

MANAGEMENT OF HIGH-COUNTRY LAKES
IN THE NATIONAL PARKS OF CALIFORNIA

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ABSTRACT

Hundreds of lakes, located within Yosemite, Sequoia, Kings Canyon, and Lassen Volcanic National Parks in California, were barren of fish life. Over the past century, trouts of various species have been introduced into many of them. In some lakes and in the streams the trouts maintain populations by natural reproduction; in others trouts can be sustained only by stocking. Periodic planting of trouts have been conducted for many years to provide for recreational fishing. Studies in the parks have provided for the management of these resources.

Recently approved National Park Service policy reaffirms that recreational angling is an appropriate visitor-use activity in park waters but that trout populations will no longer be sustained by artificial stocking. Fishing will be totally dependent upon trouts that are maintained entirely by natural reproduction.

An exception to this general policy for the national parks in California has been denied; however, the Service will participate in a two-year study with the California Department of Fish and Game to determine the biological, social, recreational, and economic impact of a no-stocking rule in California. During the two-year study period, a trout stocking program in the national parks of California will be conducted at the 1974 level.

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Hundreds of scenic lakes dot the high rugged montane landscape of California's mountainous backbone - the Cascade/Sierra ranges - that stretch from the Oregon border on the north to southern California. Many of these lakes occupy cirques and basins carved from the mountains by the relentless forces of ancient glaciers. Others are impounded by moraines left by the retreating ice. Slowly eroding forces of water and frost softened many of the ragged glacial scars; but the streams, as they plummet over cliffs on their rush toward the ocean, were unable to remove the waterfall and other obstructions in the water courses. These obstacles prevented the fishes from ascending from valley rivers to high mountain streams and alpine lakes. Thus when man climbed into the high country, he found each sparkling lake and stream, above these barriers, devoid of fishlife.

Nearly a century ago, early cattlemen, sheep herders, mountain men, early settlers and Army troopers initially transplanted trout from lowland waters to high country lakes and streams. Some fishes were transported by any available means, such as in the case of the golden trout that were carried over impassable water falls and the trailless mountains to Cottonwood Creek in a teapot! (Curtis 1935) For the most part these early plants were spotty and unrecorded and were made in the more accessible upland streams and the larger lakes of the remote mountains. First plantings of trout, in the area that later became Yosemite National Park, were made in Spiller Lake in 1875; in Eleanor Lake in 1877; in Tenaya Lake and the Lyell Fork of the Tuolumne River in 1878 and in Vernon, Kibbie and Laurel Lakes in 1880.

Army troops arrived to administer Yosemite, Sequoia and General Grant National Parks shortly after these parks were created in 1890. They discovered that few waters in the high country contained trouts or other fishes.

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The Army Superintendents embarked upon active programs to "correct" this situation. They and the troopers in their commands stocked trouts into many waters and subsequently transplanted the offspring into additional lakes and streams. Fascinating accounts of these pioneering activities are recorded in old Park Superintendents' reports.

With the advance of fish cultural activities, fish became available from federal and state hatcheries and concerted efforts were made to stock fishes for the angler on a systematic basis. Early trains brought trout consignments to railheads near the parks where they were met by Army horse-drawn ambulances and, later, by trucks. In the parks the trouts were loaded onto pack animals for the final trek to the waters where the fish were released. Frequently, however, fish supplies were limited and transportation was slow and, sometimes, unreliable. (Evans, Wallis, Gallison 1961).

Major interest and direction apparently was placed upon a goal to stock or restock all accessible waters, as well as many remote waters. Strong emphasis and reliance was placed upon the use of hatchery fishes to fill needs for "replenishment" of trout populations. Rainbow and cutthroat trouts of many strains, brook trout, brown (Loch Leven and German brown) trouts, golden trout, and even grayling were introduced in park waters with varying degrees of success.

As the numbers of visitors increased, especially in Yosemite, the need for a more reliable and available source of fish to accommodate the demands was recognized. To meet these requirements a pioneer State hatchery was established at Wawona in Yosemite in 1895 and operated intermittently until 1927. Eventually, in 1927 a major trout hatchery was built at Happy Isles in Yosemite Valley and was operated by the California Department of Fish and Game until 1955.

To provide wild native rainbow trout eggs for stocking in the Yosemite high waters, an egg-taking station was established on Frog Creek on Lake Eleanor in 1933; it operated until 1955. Eventually, fish cultural activities terminated in Yosemite as more economical and efficient facilities for trout hatching and rearing were developed elsewhere in the state. As the use of airplane to stock high country lakes evolved, it was desirable that the source of hatchery trout be more readily accessible to the airports. (Wallis 1952; 1953).

