

Affected Environment

Introduction

Defining the regional economic area to which Diamond Lake belongs is complicated because it lies in the southeast corner of Douglas County and portions of nine other counties (Coos, Curry, Josephine, Jackson, Klamath, Lake, Deschutes, Lane and Linn) are located within a 90-mile radius of it. Historically, 60-70 percent of the visitors to Diamond Lake come from within this 90-mile radius region (Stone 2003). If the above counties were considered the area that would be affected by increases in visitation to Diamond Lake due to changes in the trout fishery and water quality, the associated changes in income and employment would be tiny within the context of the total regional economy. On the other hand, if we consider the affected region the area within a 10-mile radius of Diamond Lake the effects would be much more pronounced, but such a small area cannot be considered a functional economy since it does not include the bulk of economic transactions or flow of trade.

After a review of existing studies and discussion with regional experts, including the former Umpqua National Forest economist, it was determined that the majority of the economic impacts associated with potential water quality and fishing improvements at Diamond Lake are likely to occur within the three county region of Douglas, Jackson and Klamath counties. Therefore, this area will be considered the affected environment for modeling the economic effects of the alternatives and is termed the Diamond Lake Area.

Regional Population and Economic Indicators

Table 1 displays population levels and economic indicators for the three individual counties in comparison to the state as a whole. All data presented are for the most recent year available. The population of the three county area in 2002 was estimated at 353,450. In 2001 the unemployment rate in Jackson county was equal to the state unemployment rate, while Douglas and Klamath counties had higher unemployment rates. Each of the counties had a higher percentage of people not in the labor force in 2000 compared to the state percentage. Both median household income in 2000 and per capita income in 2001 were highest for the state as a whole, followed by Jackson, Douglas and Klamath counties. Similarly, the percentage of individuals in poverty in 2000 was lowest for the state as a whole, followed by Jackson, Douglas and Klamath counties.

Table 1. Population and economic indicators for Oregon and Diamond Lake Counties

	Oregon	Douglas County	Jackson County	Klamath County
Population, 2002	3,504,700	101,300	187,600	64,550
Unemployment rate, 2001	6.3%	9%	6.3%	9.5%
% Not in the Labor Force, 2000	34.8%	43.1%	38.7%	40.3%
Median Household Income, 2000	\$40,916	\$33,231	\$36,461	\$31,537
Per capita Income, 2001	\$28,222	\$23,039	\$25,505	\$21,913
% of Individuals in poverty, 2000	11.6%	13.1%	12.5%	16.8%

Source: Center for Population Research and Census 2002; U.S. Census Bureau 2002; U.S. Bureau of Economic Analysis 2003b.

Economic Structure:

Table 2 displays some basic employment statistics for 2001 for Oregon, the local region and the three individual counties. Nonfarm employment is defined as all employment, both full and part time not associated with farming. Government data made available to the public are subject to nondisclosure rules. This applies when the data reported may disclose the operations of a single firm. Due to nondisclosure for several sectors in Klamath county, these sectors were lumped into the "Other" category. Employment in this table is measured in annual equivalents, or the yearly average of all full- and part-time jobs. A person who works 12 months at a full-time job is counted as one job. A person who works three seasonal or part-time jobs during the year would be counted as three jobs. This measure is not the same as a full-time equivalent (FTE). An FTE is equal to one person working full time for 12 months; three people each working full time for 4 months would be counted as a single FTE. In considering the employment data presented, the annual equivalent count may overstate or understate some sectors depending on its level of seasonal or part-time hiring.

Table 2. 2001 Employment by Industry for Oregon and Diamond Lake Counties

Nonfarm employment by sector	Oregon	Diamond Lake Area	Douglas County	Jackson County	Klamath County
	Jobs (Percent)				
Construction	120,622 (6%)	11,225 (6%)	2,490 (5%)	6,766 (7%)	1,969 (6%)
Manufacturing	228,753 (11%)	16,995 (9%)	6,365 (13%)	7,851 (8%)	2,779 (9%)
Transportation & Warehousing	61,499 (3%)	5,813 (3%)	2,100 (4%)	2,764 (3%)	949 (3%)
Information	46,031 (2%)	3,141 (2%)	549 (1%)	2,223 (2%)	369 (1%)
Finance and Insurance	85,478 (4%)	5,572 (3%)	1,250 (3%)	3,341 (3%)	981 (3%)
Real Estate, Rental & Leasing	82,693 (4%)	7,277 (4%)	1,679 (3%)	4,369 (4%)	1,229 (4%)
Wholesale trade	82,337 (4%)	4,281 (2%)	923 (2%)	2,582 (3%)	776 (2%)
Retail trade	241,721 (12%)	26,741 (15%)	6,144 (13%)	16,614 (16%)	4,006 (13%)
Government	278,692 (14%)	25,614 (14%)	8,523 (17%)	11,529 (11%)	5,562 (18%)
Accommodation & Food Services	143,274 (7%)	14,051 (8%)	3,369 (7%)	8,137 (8%)	2,545 (8%)
Arts, Entertainment & Recreation	42,832 (2%)	4,200 (2%)	798 (2%)	2,894 (3%)	508 (2%)
Other ¹	621,660	56,231	14,575	32,303	9,353

	(30%)	(31%)	(30%)	(32%)	(30%)
Total	2,041,321	181,739	48,972	101,647	31,120

¹Includes Agricultural Services, Forestry, Fishing & Other; Mining; Utilities; and Services other than Accommodation & Food Services and Arts, Entertainment & Recreation.

Source: U.S. Bureau of Economic Analysis, 2003b.

The 2000 distribution of employment by industry sector in the Diamond Lake Area differs in some respects from the state of Oregon as a whole. The area had 2% less of its employment in manufacturing, 2% less in wholesale trade, and 1% less in finance and insurance. The industrial sectors associated with serving tourists are not easily identified, but have been defined to include the following (Bureau of Economic Analysis, 2003a): hotels and lodging places, eating and drinking places, railroads and related services, local and bus passenger transit, taxicabs, air transportation, water transportation, automotive rental and leasing, travel agency services, amusement and recreation services, membership sports and recreation clubs, motion pictures and other entertainment, professional sports clubs and promoters, gasoline service stations, and retail excluding restaurants and gas stations. With the exception of the transportation related businesses, most of these businesses fall within the broader sectors of retail trade and services. Table 2 shows the Diamond Lake area had 3% more employment in the retail trade sector, and 1% more in the combined accommodations & food services and arts, entertainment & recreation sectors compared to the state of Oregon as a whole.

