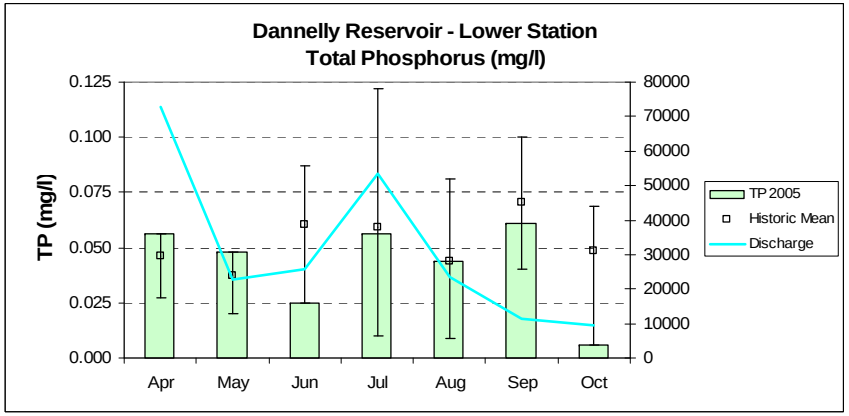
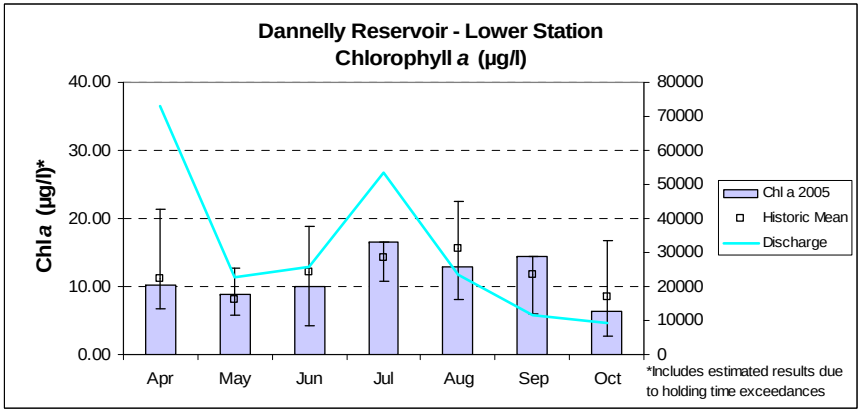


Figure 5. Total nitrogen (TN), total phosphorus (TP), chlorophyll *a* (Chl *a*), and total suspended solids (TSS) of the dam forebay station in Dannelly Reservoir, April-October 2005. Each bar graph depicts monthly changes in the variables at the lower reservoir station. The historic mean and min/max range are also displayed for comparison. Nutrients and TSS were plotted vs. discharge (USACE Mobile District gauge data, Dannelly/Millers Ferry Reservoir).







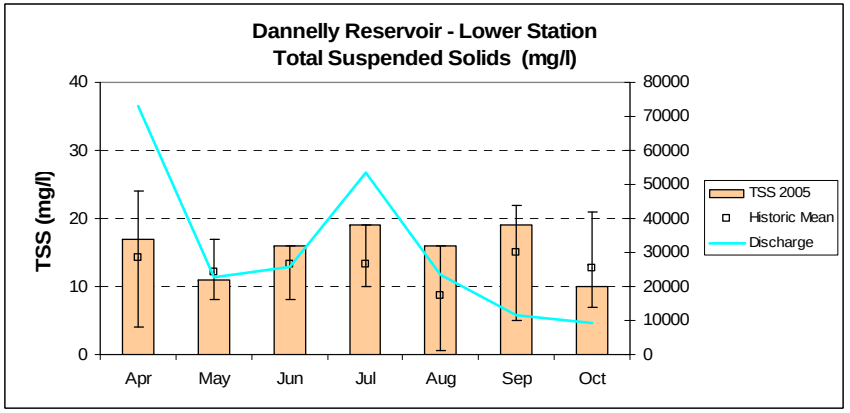


Figure 6. Mean chlorophyll *a* concentrations of mainstem Dannelly Reservoir stations, 2000-2005. Chlorophyll *a* criteria applies to the growing season mean of the lower station only.

