DIAMOND LAKE AND LEMOLO LAKE

FISH MANAGEMENT

submitted to:

OREGON DEPARTMENT OF FISH AND WILDLIFE

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Fishery management has become a very important part of each person who enjoys the pleasures of fishing, camping, and about any out-door activity in our state. Many different factors affect the overall outcome with each factor very important to each other. Some factors can not be changed or managed (i.e. physical); however, together with past and present data that can show significant changes due to management programs, the fish biologist can obtain the optimal fish production and harvest within the boundaries of not permanently damaging the habitat and fishery.

Data collected from Diamond Lake and Lemolo Lake during the 1975 fishing season is one part of this type of management. Each lake has its own special characteristics, problems, and management scheme. Each is a good example of how the biologist has used his management tools (i.e. seasons, bag limits, hatchery fish) to actually create the optimal fishery he (Oregon Department of Fish and Wildlife) deems in the best interest for the state, the fish population, the habitat, and the fisherman.

Lemolo Lake's experimental trophy lake regulations; reasons why; and tentitive conclusions will all be discussed; but first let us observe one of Oregon's prime examples of use of her fish management programs on one of Mother Nature's highly productive lakes to form a very popular and successful fishing lake -- Diamond Lake.

DIAMOND LAKE

Diamond Lake is an ideal setting for a story-book fishing hole. The lake lies just west of the Cascade summit in Southern Oregon and is nearly a mile above sea level. Having a maximum depth of only 52 feet and with 3000 surface areas for light to shine upon, Diamond Lake is

easily one of the most potentially productive lakes in Oregon. This is nothing relatively new to biologists or fisherman as the first stocking of trout in the lake occurred between 1910-1913 and has been a center of attraction for trout fishing in Oregon ever since. Except for the problem of trash fish in the 1950's, Diamond Lake has produced year after year a very good harvest of trout. How can a lake with a very high fishing pressure and almost nill natural reproduction keep doing this? The answer is an excellent fishery management program involving extensive fish stocking, data collecting, angling controls, and a very productive lake.

The simple equation that rules the management program is the balance between mortality, which is mostly the catch; and the recruitment, which is provided mostly by the stocking of fingerlings each year. The limiting and key factor affecting both variables is the food production level of the lake year after year. Diamond Lake has ideal conditions for outstanding food production with insects, shrimp, and snails being some of the more plentiful food supplies. The goal of a good management program is to get the maximum fish production and use out of the waters without permanently damaging the ecosystem. Other variables that can affect this goal are types of fish stocked and natural, number of fish stocked and available for fishery, fishing methods, season length, and bag limits.

The kamloops trout (Salmo gairdneri) were stocked in 1955, following the rotenone treatment of the lake in the fall of 1954. Being free of competing trash fish, which had overtaken the lake and forced the poisoning, the trout should have flourished. However, fish production varied between only 13-21 lbs/acre, definitely not fully utilizing the lake. Therefore, rainbow trout (Salmo gairdneri) from Oak Creek and the Willamette River system were also stocked in 1962. Fish production

improved immensely as these trout seemed ideal for the lake's conditions. 1964 showed an excellent 118.3 trout lbs/acre; but the food production started to show a steady decline from 1960 (170 lbs/acre) to 1965 (55.8 lbs/acre) and 1965 fish production dropped to 62 lbs/acre.

During this time, 500,000 fingerlings were stocked each spring and the lake had actually become over stocked. Too few fish in the lake would not utilize the lake's food production and fishing would be poor; however, too many fish cause slow growth and could permanently damage the lake's production cycles and result in even worse harvest. Therefore, between 1966 and 1972, "only" 400,000 fingerlings were released into the lake each year. It was also decided to not stock any more kamloops trout. As expected, the food production rose and then remained constant around 66 lbs/acre. (Refer to graph 1.) In 1970, food production dropped very low to 49.2 lbs/acre after a very good harvest that season. Trout production was still not consistantly good and dropped in the next two years after the big 1970 season. With food and trout production again low and the lake itself in danger of being permanently damaged, the decision was to stock less fingerlings (300,000) in 1972 in hope the trends would reverse.

That 1972 season bore out the management's projection with bottom food production improving to 107.2 lbs/acre in the fall. Since then there has been a steady upward trend for food production each year. (Refer to graph 1.) The fish production caught up in 1973 and 1974 with very good harvests and fish averaging around 1 lb/fish, (refer to graph 3 and table 1.) These figures seem to be the goals that obtain the best production; that is when the fish average one pound each and the harvest is around 300,000 fish.

