

RECREATION USE AT DIAMOND LAKE, OREGON: PERCEPTIONS OF USERS' RECREATION EXPERIENCE BETWEEN 2001 AND 2003

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Abstract

The purpose of the study was to examine recreationists' perceptions about their trip experience at Diamond Lake, Oregon, and to ascertain if user perceptions had changed over a 2-year period (2001-2003). Diamond Lake is a large natural lake, located in the Cascade Mountain range of central Oregon, less than 20 miles from Crater Lake. The introduction of a non-native fish species has resulted in a biological change in the lake that has reduced water quality and changed the use patterns at the lake. Diamond Lake users are generally satisfied with their recreation experience, but some differences were noted between the summer 2001 and summer 2003 recreation seasons. Although several of the quality domains and satisfaction items were significantly different between the 2001 users and the 2003 users, overall quality remained the same.

1.0 Introduction

Diamond Lake, located near Crater Lake National Park, has long been known as one of the best trout fishing lakes in the state of Oregon. Diamond Lake was naturally fishless, but for the past 96 years, the state of Oregon has stocked the lake with various species of trout all non-native to the lake. Accordingly, Diamond Lake became a primary destination for anglers from across Oregon and nearby states. In the mid-1940s, the tui

chub (*Gila bicolor*), an undesirable, non-native species, was illegally introduced to the lake, probably as a bait fish. The tui chub thrived in Diamond Lake, eventually out-competing the trout for the zooplankton that both species ingest. The quality of trout fishing dropped significantly over the next several years, and in the mid 1950s, the lake was drawn down and poisoned with the chemical rotenone.

Once again, the state of Oregon stocked the lake with various species of trout, and after several years the lake's trout fishing was once again considered excellent. This situation continued for a few decades, until the lake once again fell victim to the same non-native species; the tui chub (Jackson et al. 2003; Loomis et al. 1999). And once again, the tui chub was probably introduced to the lake by an angler using the fish as bait. By the mid 1990s, the quality of trout fishing had dropped precipitously. In 2001, 2002, and 2003, the lake had to be closed each summer as a result of health risks associated from toxic algae bloom (*Anabaena flos-aquae*). The increases in the algae correlated closely with the increase in the tui chub (Eilers et al. 2001).

The purpose of the study was to examine recreationists' feelings about their trip experience at Diamond Lake over a 2-year period (2001 and 2003). During that timeframe, the social and biological conditions had changed at Diamond Lake. These differences are examined in this paper.

2.0 Methods

Data were collected through face-to-face interviews with visitors at Diamond Lake. A total of 685 completed surveys were used in conducting the analyses in this paper. A total of 262 surveys were completed during summer 2001 and 423 surveys were completed during summer 2003. The data were collected throughout a 3-month period during each summer season in 2001 and 2003. In 2003, the lake was closed to water-based recreation for a period during the summer due to a severe algae bloom. The surveys that were completed at Diamond Lake during 2003 were conducted in two data collection waves. These two waves were during the lake closure and after the lake reopened to swimming and

Table 1.—Summary of Significant Differences in Demographics and Trip Characteristics by Year (Chi-square or t-values; non-significant values not shown)

Demographics and Trip Characteristics	2001	2003	Test of Significance
Non-Caucasian Respondents	4%	8%	$X^2 = 5.538^*$
First Time Visitors	9%	33%	$X^2 = 49.880^{***}$
Recreate only at Diamond Lake	61%	50%	$X^2 = 6.611^{**}$
Number of days spent recreating at DL on this trip	4.78	4.12	$t = 2.238^*$
1 to 2 days	19%	22%	
3 days	24%	27%	
4 days	16%	23%	
5 or more days	41%	28%	$X^2 = 10.082^{**}$
Number of days spent recreating at other lakes yearly	13.42	8.17	$t = 3.359^{***}$
0 to 1 days	14%	20%	
2 to 4 days	16%	32%	
5 to 10 days	34%	29%	
11 or more days	36%	19%	$X^2 = 27.960^{***}$
Number of days spent recreating at DL yearly	8.94	6.55	$t = 2.088^*$
0 to 1 days	17%	9%	
2 to 3 days	22%	29%	
4 to 6 days	24%	32%	
7 or more days	37%	30%	$X^2 = 12.209^{**}$
Group Composition			$X^2 = 14.746^{**}$
Family	68%	59%	
Family/Friends	20%	28%	
Friends	5%	8%	
Alone	4%	4%	
Other	4%	1%	