Travel Related Economic Activity

Estimates of economic activity generated from travel related spending for Oregon and the three individual counties is provided in Table 3.

Table 3. Travel Impacts for Oregon and the Diamond Lake Counties, 2001

	Oregon	Diamond Lake Area	Douglas County	Jackson County	Klamath County
Destination Spending ¹ (\$ Million)	5,624	728.0	203.8	256	109.5
Earnings (\$ Million)	1,556	232.4	48.4	62.6	26.6
Employment ² (jobs)	95,600	9,890	3,530	4,380	1,980
Employment (% of total jobs)	4.7%	5.4%	7.2%	4.3%	6.4%
Local Tax Receipts ³ (\$ Million)	73	14.3	.7	3.0	.9
State Tax Receipts (\$ Million)	160	29.3	5.3	11	2.9

¹Destination Spending does not include air transportation or travel arrangement.

²Employment includes all full- and part-time payroll employees and working proprietors.

³Property taxes are not included.

Source: Dean Runyan Associates, 2002.

The Diamond Lake Area had a higher percentage of its total employment generated from travel spending compared to the state, and the county with the highest percentage of travel related employment was Douglas county.

Diamond Lake Developed Recreation Facilities

There are three Forest Service campgrounds located on or near Diamond Lake—Diamond Lake, Thielsen View and Broken Arrow. Table 4 displays revenues collected at these campgrounds.

Table 4. Diamond Lake Forest Service Campground Revenues^{1,2}

	1988	1992	1996	1997	1998	1999	2000	2001
Campground	Revenues in \$							
Diamond Lake	121,375	202,943	123,095	164,096	157,988	155,217	170,773	154,148
Thielsen	22,337	30,496	20,719	21,336	18,038	11,523	20,925	20,542
Broken Arrow	14,667	25,047	25,031	26,645	21,602	28,019	29,791	30,208
Total	\$158,379	\$258,486	\$168,845	\$212,077	\$197,628	\$194,759	\$221,489	\$204,898

¹The Spring Fire in 1996 had an effect on camping at Diamond Lake

²There was a campsite fee increase in 1997.

Source: U.S. Forest Service, Umpqua National Forest, Diamond Lake Ranger District.

Campground receipts were 21% lower in 2001 than 1992, despite an increase in camping fees. Much of the decrease in camping use has been attributed to the decline in the quality of the fishery at Diamond Lake (David Evans and Associates 1998). Between 1989 and 2002, the correlation coefficient¹ between estimated angler trips and estimated campground usage was .80, which indicates a strong correlation between the two.²

In addition to these campgrounds, Diamond Lake Improvement Company operates Diamond Lake Resort under a FS special use permit. The lodge currently has 92 overnight units including 42 rental cabins (6 person occupancy), 40 motel units (2 person occupancy) and 10 studio units (2 person occupancy). Diamond Lake Resort reported 75,000 overnight occasions in 1992 and 51,100 overnight occasions in 1997 (David Evans and Associates 1998). Current use from April through September based on occupancy rates is estimated to be around 35,900 overnight occasions (Rockholt 2003). This decrease is again believed to be attributable to the decrease in the quality of the fishery as occupancy rates remain between 95-100% in July and August, but

¹ A correlation coefficient is a common statistic for indicating the strength of a linear relationship between two variables. It is a number ranging between -1 and 1. A positive correlation means as the value of one variable increases, the value of the other variable also tends to increase. A small or zero correlation coefficient tells us that the two variables are unrelated, while a value close to 1 indicates a strong positive linear relationship and a value close to -1 indicates a strong negative relationship. (Cody and Smith 1997)

² Estimated angler trips and campground usage were not available for every year, thus the correlation coefficient is for the years 1989, 1994, 1996-1999, and 2001-2002.

have decreased dramatically in the spring and fall periods that have traditionally attracted anglers to the area.

Figure 1 displays total sales revenues at the resort during the fishing season (April through October) for the years from 1986 to 2002. The line in the figure represent sales for all months combined, while the columns represent sales during the shoulder season (defined here to include the months of April, May, June, September and October) and the peak season (defined here as the months of July and August). This figure clearly reveals the downward trends for both total fishing sales and total shoulder season sales. Peak season sales have remained fairly constant, while total and shoulder season sales decreased by 28 percent and 49 percent, respectively, between 1992 and 1999. The resort's accounting firm reports that the fish stocking program during 2000 did help increase fishing season revenues in 2000, while sales to fire fighting crews increased revenues in 2002 (Koneckny 2003).

