

Devils Lake: Report on the Potential Economic Impact of Non-Native Aquatic Macrophytes



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Introduction

Devils Lake is an important part of the Lincoln City and Lincoln County economies. The City of Lincoln City has many tourist draws, and when it comes to outdoor activities, the city boasts the Pacific Ocean, Devils Lake, and the Siletz Bay. Each offers its own unique experience.

This report will summarize the current economic contribution of Devils Lake to the community. It will seek to explain the potential impact to the local economy if Devils Lake were to have a resurgence of non-native aquatic plants. The report begins with real estate values, which are separated into two groups, lakefront and lake view. This report will then go on to discuss the potential economic impact of non-native aquatic plants to popular activities on Devils Lake including: boating, camping, fishing and other general lake use activities. Finally, brief sections on public investment and Coho salmon have also been included.

Historically, Devils Lake became inundated with non-native aquatic macrophytes in the 1960's, specifically Eurasian watermilfoil (*Myriophyllum spicatum*) (Sytsma, *et al.* 2012). As a result of growing community concerns about the usability of the lake, the City of Lincoln City, Devils Lake Water Improvement District (DLWID) and the Environmental Protection Agency (EPA) partnered to introduce sterile grass carp (*Ctenopharyngodon idella*) in 1986. By 1993 lake usability had returned (CH2M Hill, 1994). Currently, the sterile grass carp population is decreasing and subsequently aquatic plant species are beginning to return to Devils Lake (Sytsma, *et al.* 2012). Devils Lake Water Improvement District has conducted or is in the process of conducting several studies regarding the resurgence of non-native aquatic macrophytes and their potential impact. This study will focus on the economic impacts.

A similar report was conducted by Al Rice in 1982 (Rice 1982). Rice was a volunteer for the Preservation Association of Devils Lake and a lakefront resident. He went on to become a founding member of the Devils Lake Water Improvement District and served on the DLWID board. In that study Rice looked at what could potentially be added to the local economy by reducing aquatic invasive species. Similar to this study, Rice included sections on real estate, camping, boating, fishing, and motels. Rice concluded that removal of invasive species would add \$765,000 to the local economy or 1.8 million in 2013 dollars (Rice 1982; and US Bureau of Labor Statistics, 2013).

For this study Lincoln County Assessor's office provided real estate information. Studies documenting the loss to real estate values due to aquatic invasive specie invasions were used to calculate impact. For recreational and park use economic values, state agencies provided data as did event organizers. Unfortunately, in some cases data were not available or lacked details. In those cases, researchers attempted to find the best anecdotal evidence available, and solicited information from individuals closely connected with the topic. This report aims to use the best available information for all sections.

Furthermore, for recreational and other lake users, the economic contribution will be attributed to each lake user. Users will be broken down into two or three different subsets

depending on what data are available. The first subset is a *local* user, which includes locals to Lincoln City, the second category is *day trip*, for those who will travel to Devils Lake but not spend the night, the third subset is *overnight visitor*, which is defined by a person who will be in Lincoln City for at least one night.

The lodging section of this report depended on interviews with hotel and Vacation Rental Dwelling Managers who contributed their best insight into occupancy rates and potential fluctuations, as well.

One final consideration is the multiplier effect of keeping dollars local and bringing dollars into the local economy. According to a study conducted by the Institute for Self Reliance, dollars that are spent in locally owned businesses have a multiplier effect, meaning they circulate in the economy to have a real value of \$1.45, and dollars spent at corporate chains have a multiplier of \$1.15 (Mitchell, 2009). Therefore, we can contend that the total impact to the local economy could actually be closer to 1.15 – 1.45 times the results.

Background

Devils Lake is located on the Central Oregon Coast in Lincoln County. The west side of the lake is bordered by the City of Lincoln City, with the east side of lake being in the County. Portions of Neotsu and Otis, which are two small unincorporated communities, also border the lake.

Devils Lake is 685 acres, 3.3 miles long, and 1,400 feet across on average. Devils Lake is a shallow coastal lake, with a mean depth of 8.4 feet. The major tributaries into Devils Lake are Rock and Thompson Creeks. Devils Lake is connected to the Pacific Ocean via the D River, the World's Shortest.

