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Summary of
Aquatic Resources Inventory for
Management Unit 14 (Twin Lakes)
Lassen Volcanic National Park

by

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A study of the aquatic resources was conducted in Management Unit 14 (Twin Lakes) during the period of August 17 to 25, 1976. The Twin Lakes Management Unit consists of the following lakes: Upper Twin Lake, Lower Twin Lake, Rainbow Lake, Feather Lake, Echo Lake, Swan Lake and approximately 19 unnamed lakes located in parts of Sections 1 and 2 of T30N, R5E, Sections 24, 25, 35 and 36 of T31N, R5E, and parts of Sections 17, 20 and 31 of T31N, R6E.

The study was conducted to determine the condition and status of the lakes and ponds and their environs, the extent of aquatic life, presence or absence of fish populations and their condition in relation to other populations. Management recommendations were made from the observations noted.

METHODS AND MATERIALS

Thermometers calibrated in Centigrade degrees were used to measure the water temperature and the ambient air temperature. A small, inexpensive camera was used to take color photographs of the bodies of water. The prevailing weather conditions at the time of observation were noted as they can have influence on what was observed. Fly and spin fishing tackle was used to sample the fish populations, as well as two gill nets. The nets were 150 feet long by five feet high and consisted of five panels of various mesh sizes ranging from about 1/2 inch to two inches. The nets were set from a two-man, inflatable rubber raft with the aid of a partner. A rock anchor was attached to each end of the net and deposited on the bottom. Five one-gallon plastic jugs were used as floats for each net and attached at evenly spaced intervals.

Fishing tackle was operated for a recorded amount of time in Echo, Swan, North Feather and Upper Twin Lakes. Gill nets were set in Upper Twin Lake (2), Lower Twin Lake (2), Rainbow Lake (2), and Feather Lake (1). The nets were set overnight from approximately 5:00 p.m. to 7:30 a.m. All fish captured were weighted on a beam balance to the nearest tenth of a gram and measured (fork length) to the nearest tenth of a centimeter. Condition factors for all salmonids were calculated from this data, using the formula

$$K = \frac{10000W}{L^3}$$

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North Feather 12/352
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(Summary)

Where the K is the condition factor of a given fish, W is the weight in grams of that fish and L is the fishes length in millimeters. Stomach samples and scale samples were taken from all fish for later analysis of feeding, age and growth. The abundance and species composition of each lake was calculated both by numbers of fish and by biomasses. Extent of natural propagation was noted.

Apparent color of the lakes was noted and the approximate clarity. In lakes where the boat was used (Upper and Lower Twin, Rainbow and Feather) the clarity was noted by taking a rock attached to a line and dropping it over the side and noting the depth at which the rock disappeared. The area of the lake was either estimated or taken from the notes of previous studies. Shoreline features as well as features of the watershed in general was noted. The bottom of each lake was categorized and ratios of bottom materials were recorded. A maximum depth was recorded for each lake, either by sounding or by inspection and an average depth was estimated.

Aquatic plant species present and their relative abundance were noted and food organisms were handled in the same manner. Fish predators were noted if observed or evidence of their occurrence was seen. Any suitable spawning sites were carefully noted so that it would be known if any fish population was capable of replenishing itself. Use type and degree was noted for each lake, as was fishing intensity.

Suggestions were made for improvements to the area and recommendations were forwarded, based on the observations with regards to present management policy and for consideration in the formulation of any future management policy.

All data recorded in the field were recorded on a standard "Lake Survey Form" obtained from the California Department of Fish and Game. This data was later transcribed onto a form made up for the study. These forms are the basis for this report.

RESULTS

The temperatures of the lakes themselves ranged from 5°C to 20°C, the ambient air temperature ranged from 5°C to 22°C. The greatest difference between air and water temperatures occurred at Swan Lake on August 18 when at 2:30 p.m. the air was 5°C and the water was 12°C. Since most of the observations were made late in the morning or in the afternoon the majority of air and water temperatures are quite close to each other.

The larger lakes tended to be blue, blue-green, or green in color while the smaller, unnamed lakes tended to be either green or brown.