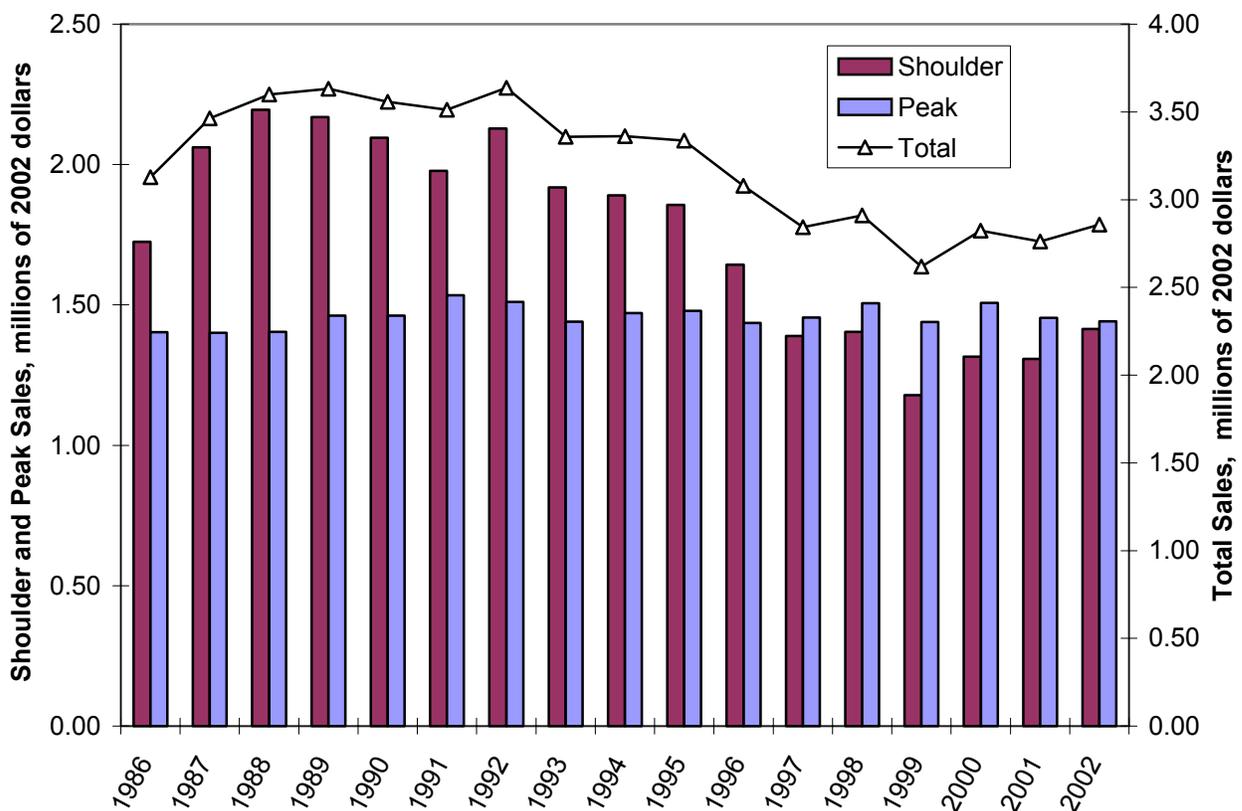


Figure 1--Diamond Lake Resort total sales for the shoulder (April-June, Sept.& Oct), peak (July & August) and total fishing season (April-October), 1986-2002 (Crone with data from Konecny 2003)

Figure 2 displays the same type of information, but only includes sales by the resort's marina department. Boat rentals and sales of fishing related items are reflected here. Again, while peak season marina sales are more variable than total peak season sales (displayed in Fig.1), they do not display the strongly decreasing trend of the total and shoulder season marina sales. Between 1992 and 1999, total fishing season marina sales decreased by 49 percent while shoulder season marina sales decreased by 74 percent. These results strongly indicate that the decrease in the

quality of the fishery is the primary cause of decreased revenues for the resort. The strong correlation coefficient, .96, between estimated angler trips at the lake and total resort sales between 1989 and 2002 also supports this premise.³

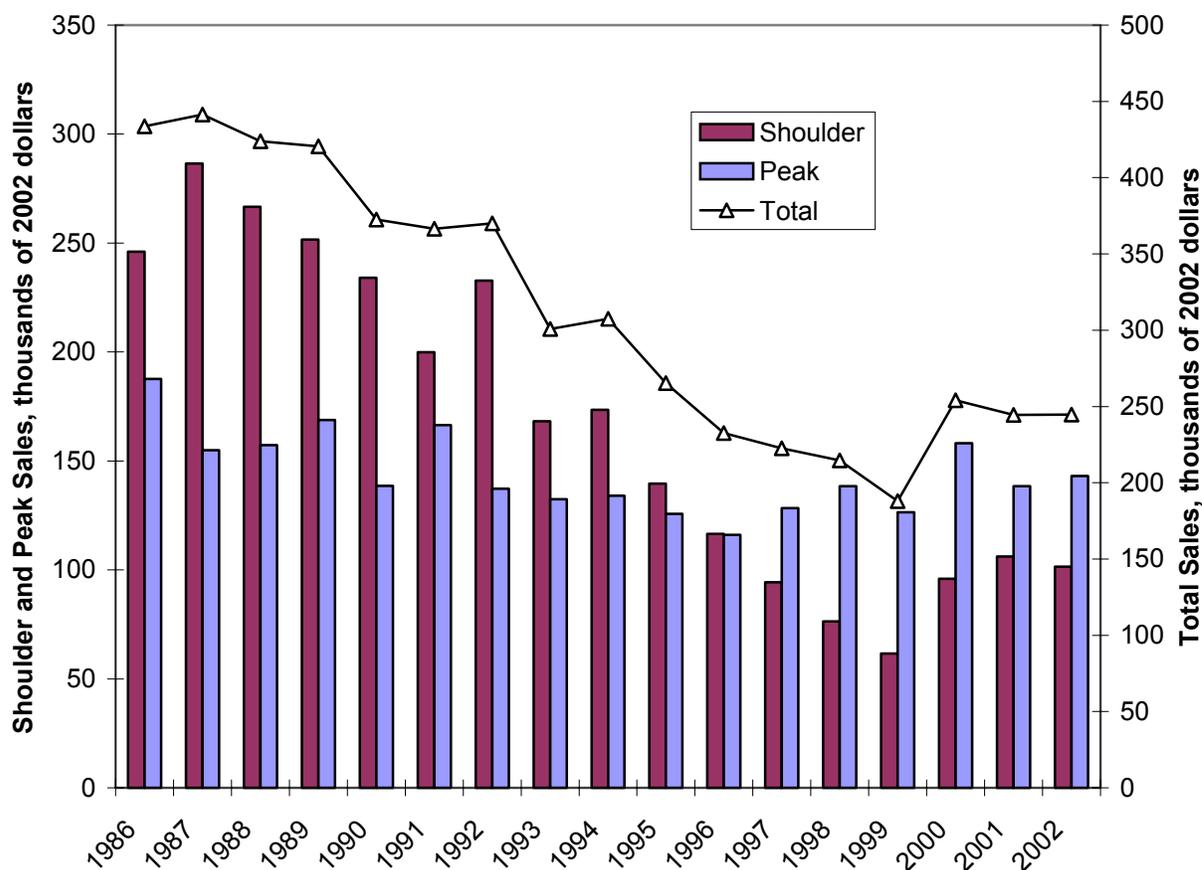


Figure 2--Diamond Lake Resort marina sales for the shoulder (April-June, Sept.& Oct), peak (July & August) and total fishing season (April-October), 1986-2002 (Crone with data from Konecny 2003)