The 1975 season (through the September 15 projections) seems to show a significant decrease in fish production and harvest while food production is still expected to be high. Since the number of angler trips and different angler methods have not drastically changed the fish production and harvest (refer to graph 2); it is feasible to assume that the trend can again be reversed (only in the different direction) by stocking a larger recruitment next spring. This should balance the upward food production and put it to use in providing more and bigger fish in 1976 and 1977.

One can see that this is a sin curve cycle varying due to the production rates. The lake has probably experienced the extremes of the variation in 1970 (high) and 1965 (low). With these and every other year's data and a continuing close moderation of each future year's trends, Diamond Lake should remain an ideal rearing ground for trout. Because of this, the privileges such as the maximum bag limit, almost unlimited fishing methods, and maximum season length can be used year after year.

In order to insure this, data must be obtained each season. A random schedule is set up throughout the season for checking of angler success and pressure along with enough weight and length data (twice a month) to project the year's results. This year's data is even more significant as a new method for angler pressure projections is being tried simultaneously with the standard Calvin method used in past years. The new Aney method consists of boat counts on the lake every two hours during fishing hours; while, in comparison, the Calvin method involved counting once each day all of the boat trailers and boat rentals for the day. Each method uses rather simple equations to get angler hours extended out for the whole season.

Comparing both projections (refer to table 1), the Calvin method is consistantly higher; however it must be shown to be a statistical significant difference and compare both methods economically and also by their feasibility to see which is best. Personally, both methods have their advantages and disadvantages; but I prefer the Aney method due to less "wasted" time driving around the lake during a prime time for creel census taking. Perhaps a different time than 9:00-11:00 A.M. for counting boat trailers would solve this drawback for the Calvin method. I found it easy to make counts at two hour intervals as one had to be around the lake all day anyway taking creel samples plus saving gas in not driving through all of the campgrounds.

The 1975 season will be a turning point again in management plans, as previously shown. It started when the ice did not get completely off the lake until June 6, meaning the fingerlings could not be put into the lake until late May. This delay meant more hatchery time for the fish and consequently larger fingerlings, ranging from 3-5 inches, were stocked. In comparision, an average year's fingerling (2-3 inches) would not get into the actual fishery (6 inch minimum) as quickly and as many as this year's recruitment class. 1975 year class fish appeared in July's fishery and supplied over 50% of the catch by September. This should definitely lower next year's carry over catch of 1975 year class fish. These would be your 10-13 inch fish in 1976.

With gas prices high, the economy down, and Crater Lake closed for awhile, 1975 should show the angler trips and hours totals down, as well as the total catch and pounds of fish lower than 1974.

The average weight of the fish through September 15 was down to .96 lbs/fish with most fish now being caught in the 8-10 inch range.

This suggests perhaps a lowering of efficiency of using the lake's food production which still should be high. Next spring, up to 400,000 fingerlings should be stocked to take advantage of the favorable food production level and raise the harvest total and average fish weight to those optimal conditions of 300,000 fish harvested a year, each weighing an average of one pound. As previously mentioned, there are too few fish in the lake (which has held more) for its maximum production capacity. This is actually a rare and promising sign for such a heavily fished and used lake considering the amount of fishing, littering, camping, and other environmental abuse it must take in these modern times.

Diamond Lake is truly a classic lake for trout fishing. However, only by the biologists yearly data collecting and observations can its production, both fish and food, be continually manipulated to produce the maximum amount of fish, and at the same time not harm the lake. It should then be able to sustain its fishing prominance year after year without damaging the lake and/or costing much more money than it does now. Surely, without this present management system, Diamond Lake fishing would not be nearly as good or as consistant; and long ago would have succumbed to overfishing and overuse as so many lakes and streams before it have.

