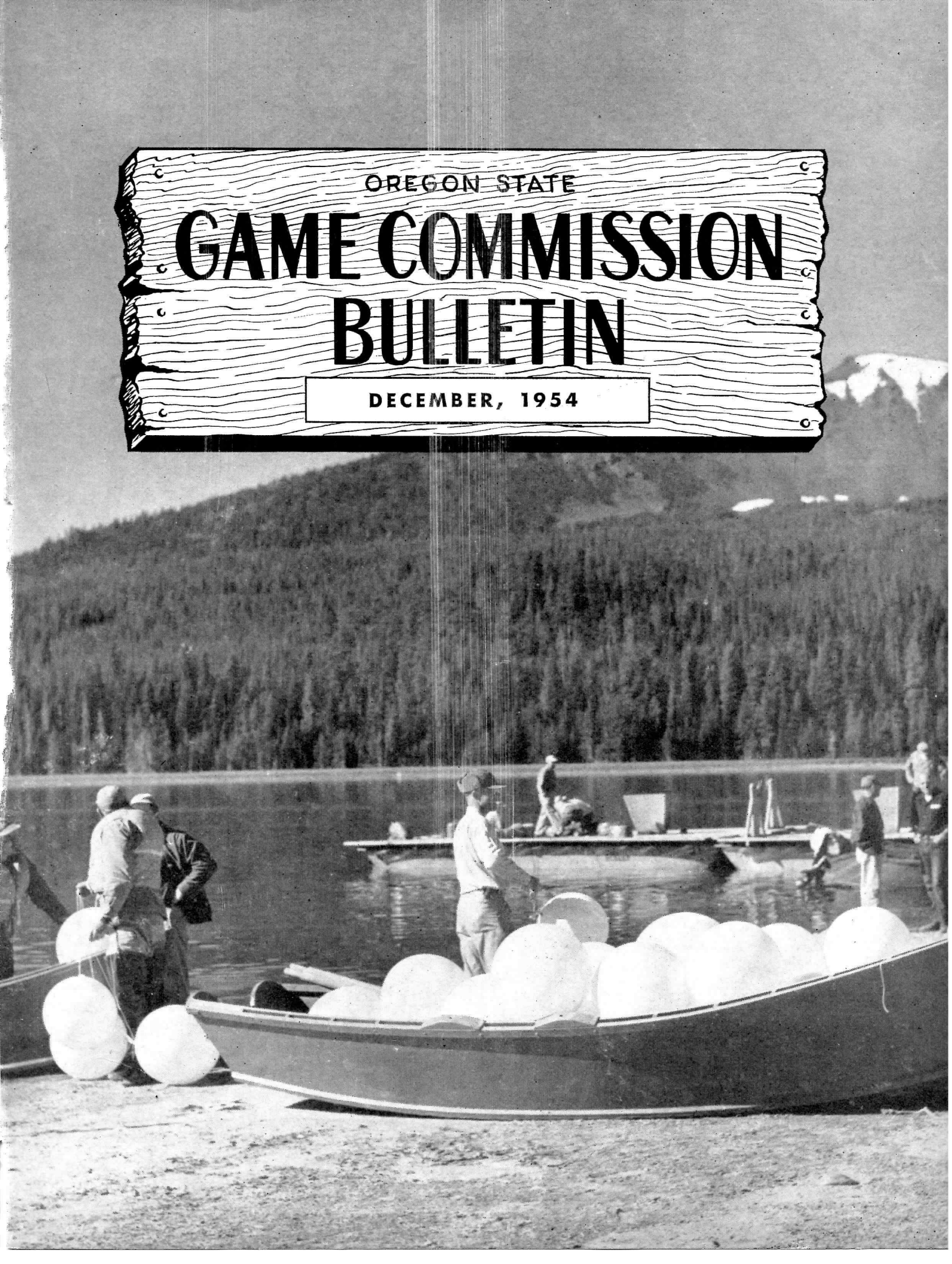
OREGON STATE

GAME COMMISSION BULLETIN

DECEMBER, 1954



This year's spring chinook salmon run in the North Umpqua exceeded the parent run of five years ago according to counts over the counting board at Winchester Dam. More than 6,600 adult spring chinook were counted, compared to the parent run of 2,593. The 1954 run is the largest since counting records were started in 1946. That year only 1,974 chinooks passed the counting station.

* * *

The Winchester Bay sports salmon fishery had a good season this year. Field agents checked 2,900 boat trips and counted a catch of 10,095 salmon (3,025 chinook and 7,070 silvers) by 11,051 anglers. Based upon the total boat count supplied by the Coast Guard, the estimated salmon catch for the season is calculated to be 20,181. Of the 10,095 fish actually examined, 131 were marked. Of this number, 99 were of Game Commission origin, 38 being Umpqua River fall chinooks and 61 coastal released silvers.