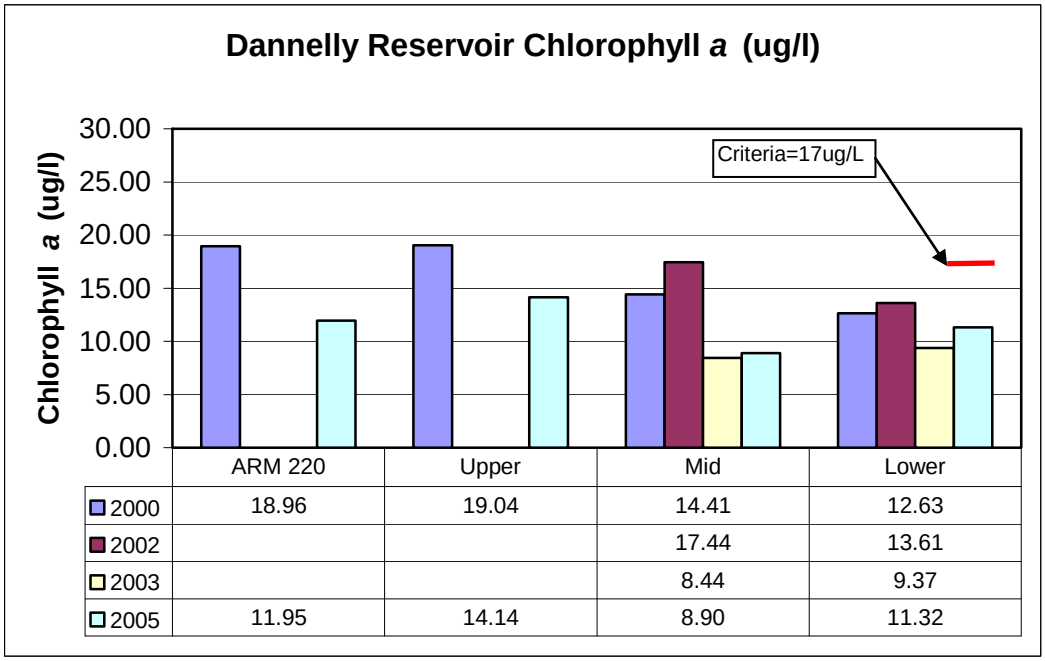


Table 2. Algal growth potential test results for mainstem Dannelly Reservoir stations, 2000 and 2005 (expressed as mean Maximum Standing Crop (MSC) dry weights of Selenastrum capricornutum in mg/L) and limiting nutrient status.

Station	2000 Control mean MSC	2000 Limiting Nutrient	2005 Control mean MSC	2005 Limiting Nutrient
ARM220	2.01	Nitrogen	9.79	Phosphorus
Upper	2.82	Nitrogen	9.70	Phosphorus
Mid	4.34	Nitrogen	8.12	Phosphorus
Lower	2.94	Nitrogen	6.61	Phosphorus

Figure 7. Depth profiles of dissolved oxygen (DO) and temperature (Temp) in Dannelly Reservoir, June-September 2005. Although profiles were measured April-October, these select months were chosen as they represent the warmest water temperatures and most stratified dissolved oxygen concentrations. ADEM Water Quality Criteria pertaining to non-wadeable river and reservoir waters require a DO concentration of 5.0 mg/l at 5.0 ft (1.5 m) (ADEM Admin. Code R. 335-6-10-.09). Under extreme natural conditions such as drought, the DO concentration may be as low as 4.0 mg/l.