Devils Lake is primarily used for recreation. Fishing, boating, swimming, kayaking, wildlife viewing, jet skiing, water skiing, wake boarding, and stand up paddle boarding are common uses on the lake. In addition, the lake features a number of city and state parks. City parks are popular places in the summer for visitors wanting to avoid the strong coastal winds. The parks provide a place to get some sun, picnic and offer venues for kids to play.

Development around Devils Lake resembles urban development more so than what would be seen around a rural lake. The west side of the lake has urban densities of 6 to 8 homes per acre. Similar densities can be seen in parts of Neotsu and Otis, specifically in neighborhoods like Sand Point and John's loop. The east side of lake is less developed overall, but there are still many lakefront homes.

Real Estate Values

Devils Lake has a long been a popular place to build a home. When many people think of the coast they think of ocean front homes, but many enjoy the lake, so much so, that ocean front

prices are very similar to lakefront. Not only do people enjoy living directly on the lake, but property values near the lake also draw premium prices.

A review of county assessment data provides details on lakefront properties and lake view properties. Information from this section was supplied by Matt Wylie – Lincoln County Appraiser.

Lakefront Real Estate Value

As expected lakefront properties have a higher economic value versus similar pieces of property which are not lakefront. According to Matt Wylie, Lincoln County Appraiser, the lakefront properties average three times the value when compared to a similar piece of property that is not lakefront (M. Wylie, Personal Communication. December 2012). The total 2012 market value of the 446 lakefront properties is roughly \$178,500,000 or about \$400,000 a lot (M. Wylie 2012). This number is three times greater than what would be expected if these same properties were not lakefront properties and would therefore change the value to \$59,500,000 or a difference of \$119,000,000 to total market value as shown in Table 1. Therefore, lakefront properties add \$119 million dollars to total real estate values due to the property being lakefront.

Table 1. Lakefront property, market values vs same properties were they not to be lake front

	Market Value	Increase in Value due to being lakefront
Lakefront	\$178,500,000	\$119,500,000
Non Lakefront	\$59,000,000	

Local government is one beneficiary of increased property values, since property values determine tax revenue. In the state of Oregon however, market values and assessed values are not the same. Due to Measure 50 properties in the State of Oregon are not taxed at their market values, but by their assessed value.¹ According to the County Assessor’s office assessed values in Lincoln County are on average 81.8% of market value (M. Wylie, 2012). Therefore, to determine what the annual property tax contribution is for lakefront properties, the total market value must first be reduced by 18.2%, or \$32,487,000. That reduction equates to an assessed value of roughly \$146 million dollars. Table 2, shows the increase to the tax rolls by virtue of the properties being lakefront versus what those same properties assessed values would be were if they were hypothetically not situated on Devils Lake.

¹ Measure 50, was approved by the Oregon Legislature in 1997. Measure 50 limits annual growth of assessed value to 3%. Market value has increased greater than 3% a year.

Table 2. Lakefront property, assessed value vs same properties were they not to be on the lakefront

	Total Assessed Value	Increase in Value due to being lakefront	Increase to tax rolls
Lakefront	\$146,013,000	\$97,751,000	\$1,325,504
Non Lakefront	\$48,262,000		

The \$97,751,000 in added value equates to an increase of \$1,325,504 to local tax rolls using a tax rate of \$13.56 per \$1,000 assessed (M. Wylie, 2012). The \$13.56 per \$1,000 is a county average, and may change lot by lot. These taxes help to fund a variety of different local government entities, including the Lincoln County School District, Lincoln County, and municipalities. As shown in Figure 1, there are a also a few smaller taxing entities in the county, one of which being Devils Lake Water Improvement District, which along with other water districts makes up 2% of total tax dollar distribution.