* * *

Just as we went to press a shipment of 20 mountain sheep from Williams Lake, British Columbia, arrived at Hart Mountain, travelling by Game Commission truck. Next month, we'll have pictures of these newcomers to Oregon.

* * *

Hunter success during the 1954 antelope season was somewhat higher than in 1953. Of the 568 antelope hunters reporting, 330 were successful in getting an antelope. This was a success ratio of 58 per cent compared to 48 per cent last year.

* * *

The four Game Commission managed public shooting grounds attracted 3,214 hunters the opening weekend of the waterfowl season, October 16 and 17. Total kill was 9,114 birds. Summer Lake had the largest bird kill and number of hunters. There 2,135 hunters bagged 4,984 ducks and 2,356 geese. Figures for the other areas are as follows: Warner Valley, 419 hunters, 283 ducks, 459 geese; Malheur, 330 hunters, 327 ducks, 90 geese; Sauvie Island, 330 hunters, 594 ducks, 21 geese.

NOTICE OF ANGLING REGULATION HEARING

The Game Commission's annual public hearing on angling regulations will be held at 10 a. m., Friday, Jan. 14, 1955.

Regulations up for consideration are those pertaining to angling seasons and bag limits as well as methods of taking game fish.

It is the Commission's policy to set the tentative angling regulations at this first hearing and then recess for two weeks in order to publicize the proposed regulations. Final regulations are then adopted at the second hearing.

Hunters and fishermen losing their licenses are often at a loss to know how to replace them. For the fee of fifty cents and the filing of an affidavit, an agent can issue a duplicate license.

Oregon State Game Commission Bulletin

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At the present time the Bulletin is circulated free of charge to anyone forwarding a written request.

COVER

Diamond Lake on September 21, the day of the mass destruction of roach. Colored balloons in the foreground were used to mark the boundaries of the four work areas into which the lake was divided. (Photo by Ron Shay)

OCTOBER MEETING OF THE COMMISSION

The Game Commission held a meeting on October 22 and acted upon the following matters:

Oak Springs Land—Authorized Director to execute option for acquisition of tract of land adjacent to Oak Springs Hatchery from the Wasco County Electric Cooperative.

Owyhee Reservoir—Refused financial assistance to improve Cherry Creek road to Owyhee Reservoir as Commission has no legal authority to make expenditures on private roads.

Capital Outlay—Authorized expenditure of $11,695 for construction of ponds at Oak Springs; $9,500 for brood pond covers at Wallowa hatchery; $1,428 for aluminum troughs at Hood River hatchery; and $3,725.65 for renovation of apartment buildings at Wilson Management Area. Also authorized renovation of house on Sauvie Island by force account because bids previously received were too high.

Beaver Marsh Project — Expressed objection to Beaver Marsh Project on McKenzie River watershed unless certain provisions for protection of fishery are included in federal license for the project.

Bald Mountain Project — Ordered protest filed with the Hydroelectric Commission against application for hydroelectric project at the Bald Mountain site in Rogue River watershed.

Right of Way — Approved granting right of way to Lane county through Camas Swale property.

Camas Swale — Decided to reactivate Camas Swale project to provide for gradual development and improvement of the area for waterfowl and upland game.

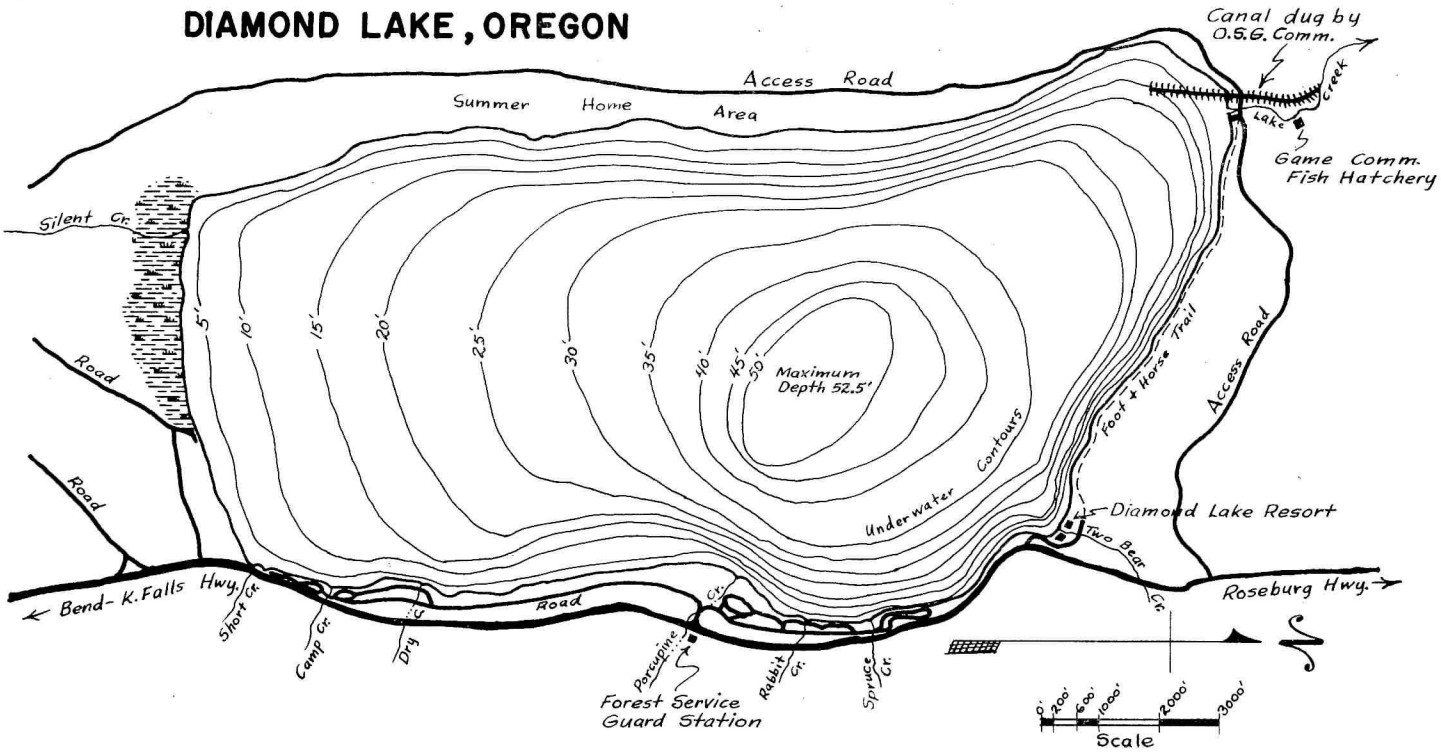
Big Creek — Decided to abandon plans to construct hatchery on Big Creek in Lane County. Director authorized to explore opportunities of selling the land.