Most of the small lakes were so shallow that the bottom could be seen in them while standing on the shore. In the larger lakes the maximum clarity occurred in Upper Twin Lake on August 23 when the rock disappeared from view at 23 feet below the surface.

The maximum depth recorded was also at Upper Twin Lake when bottom was hit at 55 feet below the surface. The average depth at Upper Twin Lake was approximately 20 feet. The average depth of the other named lakes ranged from three feet (Rainbow Lake) to 20 feet (Lower Twin Lake). The average depth of the unnamed lakes ranged from less than one foot to slightly more than one foot. None of these unnamed lakes were observed to be deeper than about four feet.

Lower Twin Lake is the largest lake in the management unit, having a surface area of 55 acres. Echo Lake is the smallest of the named lakes, being only nine surface acres. The unnamed lakes range from one-sixth of an acre to 14 acres. The 14 acre lake is the large body of water north of Feather Lake and is often called North Feather Lake.

Mud and organic debris is the predominant bottom type in all of the named lakes except Lower Twin Lake, where sand composes 60% of the bottom. In some of the lakes (Rainbow, Feather, Echo) mud and organic debris compose either 95% or 100% of the bottom. This mud often is rather shallow in depth and overlies a layer of sand and/or gravel. In the unnamed lakes mud and organic debris is again predominant, usually being 100% of the bottom.

Red fir is the predominant forest species in this management unit, being 40% to 90% of the standing trees. Other important tree species are white fir and lodgepole pine. Most of this area is in a gentle part of the park, relatively flat or only slightly rolling with scattered volcanic mountains (Fairfield Peak, Cinder Cone) and some uplifted ridges. The soil type is a shallow, loose soil often containing amounts of sand or cinders. Streams in the area tend to run intermittent and were not running during the study period. In season, Rainbow Lake flows into Lower Twin Lake, as does Upper Twin Lake. The water from Lower Twin Lake then flows northerly about two miles then easterly for about a mile where it encounters the Fantastic Lava Beds. Here the water enters the lava beds and is thought to drain through these into Butte Lake. The rest of the lakes in the unit are in enclosed basins and lose water by seepage, and evaporation and gain water by seepage and runoff.

Both mule deer and Columbian blacktailed deer are abundant here. Pine martens were sighted on several occasions. A wide variety of fowl inhabit the area, including ducks and geese and raptors. Several varieties of woodpeckers were also encountered here.

All of the named lakes in the unit are easily accessible by trail, being immediately adjacent to one of the several routes through the area. The main trail originates at the Summit Lake campgrounds and goes to Snag Lake.

At Lower Twin Lake a branch trail takes off to Swan Lake and another goes towards Badger Flat, passing Feather Lake on its way. None of the unnamed lakes are more than a mile off of any established trail, most being much closer. Location is not difficult with a map and suitable compass.

The predominant aquatic plant in the unit are members of the Carex genus. Other aquatic plants which were found include Isoetes sp., Scirpus sp., Potamogeton sp., Sparganium sp. (found only at Rainbow Lake), and various members of the family Graminae.

The genus Notonecta, or backswimmers, were the predominant food organism seen during the study, being present in nearly all of the lakes and always in large quantities. Other food organisms seen were Gerris sp. (water striders), Dineutes sp. (whirligig beetles), Hydrophilus sp. (water scavenger beetles), Dytiscus sp. (predacious diving beetles), Dipterans (flies), Chironomidae (midges, a family of Dipterans), Ephemeroptera (mayflies), and bees. Hatches of both chironomids and ephemeropterans were observed to occur during the study.

The only fish caught during the study in this management unit was a rainbow trout (Salmo gairdneri) caught in a gill net in Rainbow Lake. The fish weighed 1121.5 grams and was 43.0 centimeters long. The K for this fish was 1.4. One or two other fish were observed rising to the mayfly hatch that was occurring during observations (August 22 and 23). Reports reached me that one or more anglers had caught some large fish in Rainbow Lake since that time, but that report is unconfirmed and no creel census cards were filled out.