* Indicates significant differences between 2001 and 2003 (* $p < .05$, ** $p < .01$, *** $p < .001$)

boating. The interviews were conducted at day use sites, camping areas, along a bike trail, at areas around the Diamond Lake lodge, and at boat ramp areas. Diamond Lake visitors were asked a battery of questions about their trip characteristics, visitation patterns, recreation preferences, and satisfaction levels. For the purposes of this paper, differences in satisfaction levels and opinions about the lake were examined across the two study years.

3.0 Results

An analysis using cross tabulations and t- tests showed that there were numerous significant differences between the years 2001 and 2003. With regards to visitor

demographics, the ethnic diversity of the respondents increased significantly in that two-year period (Table 1). The proportion of non-Caucasian visitors doubled ($X^2 = 5.538^*$) between 2001 (4% non-Caucasian) and 2003 (8% non-Caucasian). However, no significant differences were noted for age or gender of the respondents across the two years. Group composition changed significantly between 2001-2003 ($X^2 = 14.746^{**}$), with the proportion of family and friends groups increasing from 20% to 28% from 2001 to 2003, and friends only groups increasing from 5% to 8%. Conversely, the proportion of visitors in family only groups dropped from 68% to 59%.

Table 2.—Summary of Significant Differences in Satisfaction Ratings and Overall Satisfaction by Year

Satisfaction Ratings ^a	2001	2003	Test of significance (t)
Safety and Security	3.72	4.23	-7.085***
Recreation Setting	4.15	4.56	-5.799***
Responsiveness of Staff	4.54	4.25	4.197***
Condition of Facilities	4.00	4.04	N/S
Health and Cleanliness	3.91	3.82	N/S
Overall satisfaction (10-point scale)	8.27	8.26	N/S

^a Response Code: 1="Awful" to 5 = "Excellent"

* Indicates significant differences between 2001 and 2003 (* p < .05, ** p < .01, *** p < .001)

The proportion of first time visitors has increased dramatically over the two-year period ($X^2 = 49.880^{***}$), from just 9% in 2001 to one-third of the respondents (33%) in 2003. There was a significant difference between years in the reported length of stay at Diamond Lake during the current visit ($X^2=11.020^{**}$). The proportion of respondents staying for less than 5 days increased (2001 = 59%, 2003 = 72%), while the proportion of visits lasting 5 or more days dropped from 41% to 28%. This finding seems to identify a new user group for Diamond Lake, the weekenders, who stay for a few days, while the longer vacationers (5 days or more) are less prevalent.

Diamond Lake visitors are increasingly going to other places as well as recreating at Diamond Lake. In 2001, nearly two thirds (61%) of the subjects surveyed indicated that they recreated only at Diamond Lake. In 2003, that proportion had dropped to 50% ($X^2 = 6.611^*$). Additionally, the respondents surveyed in 2003 reported that they spent significantly fewer days recreating at lakes other than Diamond Lake (2001 = 13.42, 2003 = 8.17, $t = 3.359^{***}$) as well as at Diamond Lake (2001 = 8.94, 2003 = 6.55, $t = 2.088$). The proportion of respondents who visited other lakes between 0-4 days in the past year increased in 2003, with a precipitous drop in the number of recreationists who spent seven or more days recreating at lakes other than Diamond Lake ($X^2 = 27.960^{***}$).