LEMOLO LAKE

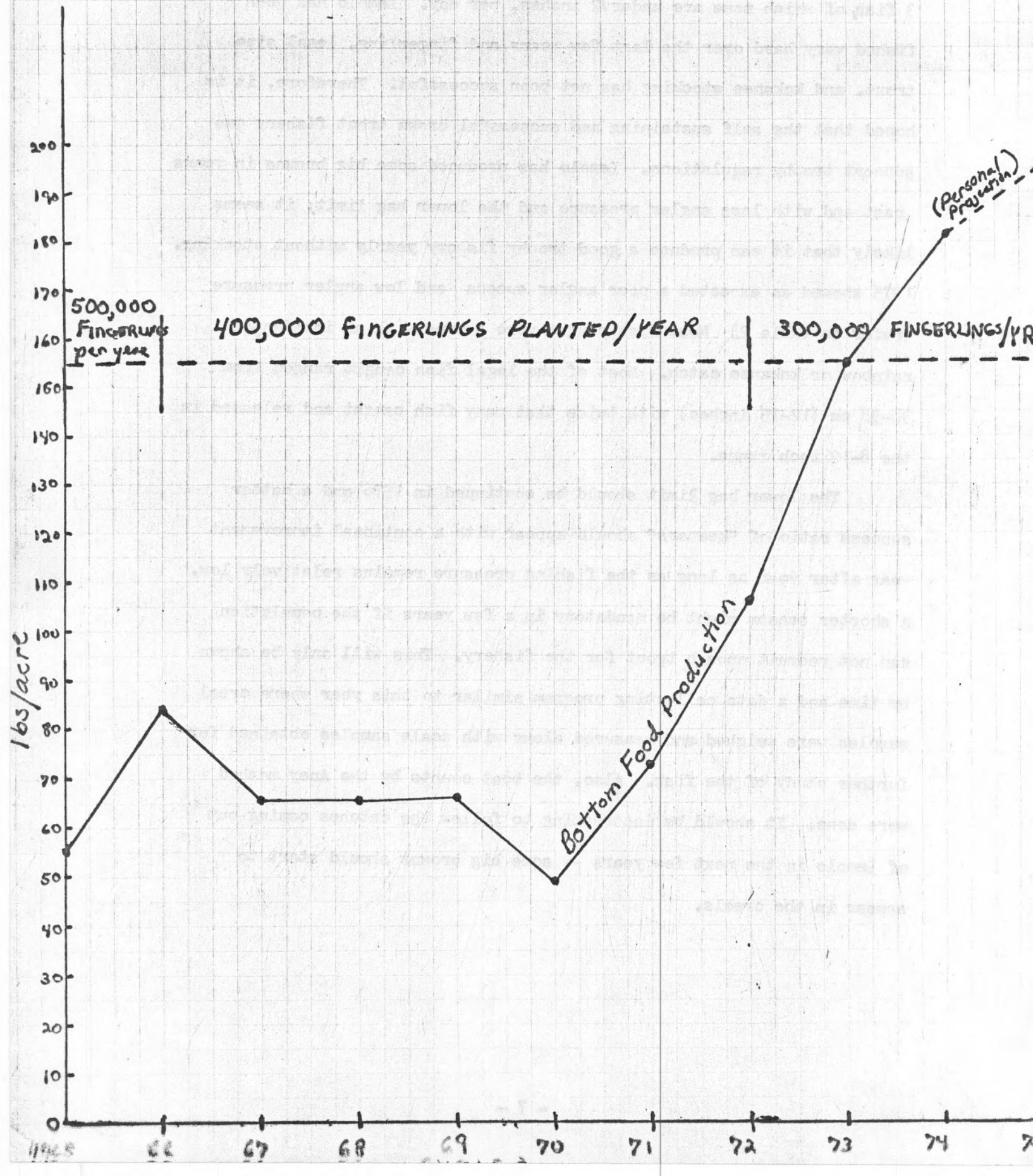
Lemolo Lake is a man-made lake in the series of Pacific Power and Light dams and generators on the upper North Umpqua River. It has had a history of brown (Salmo trutta), brook (Salvelinus fontinalis), and rainbow trout (Salmo gairdneri) along with some kokanee (Oncorhynchus nerka) fishing. The 1975 season was very important as, for the first

time, Lemolo Lake assumed trophy lake regulations which consisted of 3 fish, of which none are under 12 inches, per day. Lemolo has been fished very hard over the last few years and fingerling, legal size trout, and kokanee stocking has not been successful. Therefore, it is hoped that the self sustaining and successful brown trout fishery can support trophy regulations. Lemolo has produced some big browns in years past and with less angler pressure and the lower bag limit; it seems likely that it can produce a good trophy fishery yearly without stocking. 1975 showed as expected a poor angler succes and low angler pressure (refer to table 2.) Most fish caught were browns with an incidental rainbow or kokanee catch. Most of the legal fish caught ranged from 30-38 cm (12-15 inches) with twice that many fish caught and released in the 8-12 inch range.