Fort Stevens — Subject to permission from General Services Administration, approved leasing to State Highway Commission tract of land in Fort Stevens area, including Battery Russell and Fire Control Hill, as part of a proposed state park.

Diamond Lake — Authorized sale of diesel used at Diamond Lake for the high bid of $4,010.00.

Access—Authorized Dingell-Johnson fishery access project on McKenzie River at Blue River.

Legislation — Considered several suggested bills relating to game code.



THE DIAMOND LAKE STORY

By JOHN B. DIMICK
Coordinating Biologist Fisheries Division

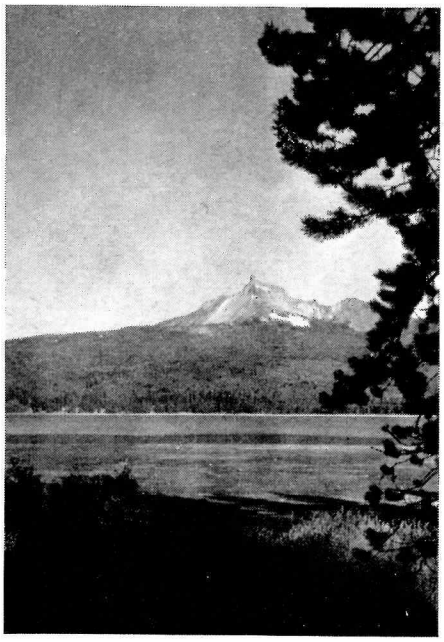
DEATH to millions of trash fish in September, 1954 — rainbow trout in every creel in 1956. This is the recent past, and the expected future of Diamond Lake which on September 21 of this year attracted nationwide interest as the scene of the largest fish eradication project ever attempted in modern fishery management.

Let's review the history and circumstances leading up to the event and see how the project was successfully accomplished.

Diamond Lake, thought to be originally barren of fish, is located in the eastern part of Douglas County in the Umpqua National Forest. It contains 2,982 surface acres and lies at an elevation of 5,182 feet. The lake is 3½ miles long and 1½ miles wide, with a maximum depth of 52½ feet. Lake Creek, a tributary of the Umpqua River system, is the outlet stream.

Records indicate that the first planting of rainbow trout took place about 1910. Unexcelled trout fishing prevailed during the 1920's and by present-day standards the size and abundance of the rainbow · trout caught during that period were incredible. Five to ten pound trout were supposedly an everyday occurrence with one reported weighing 27½ pounds. As recently as 1941, a 21 pound trout was taken.

A rainbow trout egg collecting station was established at the lake in 1919. The eggs obtained were used for restocking the lake and for distribution to other hatcheries throughout the state. A take of 19 million trout eggs was recorded for one year of the 33-year period the station was operated.



Mt. Thielsen, well-known guardian of Diamond Lake, had never seen anything like what happened there this year!