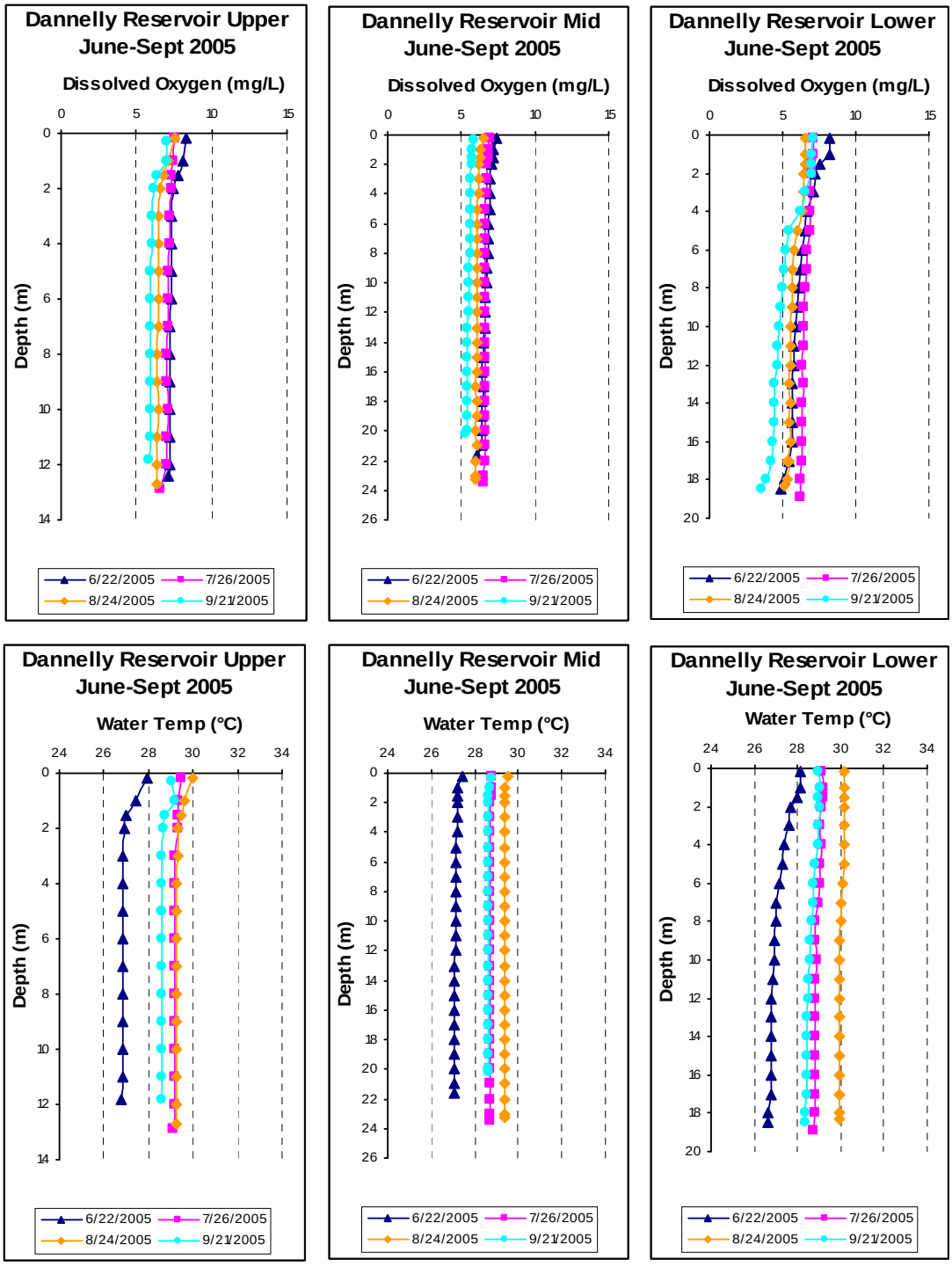


Figure 8. DO concentrations at 5 ft (1.5 m) for Dannelly reservoir tributaries collected April-October 2005. For tributary embayments, which are typically not as deep as mainstem stations and usually maintain a mixed water column throughout the season, profiles were collected but only the monthly DO concentrations at a depth of 5 ft (1.5 m) are graphed. ADEM Water Quality Criteria pertaining to reservoir waters require a DO concentration of 5.0 mg/l at this depth (ADEM 2005).