Numbers of fishes planted and species used in the early days were indiscriminate and depended more upon the availability of trout than upon the determined needs of the individual waters for supplementary

restocking. (Hubbs and Wallis 1948). Species of trouts were stocked in mixed batches in the same water. Eventually, the practice was established to "reserve" selected waters for the stocking of specific species such as: rainbow, brook, brown, golden trouts. In the streams, it became evident that trout had become established and that they could maintain populations by natural reproduction without restocking.

Brook trout, an opportunistic spawner, became established in many lakes. In selected waters, in which the exacting spawning conditions prevailed, the rainbow trout developed self-supporting populations. In other lakes where sites for natural reproduction were not available, the rainbow trout populations could not be perpetuated naturally.

The State of California and the National Park Service have combined forces to provide for recreational fishing. The State provides the trout for stocking and assists in planting operations. The Service manages the aquatic resources and establishes special fishing regulations to meet local conditions and enforces both state and federal laws. A California State fishing license is required by law.

In 1951, the National Park Service embarked upon a most intensive evaluation of its fisheries management program in Yosemite National Park. (Wallis 1952; 1953). The three-year study consisted of: a review of past and current stocking and management actions; an inventory and classification of all park lakes; an angler-use survey; a determination of the species and distribution of trout and other species; and an analyses of rules and regulations relating to fishing. As a result, for the first time, data became available to provide the factual basis for the development and implementation of a realistic fishery management program in Yosemite.

Yosemite Trout Investigations

This study resulted in: a comprehensive review of the trout fishery program in Yosemite; a 10-year stocking schedule which provided for an orderly and systematic program for restocking of park lakes; and an inventory / fact folder for each lake.

The investigations revealed that: 1. many lakes did not require stocking; 2. rainbow trout were being planted in lakes that were already fully occupied by brook trout; 3. the stocking of excessive numbers of trout had resulted in slow and stunted growth, 4. too frequent stockings of trout in remote lakes (especially those that experience relatively light fishing pressure), resulted in a poor mixture of competing age groups of trout and did not necessarily improve fishing; and 5. in some lakes at which natural reproduction was limited or totally lacking rainbow trout populations could be maintained only by periodic stocking.

From these studies, a cyclic stocking schedule evolved that included the projection of annual plantings to be made in the heavily fished waters (in which natural reproduction was limited or lacking) and stocking at intervals of 3-6 years in other waters. The planting frequency depended upon the remoteness of the water, its proximity to other lakes, the anticipated level of fishing, the level of natural reproduction, and the biological and physical characteristics of the lake. The importance of cyclic stocking to manipulate trout populations to correspond with the productivity and carrying capacity and the anticipated angler-use of an individual water is further discussed by Wallis (1963b) and by Johnston and Hendee (1975).

Results of the plants of rainbow trout are more readily recognized and analyzed when plants are made in a high lake in which little or no natural reproduction occurs than in a lake in which natural reproduction contributes to the total trout population. Based upon an evaluation of the success of previous plants, adjustments can be made in the frequency of stocking and in the numbers of fish to be used in subsequent plantings in a specific high lake.

The initial 10-year stocking schedule for 1953-1962, therefore, was periodically modified to coincide with changing conditions as they were recognized. In 1960 Wildlife Biologist Del Armstrong formulated a revised 10-year schedule.

Long Range Aquatic Resources Management Plans.

Each park, in 1966, was directed to develop a Long Range Aquatic Resources Management Plan that would serve as a "blue print" for the effective management, protection and appropriate use of aquatic resources. To serve as a guide in the development of this Plan the Aquatic Resources Natural and Historical Areas of the Wildlife Management Handbook was distributed to each area. (NPS 1966).

The Manual contained: 1. a statement of the objectives and principles for the management and use of aquatic resources; 2. instructions for the designation of fishes (native, nonnative, sport fish, scientific-aesthetic fish or undesirable nonnative fish); 3. criteria for the identification and the biological and management-use classifications of each water; and 4. instructions for the development of a 10-year stocking program, where applicable, and for research and management programs.

Management Classification of Park Lakes.