3.1 Customer Satisfaction

Regarding customer satisfaction, several levels of trip quality were measured in this study. These measures

included 13 specific satisfaction attributes (5-point Likert scale) along with customer satisfaction ratings for five quality domains (5-point Likert scale) and an overall satisfaction rating (10-point Likert scale). Three of the five quality domains showed significant differences between 2001 and 2003 (Table 2). Two of those domains were rated higher in 2003 than 2001: condition of recreation setting (2001=4.15, 2003=4.56, $t = -5.799^{***}$) and safety and security (2001=3.72, 2003=4.23, $t = -7.085^{***}$). Conversely, the responsiveness of staff scale was rated lower (2001=4.54, 2003=4.25, ($t = 4.197^{***}$).

About half of the specific satisfaction items (6 of 13) showed significant differences (Table 3). In 2003 visitors felt less crowded (2001=4.25, 2003=4.40), perceived less conflict (2001=4.25, 2003=4.39) and were less likely to agree that the conditions for fishing were not what they used to be (2001=4.34, 2003=3.83). However, the following items were rated worse in 2003: incompatibility of recreation activities (2001=1.29, 2003=2.29), level of disappointment with some aspect of the lake visit (2001=2.34, 2003=2.64), and the balance between social and biological values in the management of Diamond Lake (2001=3.73, 2003=3.57). Interestingly, there was no significant difference in the 10-point overall satisfaction rating (2001=8.27, 2003=8.26, see Table 2).

The final stage of data analysis used multiple regression analysis to determine the relationship between the specific satisfaction indicators (domain quality ratings and individual items, see Tables 2 and 3) and overall satisfaction. For this analysis, an overall satisfaction index

Table 3.—Summary of Significant Differences in Recreationists' Opinions by Year

Opinions of Recreationists ^a	2001	2003	Test of significance (t)
I had the opportunity to recreate without feeling crowded	4.25	4.40	-2.362*
I could find places to recreate without conflict from other visitors	4.25	4.39	-2.300*
There is a good balance between social and biological values in the management of Diamond Lake	3.73	3.57	2.124*
Recreation activities at the lake were NOT compatible	1.96	2.29	-3.951***
I was disappointed with some aspects of my visit to the lake	2.34	2.64	-2.967**
Fishing at Diamond Lake is not what it used to be	4.24	3.83	-3.966***
I thoroughly enjoyed my visit to Diamond Lake	4.51	4.44	N/S
My trip to Diamond Lake was well worth the money I spent to take it	4.33	4.43	N/S
I avoided some places at the lake because there were too many people there	2.22	2.28	N/S
The number of people at the lake reduced my enjoyment	2.12	2.04	N/S
The behavior of other people at the lake interfered with the quality of my experience	2.18	2.06	N/S
The other people at the lake increased my enjoyment	3.23	3.21	N/S
The lake and its surroundings are in good condition	3.76	3.69	N/S

^a Response Code: 1 = Strongly Disagree" to 5="Strongly Agree"

* Indicates significant differences between 2001 and 2003 (* $p < .05$, ** $p < .01$, *** $p < .001$)

was created using three of the individual satisfaction items (I thoroughly enjoyed my visit to Diamond Lake, My trip to Diamond Lake was well worth the money I spent to take it, I was disappointed in some aspects of my visit to the lake). Previous studies suggest that such multiple-item indices of satisfaction are more sensitive and reliable than single item ratings (Graefe and Fedler 1986). In this study, reliability analysis showed good reliability for an index created from these three items (standardized Cronbach's alpha = .69).

In 2001, multiple regression analysis identified three significant predictors of overall satisfaction. The strongest predictor of overall satisfaction was the item, "recreation activities at the lake were not compatible" ($\beta = -.419^{***}$). Those who agreed more strongly with this statement were significantly less satisfied. The other two significant predictors of overall satisfaction were the quality ratings for the "condition of facilities" and "safety and security" domains. Higher ratings for these customer service domains were associated with higher overall trip satisfaction. This regression model accounted for approximately 50% of the variance in overall trip satisfaction.