In 1940, the Klamath Lake roach or "chub" *Siphateles bicolor bicolor,* a trash fish species, was observed in the lake for the first time. Supposedly, anglers using the chub as live bait in seeking rainbow trout, had introduced it into the lake. This method of fishing is now prohibited. After the appearance of roach, trout angling declined. Poor fishing was especially evident after 1947 when the angling pressure increased. The decline in trout angling led to a preliminary biological investigation in 1946. As time passed, enormous schools of roach appeared in the shallow shore-line waters. In an effort to obtain a greater survival of the trout plantings, rainbows of 6 to 10 inches in length were stocked in preference to fry and fingerlings because the larger fish have a greater capacity for survival under such highly competitive conditions.

In 1946, roach control activities were instituted and carried out annually in an effort to retard the increase of the trash fish. The program was one of partial control and consisted of seining

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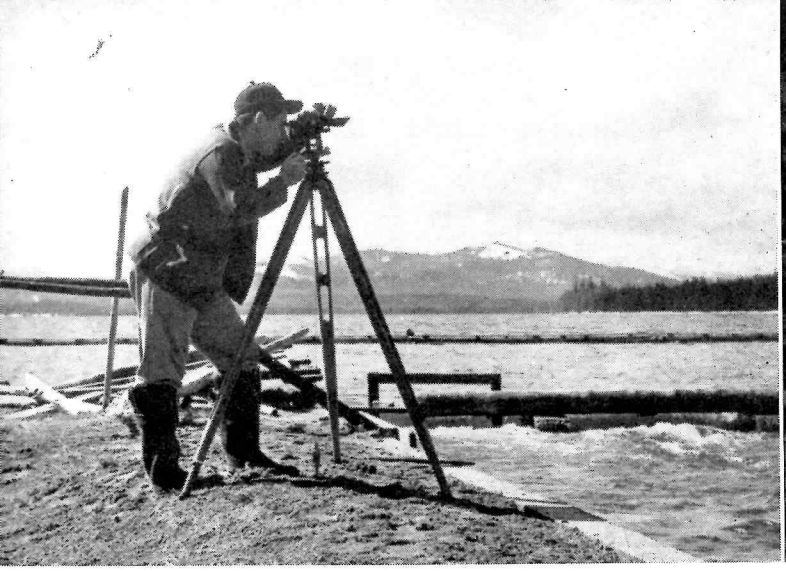


1. *Lowering level of Diamond Lake was responsibility of the Commission's engineering division. Gordon Campbell helps sight location for the drainage canal.*

2. *Excavation of drainage canal, as well as construction of control gates, was done in 1953. The canal made it possible to lower lake level approximately eight feet.*

5. *The day before the big day Ken Cochrun, field agent in charge of one of the work teams, instructs his crew.*

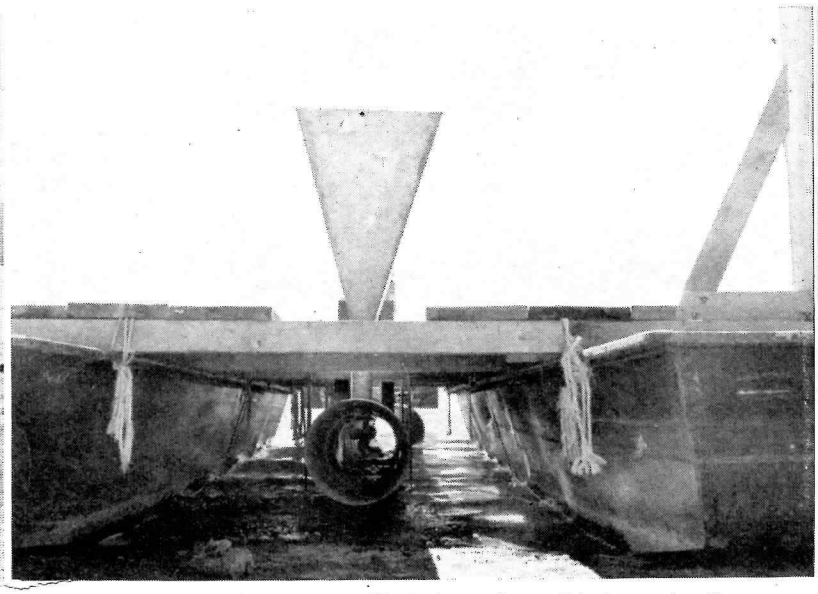
6. *Four cubeaters were used to distribute the rotenone in the deeper sections of the lake.*

9. *Aerial view of a cubeater in action. Each of the four divisions of the lake had a marked "cubeater" area.*

10. *Potholes along the shore of the lake are dusted heavily with rotenone to be sure all roach are destroyed.*