The management classification scheme designated the type of management to be directed toward each lake as follows:

Class I: Waters Managed for Purposes Other Than Fishing

Waters in this class are managed for the perpetuation of undisturbed natural aquatic ecosystems rather than sport fishing. This classification includes waters that: contain no fishlife; contain environmental factors unsatisfactory for survival of fishlife; are too remote to justify fish stocking; and waters in which fishing would prove detrimental to other natural resources or enjoyment by other park visitors.

Class II: Waters Managed for Fishing by Use of Populations of Wild Fishes

These waters contain self-supporting and established populations of native and/or nonnative trouts. Special regulations may be required in these waters to regulate fishing use and catch so as to perpetuate these wild trout populations.

Class III: Waters Managed for Fishing by Periodic Stocking of Fishes

These waters are lakes and streams designated for sport fishing in which fish populations are maintained at a fishable level by periodic stocking of hatchery trout. They consist of waters that are capable of supporting year-round populations of planted trout but possess little or no opportunities for natural reproduction.

Biological Classification of Park Lakes.

Biological Classifications relate to the status of fishes present as follows:

Group A: Waters with Natural Conditions Unmodified by the Introduction of Nonnative Fishes

Group A-1 Waters are naturally fishless waters in which fish have not been stocked. Group A-2 Waters contain endemic populations of fishes that are perpetuated entirely by natural reproduction.

Group B: Waters Modified by the Introduction of Fishes

These waters contain single or mixed populations of native and/or nonnative fishes that are maintained by periodic stocking. In some lakes with mixed populations, certain species may be maintained by stocking while other species are maintained by natural reproduction.

Group C: Waters Restored or Reverted to Natural Conditions

Lassen Plan

A Long Range Fishery Management Plan, 1966-1975, for Lassen Volcanic National Park was completed in 1966 by Lester D. Podine (1966).

The Lassen Plan identifies 58 lakes. Twenty-two of these lakes are classified as Class I; 21 of these Class I lakes are small and average eight acres in size (except Juniper Lake that contains 573 acres). Only two lakes were grouped in Class II, and Class III contained 34 lakes outlined in the plan for management by periodic stocking. Earlier studies made in the park have been reported upon by Potts (1941); Potts and Schulz (1953); Moffett (1943c); Everett (1963; 1964); Hubbell (1960; 1961) and Wallis (1953; 1955; 1959).

Yosemite Plan

A draft of a Long Range Aquatic Resources Management Plan for Yosemite was prepared in 1967 by Wildlife Biologist Neal Guse (1967) and revised and expanded in 1971 by Leo F. Marnell (1971).

The Yosemite Plan identifies 270 lakes in the park; 107 in Class I; 78 in Class II; and 60 in Class III; and 21 (with mixed trout populations) in Class III/II. In summary: 107 lakes are barren of fishlife or otherwise unsuitable for fishery management; 78 lakes contain populations entirely maintained by natural reproduction; and 81 lakes in which stocking was projected to supplement existing populations in waters.

In the absence of artificial supplementary stocking of trout, some of the 81 lakes are capable of providing a lower number of trout by natural reproduction. Through the use of special regulations to control the numbers of fishes taken by angling some of Class III lakes could provide a level of recreational fishing without stocking. However, in others, in the absence of stocking, the existing trout populations would eventually disappear and the lake would revert to a fishless state.

Use Classification of Park Lakes.

High lakes in Yosemite could be classed, also, into several Use Groups, such as: Use Group I: Lakes located adjacent to the highway or within 1-2 miles from the car; Use Group II: Lakes located 2-4 miles from the road; Use Group III: Lakes located over 4 miles from the road. Use Group III could be further divided into Group III-A: Lakes adjacent to trails or High Sierra Camps or Group III-B: Remote lakes not adjacent to trails or centers of visitor concentration. Access factors as they relate to fishing pressures have been discussed by Johnston and Hendee (1975).

Most of the lakes in Yosemite that have been stocked on an Annual or 3-year cycle fall within Use Group I and Use Group II categories and those in Group III-A are planted on a 3-5 year cycle and those in Group III-B are stocked less frequently.

All of the lakes in Lassen are located within four miles from a road and the major lakes are in Use Group I. Most Lassen lakes are small and offer little opportunity for natural reproduction. Stocking has been conducted to maintain trout populations that will provide for an acceptable level of fishing.

Lakes in Sequoia and Kings Canyon.

Lakes in Sequoia and Kings Canyon National Parks total about 1,000. Information about the lakes is spotty and incomplete. The history of fish introduction parallels that elsewhere in the High Sierras with the addition of the intensive efforts on the part of the Sierra Club in spreading the distribution of the golden trout through vigorous transplanting activities as recorded in volumes of the Sierra Club Bulletin.