In a letter to the Umpqua National Forest Supervisor, the president of the Diamond Lake Improvement Company states (Koch 2003):

Recreation at Diamond Lake is driven by successful trout fishing and other lake related activities. With a second infestation of Tui Chubs discovered in 1992 and the temporary mid-summer closure of the lake to water activities due to harmful Algae blooms the past two years, our annual revenue has crashed a crippling \$700,000! . . . We have been forced to curtail over 30 summer jobs. . . . We have also cancelled plans for major renovations on our lodging units . . . Always in the past we have been able to save money from the higher summer income to help carry us through the slower season and make the necessary repairs and capital improvements. That opportunity is now gone.

Konecny (2003) provided data documenting that upkeep expenditures at the resort have trended downward, especially over the past five years. She states, "Because of uncertainties surrounding

³ Estimated angler trip data was not available for every year, thus the correlation coefficient is for the years 1989, 1994 and 1996-2002.

the timing of the lake restoration project and the nature thereof, Diamond Lake Resort is conserving cash to cover fixed costs (such as debt service payments) while the lake restoration project is in progress. The Resort is in the awkward position of needing to upgrade its facilities but also must conserve cash to weather the lake restoration process.”

The number of fishing licenses sold at Diamond Lake Resort between 1996 and 2002 is also highly correlated (.96) with the number of angler trips occurring at the lake. The number of fishing licenses sold at the resort fell by 47 percent between 1996 and 1999 and in 2002 was only 64 percent of the 1996 level.

There is also a permitted recreational vehicle (RV) park on the lake, Diamond Lake RV Park, with 140 RV/trailer sites. The RV Park reported a decrease from 37,800 overnight occasions in 1992 to 21,100 occasions in 1997 (David Evans and Associates 1998)

The Forest Service has two day-use sites on the lake -- the South Shore picnic area and the North End boat ramp. Estimated recreation visitor days at these sites in 1997 was 7,743 (David Evans and Associates 1998).

Estimated Effects of the Fishery Decline on Local Economic Activity

Table 5 shows the estimated number of angler trips at Diamond Lake from 1975 to 2002.

Table 5. Angler trips at Diamond Lake.

	1975	1976	1977	1978	1989	1994	1996	1997	1998	1999	2000	2001	2002
	Angler trips in thousands												
Trips	106.6	90.9	102	138.7	82.4	54.3	35.3	28	10	6	14.1	20	19.8

Source: Unpublished creel survey data. Oregon Department of Fish and Wildlife.

Using expenditure profiles for local and non-local anglers from a survey and reports prepared for ODFW in 1991 (The Research Group 1991a,b), but modified to reflect Douglas, Jackson and Klamath as the local economic area, a reduction in angler trips from the high of 138,700 thousand in 1978 to the low of 6,000 in 1999 resulted in the following roughly estimated economic effects (sales and labor income are reported in 2000 dollars and annual employment is measured as the number of full and part-time jobs⁴) in the area:

- Decline in annual sales: \$4.9 million
- Decline in annual labor income: \$1.4 million
- Decline in annual employment: 70

If anglers from the local region (Douglas, Jackson and Klamath counties) are excluded in the calculation as is usually done in economic impact analysis, the rough estimates are:

- Decline in annual sales: \$3.2 million

⁴ A job can be full-time or part-time, seasonal or permanent. It is not a “full-time equivalent”.

Decline in annual labor income: \$1 million

Decline in annual employment: 51.

These are rough estimates because they assume that angler expenditure profiles (inflated to 2000\$) in 1978 and 1999 were similar to what they were in 1989, the year the expenditure survey was conducted.⁵ Additionally, the industrial structure of the three county region--Douglas, Jackson and Klamath--that existed in 2000 was used in the development of the IMPLAN model used to estimate effects here (Minnesota Implan Group 1999, 2003). Finally, the local angler expenditure profiles used here are based on estimated angler expenditures by residents of ODFWs southwest zone on trips to fish for trout at lakes or reservoirs within the southwest zone. The ODFW southwest zone includes Douglas, Jackson, Coos, Curry and Josephine counties. Table 6 displays the expenditure profiles from the 1989 survey with expenditures inflated to 2000 dollars. The expenditure profile for the local area anglers includes all trip related expenditures whether they occur at home, enroute or at the fishing destination. The expenditure profile for non-local area anglers does not include any at home expenditures, but includes one-half of the enroute expenditures and all of their fishing destination expenditures.

The assumption was also made that thirty percent of the angler trips at Diamond Lake were by residents from the three county local area (local area anglers) while seventy percent of the angler trips were by people from outside this three county region (non-local area anglers). This assumption was based on an analysis of zip code data from the National Visitor Use Monitoring data set for the Umpqua National Forest (U.S. Forest Service 2002) for the subset of visitors surveyed in the Diamond Lake area.

Table 6. Trip related per day angler expenditure profiles for expenditures within the local area.

Expenditure Category	Local area angler	Non-local area angler
	Expenditures in 2000\$	
Transportation, gas, etc.	\$12.80	\$2.87
Lodging	2.08	6.63
Food/drink at stores	11.86	3.33
Food/drink at restaurants	2.28	3.67
Guide and charter fees	.17	0
Boat gas	2.83	1.72
Rental equipment	.40	1.94
Supplies and miscellaneous	5.36	1.44
Other expenses	1.84	1.63
Total	\$39.62	\$22.94

Source: Crone with data from The Research Group, 1991b.