Lincoln County 2012-2013 Tax Dollar Distribution

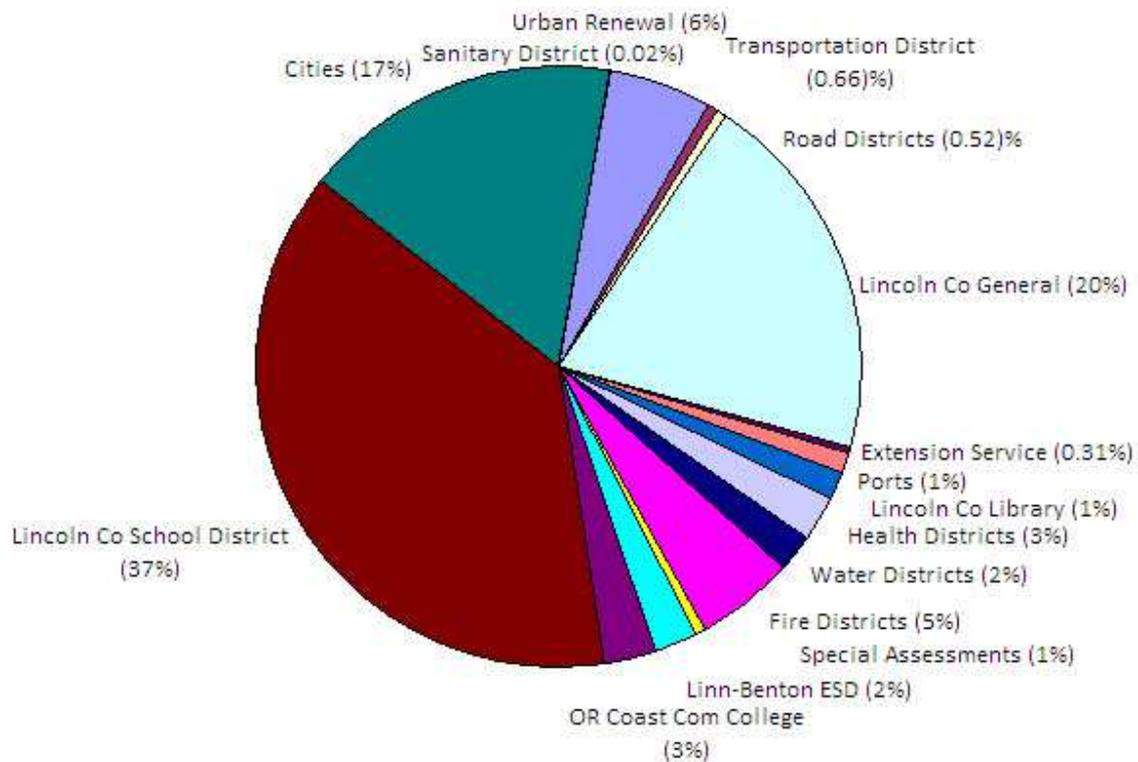


Figure 1. Lincoln County Tax Dollar Distribution²

² http://www.co.lincoln.or.us/assessor/tax_distribution/Tax%20Dollar%20Distribution%20Pie%202012-2013.pdf

Table 3 shows the actual amounts and distribution of increased tax revenue generated by lakefront properties. For example, an additional \$512,069 is added to the local school district by these properties being lakefront as opposed to if theoretically these same properties were not lakefront. Small taxing districts benefit too, as shown DLWID hypothetically gains \$24,428 in tax revenue.

Table 3. Distribution of selected taxing districts associated with Devils Lake*

	Lakefront	Non Lakefront	Revenue gained
Oregon Coast Community College	\$60,318	\$19,937	\$40,381
Fire Disrict	\$176,398	\$58,305	\$118,093
Lincoln County	\$427,862	\$141,422	\$286,440
Lincoln City	\$764,889	\$252,820	\$512,069
Schools K-12	\$827,733	\$273,592	\$554,141
DLWID	\$36,489	\$12,061	\$24,428
Total	\$2,293,689	\$758,138	\$1,535,551

*Not Calculated for Compression

Lake View Real Estate Value

Not only does the lake increase the value of lakefront homes, but on average the 250 lake view properties also have higher land values when compared to similar properties that do not offer a lake view. Although not as dramatic as the three fold increase in both land and improvement values seen in lakefront, lake view land values are 124% greater then non lake view land values (M. Wylie 2012). The average improvement value for a lake view property is \$108,250, which is not significantly different then a non lake view property in the study area. Consequently, in order to determine the added value to a property with a lake view, only the land values will be considered. When it comes to determining total property value, and the possible tax implications, land and improvement values will be considered.

According to Matt Wylie of the County Assessors office the certified 2012 market value of a lake view lot with no improvements has a base value of \$68,000, which is 24% greater then the base value of \$51,680 for a non lake view property. The \$68,000 figure is based on a 15,000 sq/ft lot with no adjustments (M. Wylie, 2012). Wylie went on to state that price will vary based on lot characteristics. Lot sizes in the area range in size from 5,000 sq/ft to greater then one acre. For this study the 15,000 sq/ft lot is a reasonable average.