Fish were observed in Upper Twin Lake, but none were caught in 29 hours of gill net effort and two hours of angling from the raft. No other fish were observed in any of the other lakes in this management unit.

The bottom of the lakes, their shorelines, inlets and outlet streams appear to possess little or no suitable spawning sites for salmonids.

The uses of this area can be broken down into two categories. Natural uses and those uses of the resource, which are made by the plants and animals which have become established there. These include mammal and avian watering, nesting, breeding, feeding, etc. These uses are heavy to very heavy, especially by the deer.

Human uses are those uses which are made of the area by human visitors. These include hiking, backpacking, camping, sightseeing, fishing, bird-watching, photography and others. These uses are also heavy due to the easy accessibility to the area from trailheads, the gentle trails and the scenic beauty of the area. Recently fishing has declined as a use because the availability of fishable waters has diminished due to lack of stocking of fish in lakes. Campers and others still exert a heavy pressure on the area and often do not observe proper wilderness etiquette in the use of water supplies.

DISCUSSION

Being late in the summer, most of the lakes could be expected to be found fairly warm and this was the case. Even extremely cold nights could do little to lower the temperature of even the surface of the waters. Most of the larger lakes were warm enough that swimming was pleasant. In some of the smaller, unnamed lakes the temperature at the surface would fall during the night, and it would take until noon or after for the water to warm up to the ambient air temperature. This is the expected occurrence in very small lakes and ponds.

A report was made by my partner, John R. West, on the Twin Lakes region and this covers a lot of the material concerning Upper and Lower Twin Lakes, Echo Lake, Swan Lake and Rainbow Lake. Mr. West has also completed a report on the Cluster Lakes region and this includes Feather Lake. The reader is referred to these reports for further information.

Blue and green are typically encountered colors of good sized lakes and usually is evidence that there are no drastic pollution problems. This reflects the reflection of light from the body of water, and also the color of the bottom materials in some instances.

A brown color is usually an indication that there is an excessive amount of organic material in the water, which is decomposing. This is the case in the small, shallow lakes where the ratio of volume to surface area is small. Hence, any organic debris which falls into the pond, such as leaf litter, falls into a smaller volume of water. Hence, the water becomes more concentrated with the products of organic decomposition. In very shallow lakes the brown color is also a reflection of the color of the debris on the bottom.

In the shallow lakes it was impossible to tell how far one could actually see if water of that type were in a deeper basin. In order to more exactly measure the clarity of these waters, a sample would have to be taken and appropriate clarity, or light penetration, or turbidity measurements be made.

The clarity of the larger, deeper lakes is usually quite good ranging from 10 feet to over 20 feet, as mentioned above. The depth to which can be seen is a variable, depending on the amount and angle of sunlight, presence or absence of clouds, and how much the surface of the lake is being disturbed by wind action. So if a deep clarity is observed on a calm day, one might find that on a cloudy, blistery day that the depth to which can be seen is much less than previously reported. Conversely, in a calmer situation one may be able to see further into the water column. Again, more detailed measurements of the water would be interesting.

The maximum depths recorded for the larger lakes reflects only a cursory sampling effort by sounding with the rock. They should be approached cautiously for two reasons.

First, very little of each lake that was sounded was actually sounded. Second, most of the lakes were down in volume from normal and high water years, so this must be taken into account. The average depth estimated for the lakes should also be approached cautiously because this is an estimation. It should also be noted that this average depth may be closer to a median than a mean in some, if not most or all, cases.

In many of the unnamed lakes, which are very shallow, the average depth may be very close to the maximum depth, the lake being a low spot in the ground where water has seeped in and remained.

The surface acreage for the larger lakes was taken from work previously done by other park employees. Since this has been a low water year these values may be slightly large, although it is believed that the difference is slight.