⁵ A recent national survey reports an average of \$29 (in 2000\$) for trip expenditures per day by U.S. residents fishing in Oregon. (U.S. Dept. of Interior, Fish and Wildlife Service and U.S. Department of Commerce, U.S. Dept. of Commerce, U.S. Census Bureau, 2003). This average includes anglers fishing for all types of fish species (cold and warm fresh water species as well as saltwater species) and on all types of waters (rivers, streams, ponds, lakes, reservoirs and oceans).

Environmental Consequences

The potential direct, indirect and cumulative economic effects associated with Diamond Lake restoration extend beyond the immediate area of the lake. For the purpose of analyzing local economic effects, the area used for analysis is the three county local region of Douglas, Jackson and Klamath counties.

Response to issues

The economics effects analysis responds to numerous potential economic effects associated with the proposed action including, but not limited to: potential impacts to tourism, private businesses at the lake, and outlying area businesses; potential impacts to campground and fishing license revenues; and project implementation costs.

Effects on Local Economic Activity

Table 7 displays estimates of the potential effects on local economic activity associated with the predicted amount of angler trips for each alternative for the years 2005 to 2011. Again, the three county region consisting of Douglas, Jackson and Klamath counties is considered to be the local area. Total Sales and Labor Income are measured in 2000\$ and employment is measured in full and part-time jobs.⁶ Major assumptions underlying these estimates are: 1) the 1989 expenditure profiles (inflated to 2000 dollars) are representative of expenditure profiles for local area and non-local area anglers for the years 2005 to 2011, under all alternatives; 2) the proportion of local area (30%) and non-local area (70%) angling days at Diamond Lake remains constant for the years 2005 to 2011, under all alternatives; 3) the economic structure of the three county local area does not change significantly between 2000 and 2011; and 4) the predicted amount of angler trips for the years 2005 to 2011 by alternative actually occur.

Because all alternatives have the same amount of angler trips predicted for 2005, the local economic activity associated with angler use of the lake is the same across alternatives. In 2006 angler effects on local economic activity are greatest under Alternative 4, followed by Alternative 1, and the least angler related economic activity is generated under Alternatives 2, 3 and 5. In 2007, Alternative 4 again ranks highest followed by Alternatives 3, 2 and 5, and 1 in that order. In 2008, Alternatives 2, 3 and 5 generate the same amount of economic activity and rank highest followed by Alternatives 4 and 1, respectively. In 2009, Alternatives 2 and 5 have the highest predicted amount of angling and associated local economic activity, followed by Alternatives 3, 4 and 1 in that order. By 2010, the predicted number of angler trips under Alternatives 2 and 5 is 100,000 which corresponds to the annual average goal set for Diamond Lake by the Oregon Fish and Wildlife commission in its 1990 management plan. In 2010 the local economic activity generated by anglers under Alternatives 2 and 5 is 25 percent higher than that generated under Alternative 3, 82 percent higher than that generated under Alternative 4 and 900 percent higher than that generated under Alternative 1.

⁶ The employment in the Total column is measured in job years, where a job year is a job that lasts the equivalent of one year. For example 4 job years could be 4 jobs for one year or one job for 4 years or any combination thereof.

Table 7 presents what has been referred to as both a “contribution analysis” and a “significance analysis.” In such an analysis the intent is to look at the contribution of expenditures by recreational visitors (in this case anglers) to the economic activity in an area, regardless of whether the expenditures represent an inflow of new money to the area or a recirculation of money already there. If the objective is to capture the impact of only the new money coming into the area, only the expenditures by recreational visitors (in this case anglers) coming from outside the local area should be considered. Table 8 presents the results of such an analysis by excluding local area angler expenditures. Although the impacts are smaller, the ranking of the alternatives by year is the same as discussed above for Table 7. Additionally, the magnitudes of the differences in effects on local economic activity across alternatives in the year 2010 are also exactly the same as discussed above.

Effects on activities at Diamond Lake Developed Recreation Facilities

Under Alternative 1, the predicted number of anglers at Diamond Lake would remain at historically low levels. In the affected environment section above the high correlation between angler trips, campground use and revenues, fishing licenses sold at Diamond Lake Resort and shoulder fishing season total and marina sales by Diamond Lake Resort was noted. If these relationships continue to hold in the future it is likely that the Diamond Lake developed recreation facilities (both public and private) will continue to suffer from reduced usage and revenues. Because water quality is not predicted to improve under this alternative, recreational visits may decrease even below current levels for the reasons noted in the Recreation section of this EIS. This would further dampen revenues at the developed recreation facilities. Considering the past several years of reduced revenues and the predicted continued reduction of revenues, Alternative 1 would have the cumulative effect of a possible permanent reduction in revenues which may lead to the eventual closure of the developed recreation facilities at the lake.

Under Alternatives 2, 3 and 5, as noted in the Recreation section recreation use is predicted to decrease during the 18-month period when the lake is drawn down, chemicals are applied, reconstruction activities take place, fish are mechanically removed, and water management activities take place during the lake refill period. As recreation use is reduced during this period, revenues at the developed recreation facilities would also be reduced. Revenues from workers carrying out the above-mentioned lake restoration activities as well as those from workers engaged in the Diamond Lake Resort marina cleanup and improvement and South Shore Store/Pizza Parlor dock area cleanup projects may offset part of these reduced recreation revenues. Once the predicted number of anglers at the lake starts to increase there is likely to be a corresponding increase in both visitors and revenues at the developed recreation facilities. Water quality is predicted to eventually improve under each of these alternatives. This improvement is likely to attract returning and new non-angling water based recreation visitors, which may further increase revenues at the developed recreation facilities.