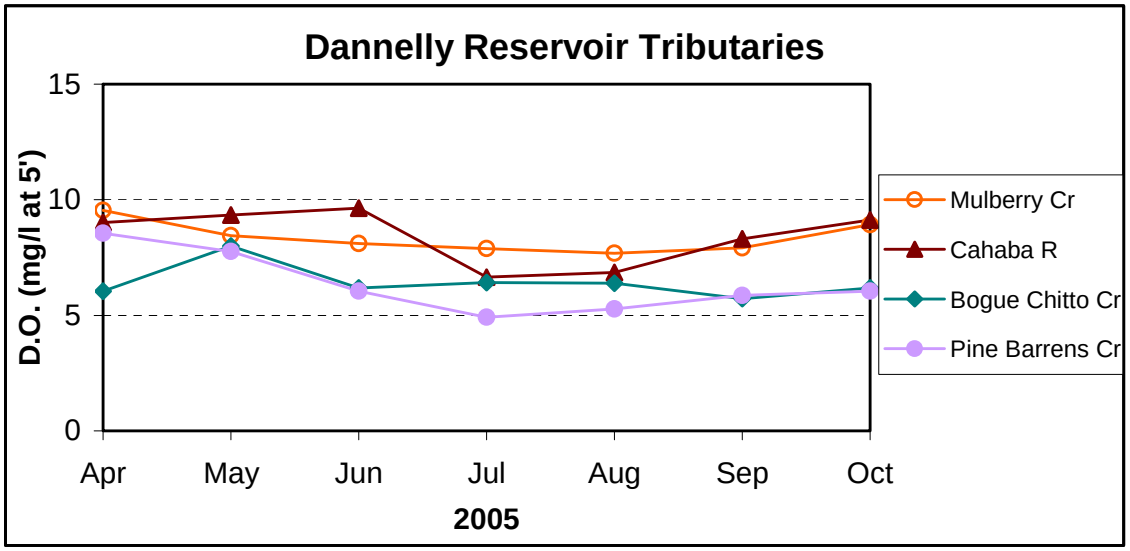


Figure 9. Monthly TSI values for Dannelly Reservoir mainstem and tributary stations using chlorophyll *a* concentrations and the Carlson's Trophic State Index calculation, April-October 2005.

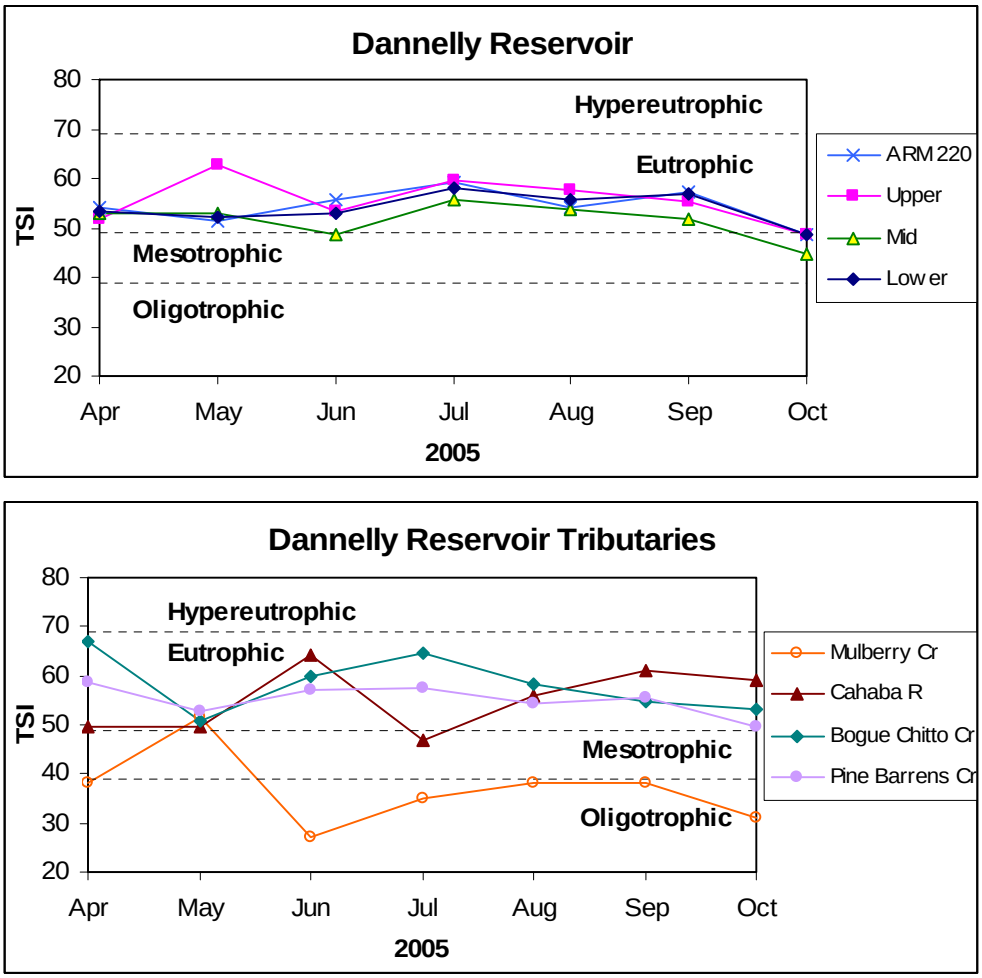
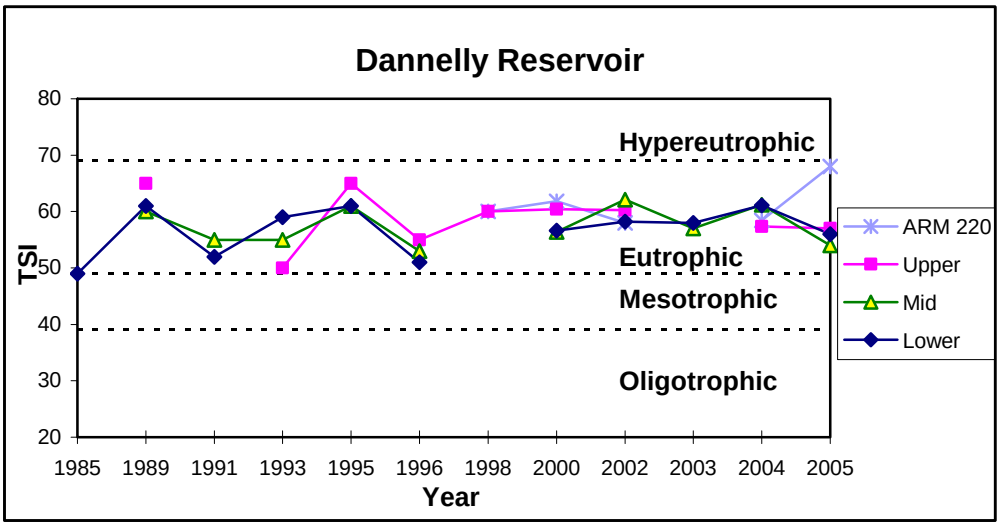