The bottom composition of a lake is a reflection of its geological characteristics and the amount of organic debris that is brought into the basin. In smaller lakes without outlets this organic debris which enters can not leave except through decomposition so the layer consistently builds up and is thickened. Eventually these lakes will be encroached upon by the forest and fill in, and the lake will no longer exist. In larger lakes this process is also occurring, but at a much slower and less noticeable rate. If the lake has an outlet some of the organic debris can be carried out, which aids in slowing up the filling of the lake.

The sand and gravel under the layer of organic debris is a part of the geological basin that the lake is in and reflects the geological history of the area.

The organic debris found usually consists of decomposing vegetable matter and fallen trees or logs.

The easy access of all the lakes and ponds within this unit makes them extremely popular with visitors, hence use is heavy and sometimes abusive.

The aquatic plants found within the lakes and upon their shores are typical plants one would expect to find at this latitude and altitude.

The amount of food organisms found seems to indicate that there is sufficient food available to feed a population.

Unfortunately the lack of spawning sites dictates that fish can not live successfully here. In order to have a fishery in the unit fish would have to be stocked and this is in opposition to the management policy of backcountry and wilderness areas in the National Park System in the Western Region,

The fish which was caught in Rainbow Lake, the others which were seen, and the ones which may have been caught out of the lake are probably remnants of the last stocking effort in 1972. One of the fish which was observed was only about 15 to 20 cm. in length. It may be that some spawning does take place occasionally in the outlet stream of this lake. The conditions there are marginal at best, but the possibility remains. If this is so, then spawning might occur every few years when conditions are proper and if a pair of fish, male and female, have survived from the last batch of adults. It is also slightly possible that this may occur in Upper Twin Lake. None of the other lakes in the system are capable of supporting a fish population.

The sparsity of captured fish in Rainbow Lake and the lack of captured fish in Upper Twin Lake would seem to indicate that the populations in these two lakes are very meager.

The repercussions of extensive visitor use upon the unit are ominous. The foaming seen on Lower Twin Lake (see Twin Lakes Regional Report by John West), the washing of dishes, clothes and persons in the lakes while using soap, the proximity of campsites to lakes which may bring in human waste products and garbage, and other factors seem to be leading to a rapid deterioration of the aesthetic value of this unit.

MANAGEMENT RECOMMENDATIONS

None of the lakes in Management Unit 14 should be stocked with fish. Fish have apparently not been able to reproduce themselves here in the past and it is doubtful that they can accomplish this now. Introducing fish to this unit would only serve to increase the pressure placed on it by visitors and lead to further deterioration of the environment. There is evidence that backcountry users are not primarily interested in fishing. (walking from the Twin Lakes cabin to Summit Lake I encountered 43 hikers going into the area, only 5 were interested in fishing in the area), and the cost factor versus the value realized by the tourist is not worthwhile. Finally, introducing fish to the unit would serve to increase the amount of organic debris in the lakes.

A seasonal backcountry ranger should be hired by the park when funds are available. He should be stationed at the Twin Lakes cabin and be responsible for the Twin Lakes area and the Cluster Lakes area. Campsites which are too close to the water should be destroyed or moved further back from the shore. People who are observed using soap in the waters, or discarding used wash water in the water should be cited.

A chemical analysis of the water of Lower Twin Lake should be made to try and determine the cause of the foaming. It might also be wise to take a coliform bacteria count of the lake to see if excessive pollution has made the water unsafe for human use. If the coliform count is too high then the lake should be closed to all human use until the problem is alleviated. It may be wise to close the lake to camping for one year anyway.

A study of Upper Twin Lake and of Rainbow Lake should be made to examine the extent of spawning in these two lakes. The lakes should be closed to fishing during the study.

The trail crews should clean up the lakes and lakeshores as much as possible. There is an enormous amount of garbage left behind and it appears that no effort has been made to clean it up.

Use of this backcountry area by hikers, campers, etc. should be closely monitored. Rangers should walk through the area more often to note uses, abuses and general condition.

A study should be made on the extent of deer browsing to determine if overbrowsing is occurring.

A study should be made to determine the extent of the pine marten population.

A bird inventory would be very helpful in evaluating and formulating future management policies and decisions.

No changes should be made in the current management policy without an in-depth study of the factors involved.