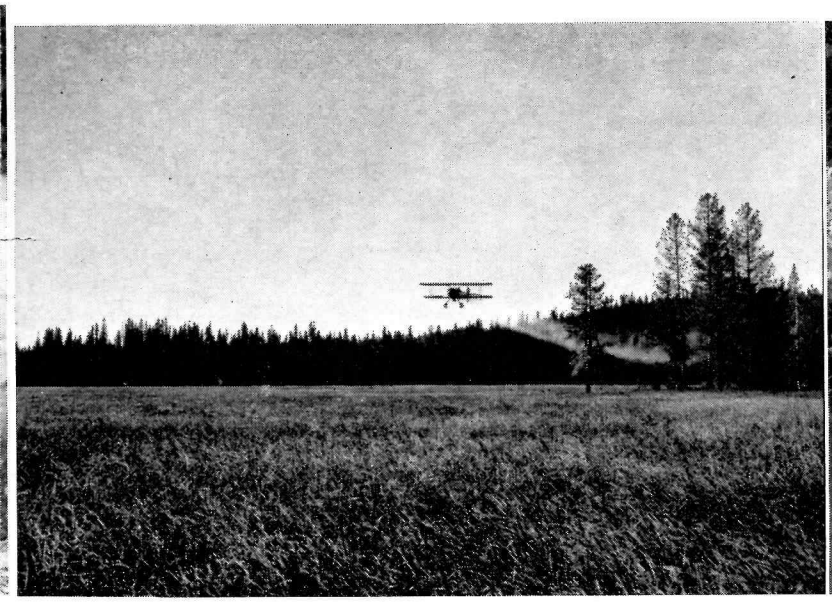
3. *Aerial view of the drainage canal which extends 1,000 feet on the ground and 800 feet into the lake. Canal runs parallel to Lake Creek, outlet of Diamond Lake.*

4. *Stockpiled by the water-filled canal are the 100 tons of rotenone used for treatment of the lake. Sacks later were distributed to strategic spots along the shore.*

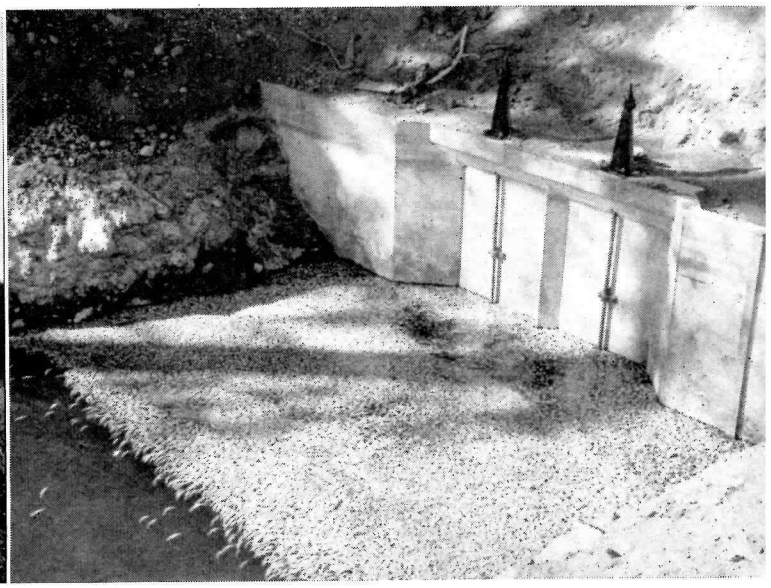


7. *Interior view of a cubeater. This device made possible fast and uniform distribution of the chemical.*

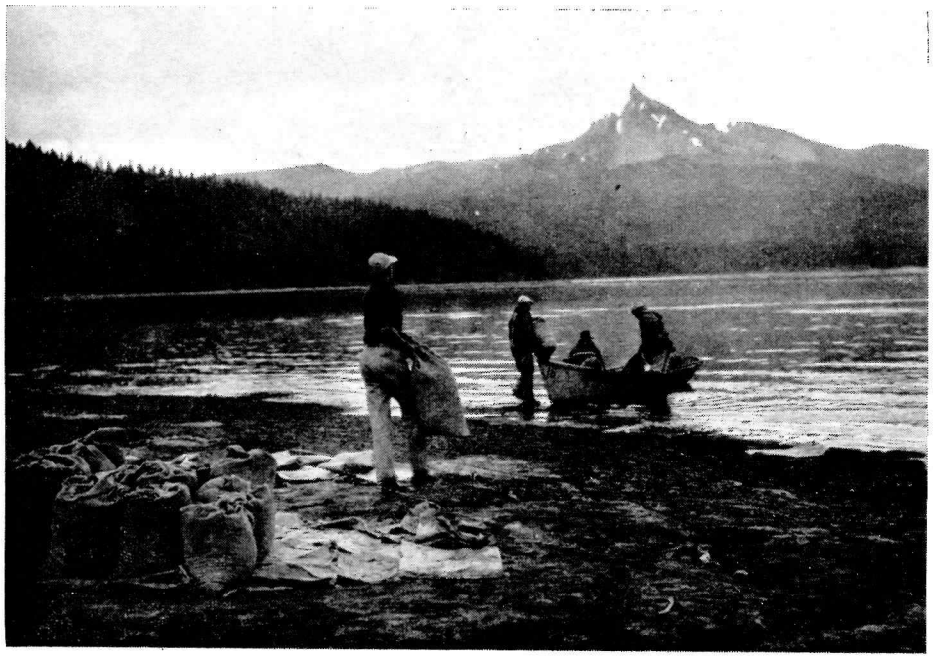
8. *Loaded with rotenone and manpower, one of the cubeaters starts on the way to its assigned area.*



11. *The marsh area adjacent to the south end of the lake receives its dose of rotenone from an airplane.*



12. *Dead roach galore but few trout. This shows roach piled up at headgate of drainage canal.*



Many boats and motors were furnished by volunteer sportsmen. Here one of their boats is being loaded with sacks of rotenone.