Figure 10. Trophic State Index values from critical period sampling of Dannelly Reservoir (August sampling only) from 1985 to 2005.



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APPENDIX

Appendix Table 1. Summary of Dannelly Reservoir water quality data, April-October, 2005. Minimum (Min) and maximum (Max) values calculated using minimum detection limits (MDL) when results were less than this value. Median (Med), average (Ave), and standard deviations (SD) values were calculated by multiplying the MDL by 0.5 when results were less than this value.

Station	Parameter	N	Min	Max	Median	Avg	SD
DANW-1	Alkalinity (mg/L)	6	38.9	48.9	41.0	41.9	3.8
	Hardness (mg/L)	4	35.9	44.1	41.6	40.8	3.7
	Total Dissolved Solids (mg/L)	6	38.0	297.0	81.5	111.8	93.0
	Total Suspended Solids (mg/L)	6	10.0	19.0	16.0	14.8	3.5
	Ammonia Nitrogen (mg/L)	6	< 0.015	0.047	0.008	0.014	0.016
	Nitrate+Nitrite Nitrogen (mg/L)	6	0.058	0.172	0.105	0.112	0.047
	Total Kjeldahl Nitrogen (mg/L)	6	< 0.150	0.884	0.352	0.384	0.276
	Total Nitrogen (mg/L)	6	0.140	0.940	0.480	0.497	0.263
	Total Phosphorus (mg/L)	6	0.006	0.056	0.046	0.039	0.020
	Dissolved Reactive Phosphorus (mg/L)	6	< 0.004	0.035	0.009	0.013	0.012
	Chlorophyll a (mg/L)[J]	6	6.41	16.55	10.06	10.80	3.50
	Turbidity (NTU)	6	10	25	12	12	7
	Secchi (m)	6	0.41	0.98	0.66	0.62	0.33
	Fecal Coliform (col/100 mL)[J]	1	---	---	---	1	---
DANW-2	Alkalinity (mg/L)	7	38.7	48.7	42.4	42.6	3.9
	Hardness (mg/L)	4	37.9	47.1	41.8	42.1	4.2
	Total Dissolved Solids (mg/L)	7	27.0	149.0	92.0	87.6	40.8
	Total Suspended Solids (mg/L)	7	8.0	13.0	8.0	9.1	1.9
	Ammonia Nitrogen (mg/L)	7	< 0.015	0.081	0.008	0.027	0.028
	Nitrate+Nitrite Nitrogen (mg/L)	7	0.084	0.248	0.170	0.176	0.059
	Total Kjeldahl Nitrogen (mg/L)	7	0.280	0.618	0.394	0.431	0.116
	Total Nitrogen (mg/L)	7	0.360	0.760	0.590	0.607	0.137
	Total Phosphorus (mg/L)	7	0.015	0.062	0.041	0.038	0.018
	Dissolved Reactive Phosphorus (mg/L)	7	0.005	0.013	0.009	0.009	0.002
	Chlorophyll a (mg/L)[J]	7	4.27	13.17	9.61	8.90	2.89
	Turbidity (NTU)	7	7	13	11	10	2
	Secchi (m)	7	0.62	1.03	0.89	0.83	0.14
	Fecal Coliform (col/100 mL)[J]	1	---	---	---	1	---
DANW-3	Alkalinity (mg/L)	7	35.0	49.4	40.7	41.9	5.5
	Hardness (mg/L)	4	33.4	47.7	37.6	39.1	6.3
	Total Dissolved Solids (mg/L)	7	31.0	106.0	77.0	76.6	25.1
	Total Suspended Solids (mg/L)	7	9.0	12.0	10.0	10.4	1.3
	Ammonia Nitrogen (mg/L)	7	< 0.015	0.066	0.027	0.031	0.025
	Nitrate+Nitrite Nitrogen (mg/L)	7	0.087	0.265	0.184	0.186	0.058
	Total Kjeldahl Nitrogen (mg/L)	7	< 0.150	0.529	0.439	0.384	0.157
	Total Nitrogen (mg/L)	7	0.160	0.750	0.600	0.571	0.192
	Total Phosphorus (mg/L)	7	0.030	0.073	0.060	0.054	0.015
	Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.015	0.010	0.009	0.005
	Chlorophyll a (mg/L)[J]	7	6.41	26.70	12.46	14.14	7.01
	Turbidity (NTU)	7	6	14	11	10	2
	Secchi (m)	7	0.62	0.93	0.86	0.83	0.10
	Fecal Coliform (col/100 mL)	1	---	---	---	20	---