The exact number of lakes that are barren of fishlife, that contain self-sustaining trout populations, and that require periodic stocking need to be determined. It is estimated that about 460 lakes contain trout (Wallis IN: Sumner et al 1966) and that trout populations can be maintained in about half of these lakes only by natural reproduction. In recent years, stocking has been carried on a 5-6 year stocking frequency cycle.

All of the lakes in the park are remote and, therefore, fall within Use Group III. Some lakes are adjacent to heavy backcountry use areas and well traveled trails while others are very isolated and inaccessible by established trails.

A card record file for the lakes of Sequoia and Kings Canyon National Parks has been established and the known distribution of the species of trouts has been recorded on a Fish Atlas Map located in park headquarters.

Stocking records are incomplete and inventory surveys have been made in few of the park's high lakes.

Studies, made in the region within and adjacent to the present area encompassing Sequoia and Kings Canyon National Parks, include Coleman (1925); Evermann (1906); Gilbert (1893); Moffett (1942, 1943a; 1943b); Needham and Hansen (1935); Bartholomew (1936); Dill (1950); Schreck (1969); Schreck and Behnke (1971); and Legendre, Schreck and Behnke (1972) and are discussed in: Wallis IN: Sumner et al (1966) and Wallis (1958) and McDermond (1946, 1947), and Curtis (1935).

Legislative History

Acts that created Yosemite, Sequoia and General Grant and Lassen National Parks and, subsequently, Kings Canyon National Park (that encompasses General Grant) provided that the Secretary of the Interior shall provide for the protection of fish and game resources against wanton destruction and that he shall make rules and regulations governing the taking of fish from the streams and lakes (Tolson 1933; 1963; 1972). Additional Acts that followed stated that "such rules and regulations shall permit the taking of fish by hook and line from streams or lakes in said parks but at such seasons, during such times, and in such manner as may be directed by the Secretary of the Interior". These have provided the basis for rules and regulations that govern fishing (USGPO 1975).

In Acts that provided for the acceptance of the cession of exclusive jurisdiction in these parks from the State of California, the right to fix and collect license fees for fishing is stated as one of four basic rights reserved by the State. The other rights are: to serve civil and criminal processes; to tax persons and corporations; and of all residents to vote in all elections.

The Act that established the National Park Service in 1916 provided the basic mandate for the Service:

"to promote and regulate the use of the Federal Areas, known as National Parks, monuments, and reservations, hereinafter specified by such means and measures as conform to the fundamental purpose of said parks, monuments, and reservations which purpose is to conserve scenery and the natural and historic objects and the wild life therein and to provide for the enjoyment of the same in such manner and by such means as will leave them unimpaired for the enjoyment of future generations."

Modification of Original Conditions.

Earlier fisheries programs that were initiated and conducted greatly altered and modified the original aquatic environments and the endemic aquatic life forms. Factors which contributed to these programs were:

1. Fishing was provided for by law.
2. The prevailing concepts were that fishery resources could be readily renewed or replenished by use of hatchery stock and that greater numbers of fish planted resulted in improved fishing.
3. Lack of full understanding and appreciation of the uniqueness and significance of fishes and other aquatic life and aquatic ecosystems in national parks.
4. The early desire to promote visitor use in the high country by using the availability of waters stocked with trout to serve as a magnet to attract fishermen.
5. The recognition of trout fishing as an acceptable recreational use activity within national parks.

Nonnative species and strains of fishes and even plants and invertebrates were widely introduced. Few waters in the national parks in California escaped alteration by the introduction of fishes. What changes these actions caused to the biological regimes of the lakes is not known. A much lesser degree of protection and preservation was afforded the natural aquatic features than was provided for terrestrial resources.

As the conservation philosophy of the Service and the Nation matured, it became evident that if natural terrestrial and aquatic ecosystems and the component plant and animal forms were not preserved within national parks, there was little chance that they would be preserved elsewhere.

National Park Service Use and Management Policies.

In an attempt to restore and perpetuate at least a portion of the native fauna found within the National Park System to a natural condition, the Service (NPS, 1975) adopted the following general resources management policy:

"The Service will perpetuate the native animal life of the parks for their essential role in the natural ecosystems. Such management, conformable with general and specific provisions of law and consistent with the following provisions, will strive to maintain the natural abundance,

behavior, diversity, and ecological integrity of native animals in natural portions of parks as part of the park ecosystem.