When calculating the increase in land value, the number of properties was multiplied by the average land value of \$68,000. As seen in the Equation 1.

Equation 1. Increase in land value due to being lake view.

$$250 \text{ Properties} * \frac{\text{Avg. Value } (\$68,000)}{\text{Properties}} = \$17,000,000$$

If these same properties were not lake view, the result would be \$12,920,000, which is the result of the same equation but replacing \$68,000 with \$51,680, which is the non lake view value. Finally \$12,920,000 was subtracted from \$17,000,000 to equal \$4,080,000, which is the hypothetical additional market value a property gains from being lake view (See Table 4). This number then is representative of the added value of being on the lake, since according to the County Assessor's office improvement values for lake view properties tend to be similar to those that are not lake view, which means that the added value of the lake is best seen in land value.

Table 4. Lake view land value vs the same properties were they not lake view property

	Total Market Value	Increase in value due to being lakefront
Lakeview	\$17,000,000	\$4,080,000
Non Lakeview	\$12,920,000	

In order to determine the additional tax revenues generated from lake view properties the assessed value will have to be calculated. The county wide average of 81.8% of market value was used to determine that the assessed value of lake view lots is \$13,906,000. Table 5 shows the total assessed value, the hypothetical increase of the combined lots due to being lakefront and the increase to county tax rolls.

Table 5. Lake view assessed land value vs the same properties were they not lake view property

	Total Assessed Value	Increase in value due to being lakeview	Increase to Tax Rolls
Lakeview (land value)	\$13,906,000	\$3,337,440	\$45,256
Non Lakeview (land value)	\$10,568,560		

In addition to lakefront and lake view there is a third category of property that was not possible to quantify for this study. This category includes properties within close proximity of the lake, but do not technically fall into the designation of lakefront or lake view. Specific areas with high densities of these home includes parts of Neotsu, Otis, properties in John's Loop neighborhood, and properties along West Devils Lake Road. Although these homes are not lake

view or lakefront, many have easy access to boat launches, fishing piers, and in some instances deeded access points to Devils Lake. These amenities and proximity to the lake allow these properties to still offer the benefits of the “lake life”. Although it is not expected that the increase in property values is as high as lake view or lakefront, the value certainly exists.

In summary, it is clear that Devils Lake adds value to the real estate in close proximity to the lake. As expected lakefront increases are the most dramatic, with lakefront properties having 3x the value of equal properties that are not lakefront. When this stock of properties is looked at as a whole, the total assessed value increase is roughly \$101 million which yields \$1,325,504 estimated annual taxes, which is shared to fund and support local governments. In addition to the lakefront, there are lake view properties which at a minimum add another \$45,000 in tax revenue to local governments through the roughly \$3.37 million in assessed value. Together this totals \$1,370,504 added to local governments in the form of property taxes.

Economic Impact

Property values are based on a number of things. In addition to the ubiquitous explanation of location, many other factors impact property values, such as neighborhood, access to schools, crime rates, and even air quality has been shown to impact property values (Small, 1974).

Determining the economic impact of aquatic invasive species has not been highly researched. Studies by Boyle & Bouchard (1996) and Leggett & Bockstael (1999) have looked at studies on the effects of water quality and their relationship to land values, but the most applicable study to Devils Lake was conducted by the University of Wisconsin Madison’s Department of Agricultural & Applied Economics. In 2008, Horsch and Lewis published “The Effects of Aquatic Invasive Species on Property Value: Evidence from a Quasi – Random Experiment.” The study calculated the impacts of Eurasian watermilfoil on property values for 170 lakes in Northern Wisconsin. Researchers concluded that land values decreased by 13% for lakes plagued by aquatic invasive species, and land property values decreased by 8% (Horsch and Lewis, 2008)

For this study these percentages are simply estimates and help to provide a possible portrait of what the result could be if aquatic non-native species returned to Devils Lake. Earlier in this section, land values and improvement values were separated for lake view properties. However, when looking at the possible potential impact in Table 6, total lot value was calculated. Lake view total market value estimated averages are roughly 44 million, seen in Equation 2.