DIAMOND LAKE STORY

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and selective chemical treatment of the roach schools as they appeared in the shallow shore-line waters. Although millions of roach were thus destroyed, their high reproductive rate kept the roach population growing.

In testing to determine the size of the roach population, an experimental type gill net was set in various locations and depths throughout the lake. In 1950, the net yielded a ratio of one trout to 94 roach; in 1951, one trout to 137 roach; in 1952, one trout to 248 roach; and in 1953, no trout to 420 roach. The ratios show the trend of the relative abundance of each species. Trout were present in 1953 although they were not captured in the gill nets. Furthermore, small roach ranging in size from 1 to 4 inches were not taken, as they were able to pass through the meshes of the net. Frequent observations indicated that more than one-half of the roach population consisted of fish of 1 to 4 inches in length.

Trout food studies have also been carried out since 1946 through systematic sampling of the lake bottom in order to determine the amount of aquatic organisms available to the fish population. These organisms make up the basic necessary fish food. The decline in the quantity of bottom food of the lake from 292 pounds per acre in 1946 to 2.3 pounds in 1951 is shown in Table I.

TABLE I

BOTTOM FOOD PER ACRE, 1946-1951

Year	Pounds per acre
1946	292
1947	-*
1948	14.4
1949	10.5
1950	5.5
1951	2.3

*Sampling was not done in 1947.

Because of its shallow depth, Diamond Lake has 2,982 acres suitable for the production of fish. Obviously, most of the aquatic fish food organisms were producing tons and tons of roach flesh.

Additional evidence that the once famous Diamond Lake sport fishery had steadily deteriorated is revealed by the creel census records obtained since 1946. A comparison of the total trout catch from 1946 through 1953 is shown in Table II.

TABLE II

CATCH STATISTICS 1946-1953

Year	Recorded Angler Trips	Total Trout caught	Average length in inches
1946	14,807	12,807	15.75
1947	26,800	37,500	13.75
1948	24,693	27,872	13.0
1949	10,367	9,660	13.5
1950	8,588	5,820	15.5
1951	6,307	3,994	12.0
1952	5,073	5,273	9.6
1953	5,885	8,455	9.6

In reviewing Table II, note the catch for the year 1953. Only 8,455 trout were caught by 5,885 anglers. From a lake of almost 3,000 acres, this gives an average of slightly less than three trout per surface acre of water. For comparative purposes, let us analyze the total catch from two other popular Oregon fishing lakes, East and Paulina lakes in the central Oregon area. (See Table III.)

TABLE III

Comparative Catch Statistics for Diamond, East and Paulina lakes for 1953

	Diamond	East	Paulina
Size of lake in acres	2,982	1,000	1,200
Recorded angler trips	5,885	29,500	16,500
Total trout caught	8,455	87,000	36,400
Fish caught per surface acre	2.8	87	30.3

From a business point of view, Diamond Lake was rapidly becoming a total economic loss to the sport fishing industry of the state of Oregon. The fishermen that formerly sought their recreation at Diamond were going elsewhere and the lake was not contributing its portion to the sport fishing resource. The continued stocking of trout of legal length on a "put and take" basis and the pursuit of a partial roach control program with a total cost of 15 to 20 thousand dollars annually was not a sound investment in view of the return of a few thousand rainbow trout in the creel.

Following the presentation of the above data, the Game Commission studied the problem thoroughly. A decision was reached that complete chemical treatment to remove the entire trash fish population, along with the few remaining game fish and subsequent restocking with rainbow trout, appeared to be the only positive approach in restoring this once famous sport fishery.

If total treatment with rotenone was to be successfully accomplished, some means of preventing the flow of toxic water into Lake Creek at the time of treatment had to be devised.

The installation of a dam in the outlet to impound the lake water until it had lost its toxicity was not considered feasible since it would be damaging to the physical properties surrounding the lake, such as the resort, summer homes and Forest Service camp grounds. Lowering the lake level by siphoning, pumping or draining through an excavated canal was proposed.