Under Alternative 4, as discussed in the Recreation section, some water based recreational activities are likely to be reduced while the yearly mechanical harvest of Tui Chub occurs. This would likely result in reduced revenues at the developed recreational facilities during these periods. This reduction may be partially offset by revenues generated from workers engaged in

the mechanical harvest activities. As the amount of angling activity increases to 55,000 angler trips in 2007, revenues at the developed facilities are likely to increase. However, since angler trips are predicted to remain at 55,000 each year thereafter, which is substantially below the pre-Tui Chub amount of angling, it is unlikely that revenues at the developed facilities would increase to their previous levels. Water quality is not predicted to improve until 2010 or 2011 and even that improvement may be minimal. In the meantime, water quality issues may continue to raise concerns by recreational visitors who may choose other areas at which to recreate, reducing revenues at the Diamond Lake developed facilities. When combined with the past reduction in revenues and the predicted increase in revenues as a result of these alternatives, there would likely be a beneficial cumulative effect to the economy of the Diamond Lake Area as improvements in the water quality and recreational fishery result in increased recreation visits over time. However, the beneficial effect is likely to be lower than under Alternatives 2, 3 and 5, because angler trips are predicted to increase less and changes in water quality are less certain.

Project Implementation Costs

Table 9 displays estimates of the costs associated with implementing each of the alternatives for the years from 2005 to 2011. These figures represent best estimates of costs given currently available information. Details on the derivation of individual cost estimates are available from the Forest and are included in the project record. Monitoring activities under Alternative 1 include only water quality monitoring, while the action alternatives include water quality, fish and biological indices monitoring. Comparing cost estimates for the action alternatives, the cost of implementing Alternatives 2 and 5 would be substantially less than the other two alternatives. The different fish stocking strategies explains the major difference in costs between Alternatives 2 and 5 and Alternative 3. The fish stocking strategy in Alternative 3 includes the higher costs of raising 12-inch hatchery catchable fish, resulting in stocking costs of around \$4.5 million over the 7-year period. In Alternative 2 mostly fingerlings are stocked resulting in costs of only about \$214,000. The higher costs in Alternative 4 are explained both by high fish stocking costs and the labor costs associated with Tui Chub removal. See Effects of Activities at Developed Recreation Facilities for a description of how each alternative would contribute to the economy during implementation.

Table 7. Estimated local economic activity associated with the predicted number of total angler trips by alternative.

		2005	2006	2007	2008	2009	2010	2011	Total
Alt 1. No Action	Angler trips	20,000	10,000	10,000	10,000	10,000	10,000	10,000	80,000
	Sales	\$752,503	\$376,251	\$376,251	\$376,251	\$376,251	\$376,251	\$376,251	\$3,010,010
	Labor Income	\$211,563	\$105,781	\$105,781	\$105,781	\$105,781	\$105,781	\$105,781	\$846,249
	Employment	11	5	5	5	5	5	5	41
Alt. 2 Rotenone + Put, Grow & Take	Angler trips	20,000	5,000	25,000	60,000	80,000	100,000	100,000	390,000
	Sales	\$752,503	\$188,126	\$940,628	\$2,257,508	\$3,010,010	\$3,762,513	\$3,762,513	\$14,673,801
	Labor Income	\$211,563	\$52,891	\$264,453	\$634,688	\$846,251	\$1,057,813	\$1,057,813	\$4,125,472
	Employment	11	3	13	32	42	53	53	207
Alt. 3 Rotenone + Put & Take	Angler trips	20,000	5,000	30,000	60,000	70,000	80,000	80,000	345,000
	Sales	\$752,503	\$188,126	\$1,128,754	\$2,257,508	\$2,633,759	\$3,010,010	\$3,010,010	\$12,980,670
	Labor Income	\$211,563	\$52,891	\$317,344	\$634,688	\$740,469	\$846,251	\$846,251	\$3,649,457
	Employment	11	3	16	32	37	42	42	183
Alt. 4 Mechanical /Biological.	Angler trips	20,000	35,000	55,000	55,000	55,000	55,000	55,000	330,000
	Sales	\$752,503	\$1,316,879	\$2,069,382	\$2,069,382	\$2,069,382	\$2,069,382	\$2,069,382	\$12,416,292
	Labor Income	\$211,563	\$370,235	\$581,797	\$581,797	\$581,797	\$581,797	\$581,797	\$3,490,783
	Employment	11	18	29	29	29	29	29	174
Alt. 5 Modified Rotenone & Stocking	Angler trips	20,000	5,000	25,000	60,000	80,000	100,000	100,000	390,000
	Sales	\$752,503	\$188,126	\$940,628	\$2,257,508	\$3,010,010	\$3,762,513	\$3,762,513	\$14,673,801
	Labor Income	\$211,563	\$52,891	\$264,453	\$634,688	\$846,251	\$1,057,813	\$1,057,813	\$4,125,472
	Employment	11	3	13	32	42	53	53	207

Table 8. Estimated local economic activity associated with the predicted number of non-local angler trips by alternative.

		2005	2006	2007	2008	2009	2010	2011	Total
Alt. 1. No Action	Angler trips	14,000	7,000	7,000	7,000	7,000	7,000	7,000	56,000
	Sales	\$484,621	\$242,311	\$242,311	\$242,311	\$242,311	\$242,311	\$242,311	\$1,938,487
	Labor Income	\$149,887	\$74,943	\$74,943	\$74,943	\$74,943	\$74,943	\$74,943	\$599,545
	Employment	8	4	4	4	4	4	4	32
Alt. 2 Rotenone + Put, Grow & Take	Angler trips	14,000	3,500	17,500	42,000	56,000	70,000	70,000	273,000
	Sales	\$484,621	\$121,155	\$605,777	\$1,453,864	\$1,938,485	\$2,423,107	\$2,423,107	\$9,450,116
	Labor Income	\$149,887	\$37,472	\$187,359	\$449,661	\$599,547	\$749,434	\$749,434	\$2,922,794
	Employment	8	2	10	23	31	38	38	150
Alt. 3 Rotenone + Put & Take	Angler trips	14,000	3,500	21,000	42,000	49,000	56,000	56,000	241,500
	Sales	\$484,621	\$121,155	\$726,932	\$1,453,864	\$1,696,175	\$1,938,485	\$1,938,485	\$8,359,717
	Labor Income	\$149,887	\$37,472	\$224,830	\$449,661	\$524,604	\$599,547	\$599,547	\$2,585,548
	Employment	8	2	12	23	27	31	31	134
Alt. 4 Mechanical /Biological.	Angler trips	14,000	24,500	38,500	38,500	38,500	38,500	38,500	231,000
	Sales	\$484,621	\$848,087	\$1,332,709	\$1,332,709	\$1,332,709	\$1,332,709	\$1,332,709	\$7,511,629
	Labor Income	\$149,887	\$262,302	\$412,189	\$412,189	\$412,189	\$412,189	\$412,189	\$2,323,246
	Employment	8	13	21	21	21	21	21	126
Alt. 5 Modified Rotenone & Stocking	Angler trips	14,000	3,500	17,500	42,000	56,000	70,000	70,000	273,000
	Sales	\$484,621	\$121,155	\$605,777	\$1,453,864	\$1,938,485	\$2,423,107	\$2,423,107	\$9,450,116
	Labor Income	\$149,887	\$37,472	\$187,359	\$449,661	\$599,547	\$749,434	\$749,434	\$2,922,794
	Employment	8	2	10	23	31	38	38	150