Station	Parameter	N	Min	Max	Median	Avg	SD
DANW-4	Alkalinity (mg/L)	6	35.0	48.1	35.5	38.9	5.7
	Hardness (mg/L)	4	31.8	36.7	36.0	35.1	2.3
	Total Dissolved Solids (mg/L)	6	31.0	89.0	73.0	65.2	22.6
	Total Suspended Solids (mg/L)	6	9.0	26.0	12.0	14.5	6.5
	Ammonia Nitrogen (mg/L)	6	< 0.015	0.047	0.013	0.019	0.016
	Nitrate+Nitrite Nitrogen (mg/L)	6	0.111	0.236	0.156	0.163	0.045
	Total Kjeldahl Nitrogen (mg/L)	6	< 0.150	0.536	0.308	0.315	0.172
	Total Nitrogen (mg/L)	6	0.200	0.650	0.510	0.478	0.176
	Total Phosphorus (mg/L)	6	0.006	0.067	0.040	0.038	0.020
	Dissolved Reactive Phosphorus (mg/L)	6	< 0.004	0.030	0.009	0.011	0.010
	Chlorophyll a (mg/L)[J]	6	6.41	18.51	11.21	11.45	4.22
	Turbidity (NTU)	6	7	18	9	10	6
	Secchi (m)	6	0.40	1.25	0.72	0.71	0.43
	Fecal Coliform (col/100 mL)	1	---	---	---	38	---
DANW-5	Alkalinity (mg/L)	7	3.3	9.8	8.0	7.4	2.1
	Hardness (mg/L)	4	9.8	11.4	10.0	10.3	0.7
	Total Dissolved Solids (mg/L)	7	16.0	81.0	65.0	58.1	23.1
	Total Suspended Solids (mg/L)	7	9.0	295.0	15.0	55.1	105.8
	Ammonia Nitrogen (mg/L)	7	< 0.015	0.075	0.008	0.025	0.026
	Nitrate+Nitrite Nitrogen (mg/L)	7	0.057	0.192	0.140	0.141	0.044
	Total Kjeldahl Nitrogen (mg/L)	7	< 0.150	0.477	0.215	0.232	0.175
	Total Nitrogen (mg/L)	7	0.200	0.660	0.390	0.374	0.172
	Total Phosphorus (mg/L)	7	0.048	0.085	0.053	0.057	0.013
	Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.015	0.011	0.010	0.004
	Chlorophyll a (mg/L)[J]	7	0.71	8.54	2.14	2.62	2.67
	Turbidity (NTU)	7	7	62	14	26	21
	Secchi (m)	5	0.30	0.70	0.30	0.31	0.27
	Fecal Coliform (col/100 mL)	1	---	---	---	700	---
DANW-6	Alkalinity (mg/L)	7	56.5	73.4	64.1	64.3	7.5
	Hardness (mg/L)	4	59.4	84.3	68.9	70.4	10.3
	Total Dissolved Solids (mg/L)	7	78.0	112.0	97.0	94.9	12.1
	Total Suspended Solids (mg/L)	7	14.0	78.0	18.0	26.9	22.8
	Ammonia Nitrogen (mg/L)	7	< 0.015	0.031	0.008	0.015	0.009
	Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.003	0.249	0.028	0.095	0.112
	Total Kjeldahl Nitrogen (mg/L)	7	< 0.150	0.510	0.209	0.228	0.180
	Total Nitrogen (mg/L)	7	0.080	0.670	0.320	0.324	0.219
	Total Phosphorus (mg/L)	7	< 0.004	0.061	0.033	0.035	0.026
	Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.014	0.007	0.007	0.005
	Chlorophyll a (mg/L)[J]	7	5.34	30.44	13.35	14.80	9.39
	Turbidity (NTU)	7	9	23	15	15	5
	Secchi (m)	7	0.50	1.55	0.74	0.82	0.37
	Fecal Coliform (col/100 mL)	1	---	---	---	60	---