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DIAMOND LAKE STORY

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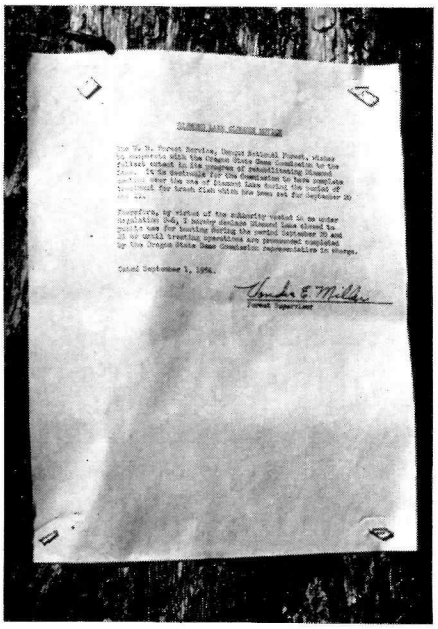
An engineering study indicated that the most economical solution was one of lowering the lake level approximately eight feet by means of a canal constructed parallel to the outlet. The cost of siphoning or pumping was found to be prohibitive in comparison to that of excavating a canal. In addition, the canal would be a permanent structure available for reuse in the future if ever necessary.

Inasmuch as Diamond Lake is located in the Umpqua National Forest, authorization for the project had to be obtained from the United States Forest Service. This was granted through a special use permit. The Forest Service also enacted special regulations when necessary, such as closing the lake to all public use during the time of treatment.

In the summer of 1953, a contract was issued to a private concern for the excavation of the drainage canal. Work involved the excavation of a canal, 1,000 feet on land and extending 900 feet out into the lake and the installation of a concrete and steel control structure. This phase of the project was finished by November, 1953.

Chemical treatment was scheduled for September 21, 1954. Draining started on July 15. According to previous calculations, lowering the lake the desired eight feet would take 66 days, provided that a full flow in the canal could be maintained at all times. Because of several unforeseen interruptions when



United States Forest Service sign announcing closure of lake to public use to facilitate lake treatment operations.

the flow was cut off, slightly less than 7½ feet of water was removed.

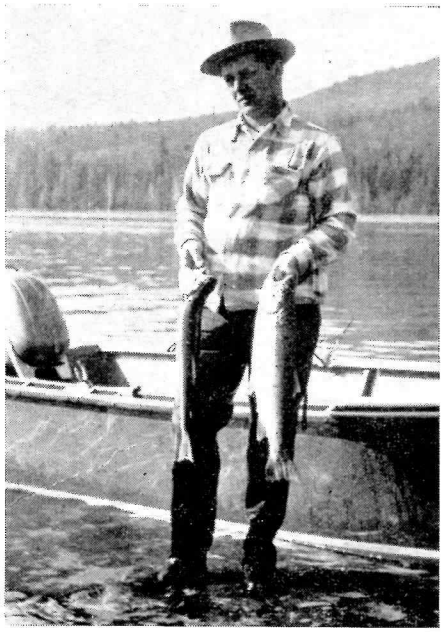
The draining of the lake prevented toxic water from entering the Umpqua River system and reduced the water volume of the lake. The canal was equipped with permanent head gates which were to be sealed after the drawdown and just prior to the application of rotenone, thus allowing sufficient time for the water to lose its toxicity before flowing again in the natural channel of Lake Creek. By eliminating eight feet of the surface water, the volume of the lake was reduced from 78,000 acre feet to 53,000 acre feet with a reduction in surface acreage from 2,982 to 2,600 acres. This reduced the quantity of rotenone required by about 35 per cent.

The amount of rotenone needed was determined to be 100 tons or 200,000 pounds, plus 275 gallons of emulsifiable or liquid rotenone for treatment of the tributary streams and for aerial spraying of the marsh area near the south shore. All of the material was purchased, delivered, and stockpiled at the lake in August.

In an effort to devise some method of expediting the uniform distribution of the 100 tons of rotenone, tests had been conducted with a mechanical type rotenone spreader to determine its adaptability for the Diamond Lake project. Originated by Eldon Vestal of the California Department of Fish and Game, the cubeater, a barge-like apparatus deriving its name from the South American cube' root from which rotenone is an extract, consisted of a metal hopper, corrugated metal tube, and an outboard motor arrangement for mixing and discharging the dry rotenone powder into the water. The equipment was mounted on a barge having a deck surface of 26 by 16 feet and propelled through the water by a 25 h.p. outboard motor. Testing demonstrated the ability of the equipment to disperse the rotenone at a much faster rate than was possible by any former method and as a result, it was decided to use four such cubeaters in the Diamond Lake undertaking.

During the week preceding the poisoning, preparations began in earnest. For supervisory purposes, the lake surface was divided into four general sections. Large orange and white weather balloons were anchored to designated boundaries, and each section was numbered by placing markers on the shore.

Within each section, one "cubeater"



Two of the few big trout recovered are held by John Dimick, fishery biologist in charge of operations for the chemical treatment of the lake.

area was established in the deep water, with several smaller shallow areas designated for dispersal of rotenone by outboard motor boats. Each cubeater operated over approximately 300 surface acres while the smaller boats covered from 20 to 50 acres. The appropriate quantity of rotenone for the calculated water volume of each area was stockpiled along the shore line.