Table 9. Estimated project implementation costs by alternative.

Alternative	Activity	Cost Estimate
Alt. 1	Monitoring	\$471,800
No Action	Lake closure coordination	156,800
	Fish Stocking	202,000
	Total	\$830,600
Alt. 2		
Rotenone + Put,	Canal reconstruction	\$393,000
Grow & Take	Lake draw down	15,100 – 21,100
	Mechanical fish removal & utilization (commercial operation)	150,000 – 225,000
	ODFW fish removal	50,000
	Rotenone product & application cost	974,300 – 1,024,300
	Fish carcass removal and utilization	60,000 – 100,000
	Lake refill	6,000 – 10,000
	Monitoring	953,600
	Fish stocking	214,000
	Education	50,000 – 100,000
	Total	\$2,866,000 - \$3,091,000
Alt. 3		\$393,000
Rotenone +	Canal reconstruction	
Put & Take	Lake draw down	15,100 – 21,100
	Mechanical fish removal & utilization (commercial operation)	150,000 – 225,000
	ODFW fish removal	50,000
	Rotenone product & application cost	974,300 – 1,024,300
	Fish carcass removal and utilization	60,000 – 100,000
	Lake refill	6,000 – 10,000
	Monitoring	953,600
	Fish stocking	4,446,000
	Education	50,000 – 100,000
	Total	\$7,098,000 - \$7,323,000
Alt. 4		
Mechanical/ Biological	One year test, 6 years annual mechanical fish harvest and utilization (commercial operation)	\$1,141,000 - 1,857,000
	ODFW fish removal	270,000
	Monitoring	1,053,600
	Fish stocking	2,470,000 – 2,749,000
	Education	50,000 – 100,000

	Total	\$4,984,600 - \$6,029,600
Alt. 5 Modified Rotenone & Stocking	Canal reconstruction	\$393,000
	Lake draw down	15,100 – 21,100
	Mechanical fish removal & utilization (commercial operation)	150,000 – 225,000
	ODFW fish removal	50,000
	Rotenone product & application cost	1,351,800 – 1,401,800
	Fish carcass removal and utilization	60,000 – 100,000
	Lake refill	6,000 – 10,000
	Monitoring	953,600
	Fish stocking	313,000
	Education & other reintroduction prevention activities	100,000 – 200,000
	Total	\$3,392,500 - \$3,667,500

Cumulative Effects Associated with the Contingency Plan:

The following estimated economic effects and contingency plan costs for the action alternatives are based on the assumption that Tui Chub would be detected in 2011 and the contingency plan would be implemented annually from 2012-2016, or five years beyond the 7-year lifetime of the project. Table 10 displays estimates of the potential effects on local economic activity associated with the predicted amount of angler trips for each alternative for the years 2012 to 2016. Again, the three county region consisting of Douglas, Jackson and Klamath counties is considered to be the local area. Total Sales and Labor Income are measured in 2000\$ and employment is measured in full and part-time jobs. Major assumptions underlying these estimates are: 1) the 1989 expenditure profiles (inflated to 2000 dollars) are representative of expenditure profiles for local area and non-local area anglers for the years 2012 to 2016, under all alternatives; 2) the proportion of local area (30%) and non-local area (70%) angling days at Diamond Lake remains constant for the years 2012 to 2016, under all alternatives; 3) the economic structure of the three county local area does not change significantly between 2000 and 2016; and 4) the predicted amount of angler trips for the years 2012 to 2016 by alternative actually occur.

Table 10 shows that angler trips and local economic activity continue to be highest under Alternatives 2 and 5 until the year 2016, when they are the same across all action alternatives. Similarly, total angler trips and total local economic activity over both the five-year period from 2012 to 2016 and the 12-year period from 2005 to 2016 are highest under Alternatives 2 and 5, followed by Alternatives 3 and 4 respectively.

Table 11 displays the number of angler trips and amount of local economic activity generated by non-local anglers during the life of the contingency plan and over the entire 12-year period. Again, although the impacts are smaller, the ranking of the alternatives are the same as discussed above for Table 11.

Under all the action alternatives, during the contingency plan implementation, some water based recreational activities are likely to be reduced while the yearly mechanical harvest of Tui Chub occurs. This would likely result in reduced revenues at the developed recreational facilities during these periods. This reduction may be partially offset by revenues generated from workers engaged in the mechanical harvest activities.

Table 12 displays the estimated contingency plan costs for each action alternative. The difference in costs is due to differences in fish stocking. Alternatives 2 and 5 have the lowest fish stocking costs and the lowest total contingency plan costs over the 5-year life of the contingency plan. Alternative 3 has the highest fish stocking cost and highest total cost followed by Alternative 4.

Table 13 shows the total project implementation costs, total contingency plan costs, and total of all costs from 2005-2016 for the action alternatives. Alternative 2 has the lowest total costs for the 12-year period, followed by Alternatives 5, 4 and 3 respectively. Using Alternative 2 for comparison purposes and using the upper end cost estimate for each alternative, Alternative 5 costs are 12 percent higher than Alternative 2 costs, Alternative 4 costs are 78 percent higher than Alternative 2 costs, and Alternative 3 costs are 111 percent higher than Alternative 2 costs, for the 12-year period.