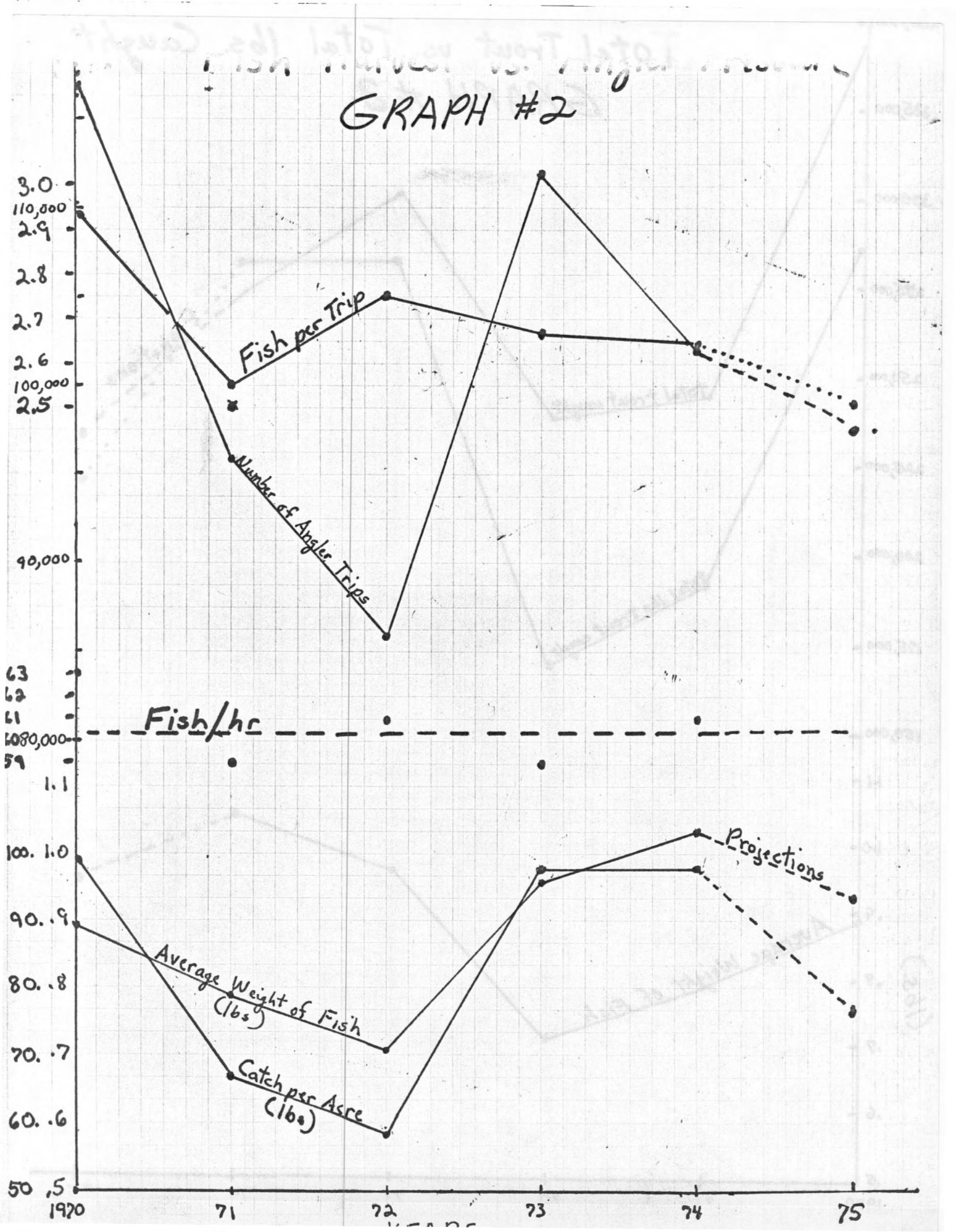
The lower bag limit should be continued in 1976 and a better success ratio of "keepers" should appear with a continual improvement year after year as long as the fishing pressure remains relatively low. A shorter season might be mandatory in a few years if the population can not recruit enough trout for the fishery. This will only be shown by time and a data collecting program similar to this year where creel samples were weighed and measured along with scale samples obtained for further study of the fish. Also, the boat counts by the Aney method were done. It should be interesting to follow the catches coming out of Lemolo in the next few years -- some big browns should start to appear in the creels.