On September 20, approximately 100 Game Commission employees and 150 volunteer sportsmen assembled at the lake for indoctrination. Crews were assigned to the cubeaters and given operating instructions. Operators of the outboard motor boats were instructed in the proper manner of distributing rotenone by a practice demonstration in towing burlap bags.

At 5:30 a.m. on the morning of the 21st, the operation began. Distressed roach soon started to appear on the surface of the lake. It also became evident that roach were unexpectedly scarce in the shallow waters. By midmorning dead and dying roach were appearing on the surface in deep water in great numbers. By Tuesday evening, dead roach thoroughly dotted the surface of the lake. It was now apparent that the bulk of the fish were inhabiting the deeper areas owing to a change in surface water temperature resulting from cold weather. From past experience it was known that the rotenone powder would not descend into the deeper depths for several days. For this

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A crowded spot along the lakeshore of Diamond Lake.

DIAMOND LAKE STORY

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reason fish continued to perish for at least three days following the Tuesday application.

Many of the several thousand spectators came with the intention of picking up trout, and dip nets of all descriptions were in evidence. They were greatly disappointed for the most part because the trout were scarce. Only a few trout had been recovered by late evening of the first day.

In noting the number of trout seen and recovered, those reported by others, and trout found along the shore line for several weeks after the poisoning, it is estimated that not over 100 rainbow trout were accounted for with the largest weighing an estimated 12 pounds. Some undoubtedly did not rise to the surface.

The total kill of roach has been difficult to estimate accurately, although tremendous rafts of the dead fish were in evidence along the shore line and floating in the lake. Like the trout, unknown numbers decomposed on the bottom. From frequent observations and sample counts, a conservative estimate would be one roach killed for each 4 square feet of water surface. On this basis, it is calculated that 32,000,000 roach were destroyed. Converted to pounds, at the rate of 40 roach to the pound, the total kill amounted to a conservative 400 tons.

Since the chemical treatment, frequent tests have been carried on with the setting of gill nets to determine if a complete kill of all fish was achieved. Nets have been operated in practically all areas of the lake and to the first of November no live fish have been recovered. Observations along the shore and out in the lake have not revealed the survival of any fish.

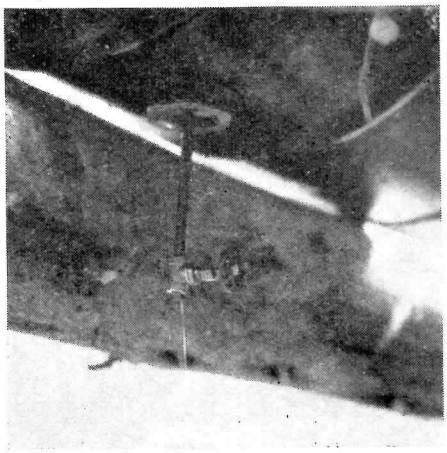
Testing commenced on September 29 to determine the period of time that the lake water remained in a toxic condition. Live fish lowered to various depths in wire live boxes have been used for the purpose. The first experiments on September 29 showed the fish to be in distress in 12 minutes with death occurring in 45 minutes. Similar tests have been continued, and it has just now (early November) been found that the rotenone in certain areas, particularly the surface water, has become inactive.

Restocking is planned for the spring of 1955 with 150,000 Canadian rainbow trout as the initial plant. This is to be followed by 500,000 rainbow fry annually until sufficient brood stock is available in the spawning run at Diamond to supply the necessary eggs. The Canadian rainbow or Kamloops trout, a variety not native to Oregon, is the only trout of pure strain available to us. Eggs for the Diamond Lake stocking are currently being obtained from British Columbia through the courtesy of the British Columbia Game Commission. It is possible that the lake water may be nontoxic soon enough to be stocked in the early winter of 1954. No open fishing season is planned for 1955.

Total cost of the Diamond Lake project will be approximately $140,000. The Dingell-Johnson program of federal aid to the states for fisheries restoration made the project possible. In Dingell-Johnson projects three-fourths of the necessary funds are provided from the federal excise tax on fishing tackle with one-fourth contributed by the respective states.

We should like to pay special tribute here to the United States Forest Service for the excellent cooperation and special efforts rendered in assisting the orderly progress of the project. The United States Fish and Wildlife Service, the administering agency of the Dingell-Johnson fund, actively aided in formulation of the project and gave every assistance in progress of the project. Cooperation and assistance were gratefully received from the Diamond Lake Lodge owners, the summer home owners and the California-Oregon Power Company. Special and enthusiastic appreciation is expressed to the many sportsmen who furnished real and necessary help during the poisoning phase of the project.

The rehabilitation of Diamond Lake and the restoration of its once famous trout fishery is another example of the Oregon Game Commission's desire to provide the maximum production of game fish in all of Oregon's trout waters.



Rotenone dripping from spigot of barrel placed on two logs in a tributary stream.

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