"Animal life in the National Park System shall be given protection against harvest, removal, destruction, harassment, or harm through human action, except where. . . fishing is permitted by law for either sport or commercial use or is not specifically prohibited; . . .

"Natural processes shall be relied upon to regulate populations of native species to the greatest extent possible . . ."

The fishery management policy further provides that in national parks:

"No artificial stocking of fish species exotic to a park will occur; artificial stocking of fish may only be employed to reestablish native species. Naturally barren waters will not be stocked with either native or exotic fish species."

In keeping with the Congressional intent to permit the taking of fish while protecting park resources, the following recreational angling use policy has recently been formulated:

"Fishing has been traditionally permitted in the National Park System since the establishment of Yellowstone. The Service will continue this practice, but, in so doing, it affirms that:

- Waters may be closed to fishing to protect rare, threatened, or endangered plant and animal species in the waters or in adjacent habitat.
- Portions of park waters may be closed to fishing when the fish life and other aquatic life has greater value to greater numbers of visitors for the appreciation of plant and animal life, for scientific study, interpretation, or environmental education.
- Fishing may be prohibited in certain waters and at certain times when necessary to protect spawning grounds of endemic fish species or to maintain natural distributions of densities of native wildlife species that use fish for food.

- Fishing may be permitted in historic zones when it does not intrude adversely on the historic scene or harm historic resources.

"Where fishing is permitted, such fishing shall be carried out in accordance with applicable State and Federal laws and regulations. Park regulations may be different for native and nonnative species and may be modified for specified waters. Commercial fishing is permitted only where authorized by law.

"Fisheries management in natural zones:

- shall be specifically aimed towards preservation and/or restoration of native species.
- shall be regulated for native species so that mortality from fishing is compensated by natural reproduction and that fishing mortality does not cause significant alterations from the historical (unexploited) density and age structure of the population."

Policy Concerns. Study Proposed.

The California Department of Fish and Game, California Trout, Trout Unlimited, National Wildlife Federation, other conservation organizations and involved citizens, have expressed concern about the impact of the no-stocking-policy upon the recreational angling in the national parks located in California. Following a meeting with various representatives, Regional Director Howard Chapman, Western Region, National Park Service, requested that an exception to the general Service-wide stocking policy be granted that would provide for the continuation of a systematic stocking program in the national parks in California.

The National Park Service's Policy Council, reviewed this request and recommended that no exception to the policy be granted. On October 25, 1975, Director Gary Everhardt concurred with this recommendation. He directed Mr. Chapman to enter into a cooperative 2-year study with the California Department of Fish and Game to determine the biological, economic, recreational, and social impacts of this policy in California. He stressed, however, that the objective of the study is not to justify the fish stocking policy but to develop a recreational fisheries management program, consistent with natural area management and policies. During this 2-year study period he directed that trout stocking programs

within these four parks shall be continued at a level not to exceed those which operated in 1974. The Service is prepared to enter into such a study and welcomes an opportunity to participate in such a cooperative endeavor.

The Service recognizes that fishing in the park lakes and streams is an important experience to some high country users. Studies of users of the high lakes country in Washington, Utah, and California by Hendee, Clark, Dailey (1974), Carpenter and Bowhis (1975), Johnston and Hendee (1975), and Kennedy and Brown (1974) reveal that while about 40% of the backcountry visitors fish, fishing is not the prime motive for the wilderness experience for many. In fact, the studies disclosed that only about 6% expressed a strong feeling for fishing and that they might have gone elsewhere for their outing if fishing had not been available.

The Service recognizes that a full implementation of a no-stocking-policy will result in a reduction in the numbers of lakes that contain trout populations. As a consequence, more intensive management of the remaining lakes will be required to perpetuate the naturally produced wild trout populations. The hundreds of miles of streams that contain established trout populations will not be affected except, perhaps, as added fishing pressures may be directed toward them. Under such intensive management, special regulations, such as: reduced catch-and-keep limits, or special lure or special seasons may be required. It may be desirable on certain waters to initiate Fishing-For-Fun or catch-and-release type programs. Such activities have proven successful elsewhere. Wallis (1971; 1963a; 1963c; 1960; 1965) has described and discussed the application of special regulations to achieve management objectives and has reviewed the application and success of such programs on a state-by-state basis. Under such programs, a high level of "quality" recreational fishing in the lakes in the national parks in California can be maintained in the lakes in the national parks in California without destruction of significant natural values or of the enjoyment of the parks' resources by the fishermen and the nonfishermen.

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