10. Estimated local economic activity associated with the predicted number of total angler trips by action alternative, if the contingency plan is implemented.

		2012	2013	2014	2015	2016	Total 2012 -2016	Total 2005-2016
Alt. 2 Rotenone + Put, Take & Grow	Angler trips	100,000	90,000	80,000	68,000	55,000	393,000	783,000
	Sales	\$3,762,513	\$3,386,261	\$3,010,010	\$2,558,509	\$2,069,382	\$14,786,675	\$29,460,476
	Labor Income	\$1,057,813	\$952,032	\$846,251	\$719,313	\$581,797	\$4,157,206	\$8,282,678
	Employment	53	47	42	36	29	207	414
								0
Alt. 3 Rotenone + Put & Take	Angler trips	80,000	55,000	55,000	55,000	55,000	300,000	645,000
	Sales	\$3,010,010	\$2,069,382	\$2,069,382	\$2,069,382	\$2,069,382	\$11,287,538	\$24,268,208
	Labor Income	\$846,251	\$581,797	\$581,797	\$581,797	\$581,797	\$3,173,439	\$6,822,896
	Employment	42	29	29	29	29	158	341
								0
Alt. 4 Mechanical /Biological.	Angler trips	55,000	55,000	55,000	55,000	55,000	275,000	605,000
	Sales	\$2,069,382	\$2,069,382	\$2,069,382	\$2,069,382	\$2,069,382	\$10,346,910	\$22,763,202
	Labor Income	\$581,797	\$581,797	\$581,797	\$581,797	\$581,797	\$2,908,985	\$6,399,768
	Employment	29	29	29	29	29	145	319
								0
Alt. 5 Modified Rotenone & Stocking	Angler trips	100,000	90,000	80,000	68,000	55,000	393,000	783,000
	Sales	\$3,762,513	\$3,386,261	\$3,010,010	\$2,558,509	\$2,069,382	\$14,786,675	\$29,460,476
	Labor Income	\$1,057,813	\$952,032	\$846,251	\$719,313	\$581,797	\$4,157,206	\$8,282,678
	Employment	53	47	42	36	29	207	414

Table 11. Estimated local economic activity associated with the predicted number of non-local angler trips by action alternative, if the contingency plan is implemented.

		2012	2013	2014	2015	2016	Total 2012 -2016	Total 2005-2016
Alt. 2 Rotenone + Put, Take & Grow	Angler trips	70,000	63,000	56,000	47,600	38,500	275,100	548,100
	Sales	\$2,423,107	\$2,180,796	\$1,938,485	\$1,647,713	\$1,332,709	\$9,522,810	\$18,972,926
	Labor Income	\$749,434	\$674,491	\$599,547	\$509,615	\$412,189	\$2,945,276	\$5,868,070
	Employment	38	35	31	26	21	151	301
Alt. 3 Rotenone + Put & Take Fishery	Angler trips	56,000	38,500	38,500	38,500	38,500	210,000	451,500
	Sales	\$1,938,485	\$1,211,553	\$1,211,553	\$1,211,553	\$1,211,553	\$6,784,697	\$15,144,414
	Labor Income	\$599,547	\$374,717	\$374,717	\$374,717	\$374,717	\$2,098,415	\$4,683,963
	Employment	31	21	21	21	21	115	249
Alt. 4 Mechanical /Biological	Angler trips	38,500	38,500	38,500	38,500	38,500	192,500	423,500
	Sales	\$1,211,553	\$1,211,553	\$1,211,553	\$1,211,553	\$1,211,553	\$6,057,765	\$13,569,394
	Labor Income	\$374,717	\$374,717	\$374,717	\$374,717	\$374,717	\$1,873,585	\$4,196,831
	Employment	21	21	21	21	21	105	231
Alt. 5 Modified Rotenone & Stocking	Angler trips	70,000	63,000	56,000	47,600	38,500	275,100	548,100
	Sales	\$2,423,107	\$2,180,796	\$1,938,485	\$1,647,713	\$1,332,709	\$9,522,810	\$18,972,926
	Labor Income	\$749,434	\$674,491	\$599,547	\$509,615	\$412,189	\$2,945,276	\$5,868,070
	Employment	38	35	31	26	21	151	301

Table 12. Estimated contingency plan implementation costs (5 years, 2012-2016)

Alternative	Activity	Cost Estimate
Alt. 2 (Rotenone + Put, Grow & Take)	Mechanical Chub Removal	\$240,000
	Chub Population Assessment	85,000
	Fish Stocking	1,427,000
	Total	\$1,752,000
Alt. 3 (Rotenone + Put & Take)	Mechanical Chub Removal	\$240,000
	Chub Population Assessment	85,000
	Fish Stocking	2,550,000
	Total	\$2,875,000
Alt. 4 (Mechanical/Biological)	Mechanical Chub Removal	\$240,000
	Chub Population Assessment	85,000
	Fish Stocking	2,270,000
	Total	\$2,595,000
Alt. 5 (Modified Rotenone & Stocking)	Mechanical Chub Removal	\$240,000
	Chub Population Assessment	85,000
	Fish Stocking	1,427,000
	Total	\$1,752,000

Table 13. Estimated total costs if contingency plan is implemented.

Alternative	Total Project Implementation Costs (2005-2012)	Contingency Plan Costs (2012-2016)	Total Costs (2005-2016)
Alt. 2 (Rotenone + Put, Grow & Take)	\$2,866,000 - \$3,091,000	\$1,752,000	\$4,618,000 - \$4,843,000
Alt. 3 (Rotenone + Put & Take)	\$7,098,000 - \$7,323,000	\$2,875,000	\$9,973,000 - \$10,198,000
Alt. 4 (Mechanical/Biological)	\$4,984,600 - \$6,029,600	\$2,595,000	\$7,579,600 - \$8,624,600
Alt. 5 (Modified Rotenone & Stocking)	\$3,392,500 - \$3,667,500	\$1,752,000	\$5,144,500 - \$5,419,500

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