TROPIC RESERVOIR

Introduction

The origins of Tropic Reservoir began ten million years ago as the entire area now known as the Colorado Plateau (an area roughly centered at the Four Corners area) began to uplift. The flow of streams in central Utah was generally south to north, as exhibited by the Sevier River. As uplift took place, large rivers, such as the Colorado and the Green, were able to maintain their elevation by cutting into the land as fast as it uplifted. Smaller rivers, such as the Sevier, were not able to maintain their elevation. Tributaries of deep canyons began to extend themselves at their headwaters, pirating drainage area once held by the Sevier. Headward extension eventually created what is now known as the Grand Staircase, as layers of rock were stripped away, leaving a series of step-like cliffs. The Paunsaugunt Plateau is a remnant of the Sevier drainage with nearly all of its tributaries captured by surrounding watersheds. The headwaters of the East Fork Sevier River are now a shallow elevated basin dropping off at cliffs on three sides, but still draining placidly to the north,

Characteristics and Morphometry

Lake elevation (meters / feet)	2,388 / 7,835
Surface area (hectares / acres)	73 / 180
Watershed area (hectares / acres)	22,300 / 54,104
Volume (m^3 / acre-feet)	
capacity	4,440,607 / 3,600
conservation pool	0
Annual inflow (m^3 / acre-feet)	
Retention time (years)	
Drawdown (m^3 / acre-feet)	
Depth (meters / feet)	
maximum	9 / 29.9
mean	3 / 9.9
Length (meters / feet)	2,380 / 7,809
Width (meters / feet)	366 / 1,201
Shoreline (km / miles)	4.8 / 3

Location

County	Garfield
Longitude / Latitude	112 15 23 / 37 36 10
USGS Map	Tropic Reservoir, Utah 1966
DeLorme's Utah Atlas & Gazetteer™	Page 18, B-3
Cataloging Unit	Otter Creek?? (16030002)

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meandering for hundreds of miles before coming to rest in Sevier Lake.

Settlers in Tropic realized that the much precipitation fell on the high Paunsaugunt Plateau, and given the very gentle gradient from the river to the edge of the plateau, were able to neatly divert water from its meandering course over to the edge of the plateau, where it cascaded down Water Canyon (now in Bryce Canyon National Park) to their settlement in Tropic. Tropic Reservoir, an intermediate-sized impoundment of the gentle river valley, retains the winter snowmelt for use throughout the summer.

The reservoir shoreline is owned and administered by the Dixie National Forest with unrestricted public access. Defined beneficial uses include: water recreation excluding swimming, propagation of cold water species of game fish and aquatic life, and agricultural needs.

Recreation

Tropic Reservoir is accessible on FS-087, which intersects U-12 11 miles east of US-89 and 3 miles wast of the Bryce Canyon entrance. Tropic Reservoir is 8 miles south of U-12 on FS-087.

Fishing, boating, picnicking, cross country skiing and snowmobiling are popular around the lake. The reservoir has a concrete boat ramp. Recreation use is fairly heavy.

King Creek, a Forest Service campground at the reservoir, has 34 campsites and picnic areas. Facilities include tables, fire pits, toilets, water and a sanitary dump station for recreational vehicles. Fees are charged for use. The reservoir and campground are nestled in groves of tall pines and unsurpassed scenic beauty.

Watershed Description

Tropic Reservoir is on the extreme headwaters of the East Fork Sevier River, on the Paunsaugunt Plateau, perched as if on a platform between the Pink Cliffs to the east and south, and the Sunset Cliffs to the west. The area surrounding the reservoir is gently rolling hills covered with Ponderosa Pine.

The watershed high point, Black Butte, is 2,914 m (9,560 ft) above sea level, thereby developing a complex slope of 6.0% to the lake. The inflows Badger Creek and the East Fork Sevier River. The average stream gradient above the reservoir is 1.8% (97 feet per mile). The sole outflow is the East Fork Sevier River, part of which is diverted into the Tropic Canal some distance downstream.

The soil is of limestone origin with rapid permeability and erosion is fairly rapid. A complete listing of soil compositions that compose the watershed are listed in Appendix III.

The vegetation communities are comprised of bitterbrush-mountain mahogany, mahonia, grass-forbes, pinion-juniper, pine, aspen, spruce-fir, oak, and maple. The watershed receives 30 - 40 cm (12 - 16 inches) of precipitation annually with a frost-free season of 80 - 100 days at the reservoir.

Land use is multiple use and recreation. Much of the watershed is in Bryce Canyon National Park, where lands are protected from the problems associated with grazing, but suffer from recreational development and human use.