BOTTOM FOOD PRODUCTION VS. FINGERLING PLANTS

GRAPH #1

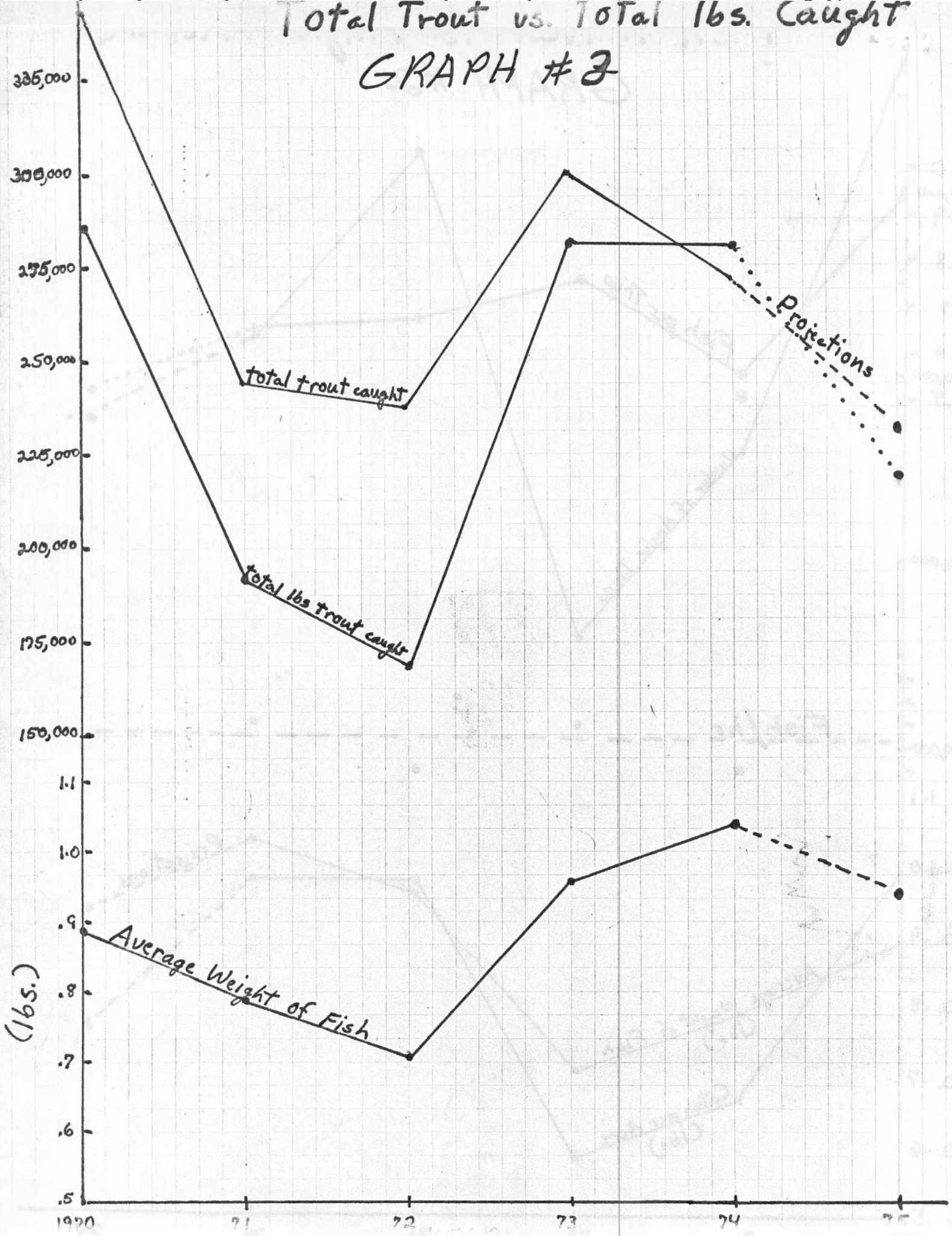


GRAPH #2


3.0
110,000
2.9
2.8
2.7
2.6
100,000
2.5
90,000
Fish per Trip
Number of Angler Trips
63
62
61
60
80,000
59
Fish/hr
1.1
100. 1.0
90. .9
80. .8
70. .7
60. .6
50 .5
Projections
Average Weight of Fish (lbs)
Catch per Acre (lbs)
1970
71
72
73
74
75

Total Trout vs. Total lbs. Caught

GRAPH #2



DIAMOND LAKE DATA METHODS

CALVIN (BOAT TRAILERS)		Aney (boat counts)	
Anglers	93,812	Anglers	86,767
Fish caught	190,024	Fish caught	173,060
lbs Fish caught	176,996.3	lbs Fish caught	165,587.7

	Food Production		Fish Production
1970	49.2 lbs	1970	98.6 lbs
1971	73.1 lbs	1971	66.5 lbs
1972	107.2 lbs	1972	58.1 lbs
1973	155.8 lbs	1973	97.6 lbs
1974	182.6 lbs	1974	97.5 lbs

TABLE #1

LEMOLO LAKE (1975)

	June	July	August	Accum.
Anglers	1259	610	508	3972
Angler Hrs	3271	1664	1859	11,460
Fish (KEPT)	285	200	193	1365
Fish (released)	568	348	368	2226
Fish (Total)	853	548	561	3591
Fish/hr	.088	.12	.14	.12
Fish/Angler	.21	.33	.38	.35

TABLE #2