Station	Parameter	N	Min	Max	Median	Avg	SD
DANW-7	Alkalinity (mg/L)	7	42.1	61.8	46.0	49.7	8.4
	Hardness (mg/L)	4	45.1	70.2	46.8	52.2	12.0
	Total Dissolved Solids (mg/L)	7	49.0	192.0	90.0	100.3	43.8
	Total Suspended Solids (mg/L)	7	12.0	45.0	21.0	22.1	10.6
	Ammonia Nitrogen (mg/L)	7	< 0.015	0.048	0.018	0.022	0.014
	Nitrate+Nitrite Nitrogen (mg/L)	7	0.027	0.230	0.076	0.108	0.070
	Total Kjeldahl Nitrogen (mg/L)	7	0.176	0.997	0.498	0.537	0.302
	Total Nitrogen (mg/L)	7	0.250	1.070	0.630	0.644	0.287
	Total Phosphorus (mg/L)	7	0.038	0.087	0.064	0.061	0.018
	Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.021	0.008	0.011	0.007
	Chlorophyll a (mg/L)[J]	7	8.01	41.65	17.09	20.06	12.46
	Turbidity (NTU)	7	11	23	14	15	4
	Secchi (m)	7	0.41	0.79	0.55	0.56	0.12
	Fecal Coliform (col/100 mL)[J]	1	---	---	---	6	---
DANW-8	Alkalinity (mg/L)	7	42.4	55.4	46.0	48.5	5.3
	Hardness (mg/L)	4	39.5	60.9	48.4	49.3	9.0
	Total Dissolved Solids (mg/L)	7	78.0	98.0	85.0	88.1	7.2
	Total Suspended Solids (mg/L)	7	8.0	23.0	15.0	15.4	6.1
	Ammonia Nitrogen (mg/L)	7	< 0.015	0.019	0.008	0.009	0.004
	Nitrate+Nitrite Nitrogen (mg/L)	7	< 0.003	0.261	0.016	0.074	0.102
	Total Kjeldahl Nitrogen (mg/L)	7	< 0.150	0.771	0.450	0.462	0.226
	Total Nitrogen (mg/L)	7	0.080	0.850	0.520	0.537	0.269
	Total Phosphorus (mg/L)	7	< 0.004	0.074	0.059	0.044	0.028
	Dissolved Reactive Phosphorus (mg/L)	7	< 0.004	0.022	0.007	0.010	0.007
	Chlorophyll a (mg/L)[J]	7	6.94	17.62	12.82	12.66	3.70
	Turbidity (NTU)	7	11	21	15	15	3
	Secchi (m)	7	0.39	0.80	0.57	0.60	0.15
	Fecal Coliform (col/100 mL)[J]	1	---	---	---	8	---

J=one or more of the values provided are estimated; < = Actual value is less than the detection limit