Limnological Assessment

The water quality of Tropic Reservoir is good. It is considered to be hard with a hardness concentration value of approximately 196 mg/L ($CaCO_3$). Although there are no overall water column concentrations that exceed State water quality standards there are reported violations of parameters at various depths in the lake. These parameters include pH and dissolved oxygen. At various times of the year the hypolimnion of the lake the oxygen deficiencies develop. These anoxic conditions develop primarily during the winter due to the decomposition of large amounts of organic material from macrophytes and algae that are deposited in the bottom of the reservoir. As these material decompose they require large amounts of oxygen which is removed from the water column. Due to the extensive winter period in this area, it is not uncommon to see extensive anoxic conditions develop in the reservoir. On February 14, 1989 the reservoir was surveyed and the dissolved oxygen concentration was 7.3 mg/L at 1.0 meter which dropped dramatically to 0.3 mg/L at 4 meters and 0.0 mg/L at the bottom(6.5 meters). Surveys have not been conducted in recent years during the winter, but conditions are expected to remain the same.

Current data suggest that the reservoir is currently a nitrogen limited system. TSI values indicate the reservoir is oligotrophic in a state of low productivity. The reservoir typically does not stratify due to its shallow nature and early withdrawal of water for irrigation needs downstream.

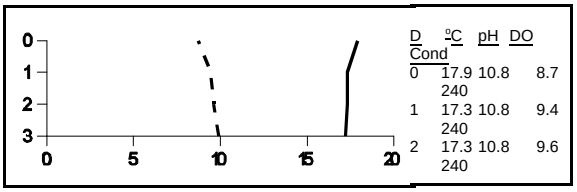
Limnological Data

Data averaged from STORET sites: 494934, 494935

Surface Data	1979	1990	1991
Trophic Status	M	O	O
Chlorophyll TSI	50.97	-	36.37
Secchi Depth TSI	43.85	52.38	46.51
Phosphorous TSI	47.35	43.04	27.35
Average TSI	47.39	31.80	36.75
Chlorophyll a (ug/L)	-	0	1.8
Transparency (m)	1.9	2.0	2.6
Total Phosphorous (ug/L)	15	20	5
pH	8.6	9.2	9.6
Total Susp. Solids (mg/L)	-	<3	<3
Total Volatile Solids (mg/L)	-	-	2
Total Residual Solids (mg/L)	-	-	<3
Temperature (°C / °f)	15/59	16/61	15/59
Conductivity (umhos.cm)	408	270	325
Water Column Data			
Ammonia (mg/L)	0.05	0.03	0.03
Nitrate/Nitrite (mg/L)	0.07	-	0.02
Hardness (mg/L)	226	168	195
Alkalinity (mg/L)	226	163	188
Silica (mg/L)	-	-	3.6
Total Phosphorous (ug/L)	16	20	5
Miscellaneous Data			
Limiting Nutrient	N	N	N
DO (Mg/l) at 75% depth	7.5	8.3	9.7
Stratification (m)	6	NO	NO
Depth at Deepest Site (m)	8	1.8	3

Extensive growth of macrophytes occurs in the reservoir. It is not uncommon for them to reach the surface later in the year as the water level is drawn down and they do inhibit travel on the reservoir.

According to DWR no fish kills have been reported in recent years, but they recognize the potential for fish leaving the reservoir during the winter due to anoxic conditions. The reservoir supports a population of rainbow trout (*Oncorhynchus mykiss*) and cutthroat trout (*Oncorhynchus clarki*). The lake has been treated for rough fish competition in 1955, 1959., 1966, 1971 and 1979 so populations of native fishes may not be present in the lake. Brook trout (*Salvelinus fontinalis*) have been stocked in the upper tributaries and could appear in the reservoir. Current stocking reports indicate that DWR stocks the lake annually with approximately 6,000 catchable rainbow trout.



D	°C	pH	DO Cond
0	17.9	10.8	8.7 240
1	17.3	10.8	9.4 240
2	17.3	10.8	9.6 240

Phytoplankton in the euphotic zone include the following taxa (in order of dominance)

Species	Cell Volume (mm^3/liter)	% Density By Volume
Fragilaria crotonensis	0.229	45.75
Pennate diatoms	0.223	44.64
Scenedesmus bijuga	0.031	6.22
Oocystis sp.	0.008	1.67
Centric diatoms	0.006	1.27
Chlamydomonas globosa		0. 0 0 2 0.45
Total	0.499	
Shannon-Weaver [H']	1.04	
Species Evenness	0.58	
Species Richness	0.25	

The flora of Tropic Reservoir is quite healthy, as indicated by the almost complete dominance of diatoms.

Pollution Assessment

Nonpoint pollution sources include: sedimentation and nutrient loading from grazing, and waste material and litter from recreation. Cattle graze in the watershed and around the reservoir.

There are no point pollution sources in the watershed.

Beneficial Use Classification

Information

Dixie National Forest	586-2421
Powell Ranger District	676-8815
Tropic and East Fork Irrigation Company	679-8746
Ruby's Inn	
Five County Association of Governments	
Division of Wildlife Resources	538-4700
Division of Water Quality	538-6146

The state beneficial use classifications include: boating and similar recreation (excluding swimming) (2B), cold water game fish and organisms in their food chain (3A) and agricultural uses (4).