In 2003, multiple regression analysis identified four significant predictors of overall satisfaction. Again, the statement, "recreation activities at the lake were not compatible" ($\beta = -.314^{***}$) was a strong inverse predictor of overall satisfaction. The other significant predictors in 2003 were different than those in 2001. The statements, "there is a good balance between social and biological values in the management of Diamond Lake" ($\beta = .142^{***}$) and "I had the opportunity to recreate without feeling crowded" ($\beta = .338^{**}$) were significant predictors of overall satisfaction in 2003. Additionally, the rated quality of the "health and cleanliness" domain ($\beta = .260^{**}$) was a significant predictor of overall satisfaction. Overall, this regression model accounted for approximately 46% of the variance associated with overall satisfaction.

4.0 Conclusions and Implications

The findings of this study show that significant differences in the user populations have taken place at Diamond Lake. However, the respondents' evaluation of their overall satisfaction has not been impacted. This seems to indicate that a simple examination of customer satisfaction is not an appropriate method of ascertaining visitor perceptions about Diamond Lake. Clearly, the

Table 4.—Regression of Specific Satisfaction Attributes at Diamond Lake on Overall Satisfaction in 2001 and 2003 (non-significant values not shown).

Satisfaction Attributes Independent Variable ^a	Standardized coefficients (β)	
	2001	2003
Rated quality – Health and Cleanliness		.260
Rated quality – Condition of Facilities	.285	
Rated quality – Safety and Security	.229	
Recreation activities at the lake were NOT compatible	-.419	-.314
There is a good balance between social and biological values in the management of Diamond Lake		.142
I had the opportunity to recreate without feeling crowded		.338
R ²	.503	.460
Adjusted R ²	.496	.455

^a Dependent variable is a satisfaction index created from 3 items: I thoroughly enjoyed my visit to Diamond Lake, My trip to Diamond Lake was well worth the money I spent to take it, I was disappointed in some aspects of my visit to the lake.

user groups at Diamond Lake have changed, and just as clear is the finding that the recreationists who were interviewed were satisfied with their experience. In fact, of those satisfaction categories where significant differences were found, two of the three satisfaction ratings were higher in 2003 than in 2001 (safety/security and condition of recreation setting). Similarly, of the six opinion statements that showed significant differences between 2001 and 2003, three of them showed Diamond Lake in a more positive light in 2003 than 2001.

Interestingly, the items that moved in a positive direction were related to visitors' perceptions about conflict, crowding, and the condition of fishing at the lake. And lastly, a linear regression model of the specific satisfaction attributes on overall satisfaction showed distinctly different predictors of satisfaction between 2001-2003. While the compatibility of recreation activities was a significant (but negative) predictor of satisfaction in both 2001 and 2003, the only other significant predictors of overall satisfaction in 2001 were the condition of facilities and safety/security. Conversely, in 2003 the balance between social and biological management and the crowding variable, along with the compatibility variable, predicted overall satisfaction.

Overall, these findings indicate that recreation resource managers should focus on maintaining and improving the environmental and social qualities of the lake,

regardless of the make up of the user group. Certainly, the sociological and biological makeup of Diamond Lake has changed, and the resource managers charged with satisfying the public who visit the lake have met the needs of the new users at Diamond Lake. But study results suggest that resource managers should monitor traditional social carrying capacity issues at the lake and the surrounding area (e.g. crowding, conflict), and the impacts of the changes in the biological make up of the lake. Specifically, resource managers should continue to monitor recreationists' experience levels as changes in the biological and social configuration of the lake can directly affect a visitor's overall experience.

Future research at Diamond Lake should focus on understanding the dynamic changes that have taken place at Diamond Lake. For example, what happened to the recreationists who were interviewed in 2001, a group that was clearly different than the recreationists interviewed in 2003? Were these people displaced to other recreation areas, and if so, where have they gone? And lastly, given the diversity of the new user group, should resource managers focus on meeting the needs of the "weekenders" or attempt to lure back longer "vacationers?" Merely understanding that the overall satisfaction has remained high will not be sufficient information with which to provide a quality recreation experience for the many different types of users who recreate at Diamond Lake.

5.0 Citations

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