Equation 2. Lake view estimated make value

$$250 \text{ Properties} * \left(\frac{\$68,000}{\text{Properties}} \right) + \left(250 \text{ Properties} * \frac{\$108,250}{\text{Improvement Value}} \right) = \$44,062,500$$

When applying the Horsch and Lewis studies findings of 8% and 13% decreases in property values to Devils Lake it yields the following results: an 8% decrease would equate to \$17,805,000 loss to market values, and a 13% decrease in value would equate to a loss of \$28,933,125 in total market value.

These market value loses would also impact assessed values and tax revenue although the exact figures are difficult to show due to Oregon tax law and limitations of the data. As stated earlier, due to Measure 50, assessed values can only increase 3% per year regardless of real market value changes. Therefore, only 16% of properties are being taxed at their real market value (S. Wylie, 2013). The hypothetical results shown in this study for assessed values would be accurate should market values equal assessed values. Anecdotally real market values may go below 8-13% and thus be less than assessed values, but for this study we simply showing one possibility based on the Wisconsin study.

Table 6, shows the theoretical loss to market values, assessed values and the consequential loss to local tax revenues. Market values are shown declining by 8% and 13% as could be expected based on the Horsch and Lewis Study. Table 6, also shows the greatest hypothetical loss to assessed values of 13%, which would lead to an annual tax revenue reduction of \$320,929.

Table 6. Potential economic impact to real estate

	Market Value	Potential 8% Loss	Potential 13% Loss
Lakefront	\$178,500,000	\$14,280,000	\$23,205,000
Lake View	\$44,062,500	\$3,525,000	\$5,728,125
Total	\$222,562,500	\$17,805,000	\$28,933,125
	Assessed Value	Potential 13% Loss	Potential Tax Revenue Loss
Lakefront	\$146,013,000	\$18,981,690	\$257,391
Lake view (land value)	\$36,043,125	\$4,685,606	\$63,537
Total	\$182,056,125	\$23,667,296	\$320,929

Recreation

Devils Lake is home to a variety of parks and park amenities for public use. The lake has four city parks, Holmes, Hostetler, Regatta, and Sand Point, which is in the county but managed by the city. There are also two state parks, East Devils Lake State Recreation Area, and the state campground, Devils Lake State Park.

Park use is significant and parks are used for a variety of activities including swimming, fishing, playing, sun bathing, barbeques, family reunion, parties, community events, wildlife/nature watching, and boat launch/mooring. East Devils Lake State Recreation Area has a car counter at the entrance of the recreation area. Although the counter does not record the reason for

the trip, it does at least give an idea of how many people are visiting the park and Devils Lake. Unfortunately, no other parks record park use.

East Devils Lake State Recreation Area (EDLSRA) is a state park managed by the Oregon Parks and Recreation Department (OPRD). The public primarily uses the park for its boat launch, fishing dock, and picnic areas. According to OPRD car counts, an average of 71,181 cars enter EDLSRA per year since 2007. OPRD estimates that each car averages two park users. Therefore, OPRD estimates an average of 142,362 visitors to EDLSRA a year.

Regatta Park, straight across the lake from EDLSRA is also a busy park, and along with EDLSRA the highest used. It has a boat launch, large play structure, beach, swim area, picnic area, and heavily used fishing dock. Smaller parks like Holmes Road and Sand Point are predominately used by local residents, and certainly create a more livable neighborhood, but provide less direct economic value to the community.

Boating

The Oregon State Marine Board (OSMB) maintains boat use data in the State of Oregon. OSMB conducts triennium surveys of all registered boat users in Oregon. This study is limited however since only motorized boats and sail boats exceeding 12 feet need to be registered and therefore canoes, kayaks, paddle boats, and other non-motorized boaters are not included in the triennium survey (OSMB website). Thus for this study, it was not possible to quantify non-registered boats. The triennium surveys do not include boat rentals, and therefore the owner of the only private marina on the lake was consulted. Lastly, the boating numbers attributed with fishing will be shown in the boat use section, but the dollar values will be counted with the fishing section of this report.

In Lincoln County, Devils Lake is one of 12 monitored water bodies that registered use in the 2008 triennium survey. Devils Lake's popularity varies by year, but generally it is the third to sixth most popular water body in the county. Other favorite water bodies in the county include, the Pacific Ocean, Yaquina Bay, Siletz River, and Alsea River (OSMB Triennium Survey, 2008). When considering fresh water, Devils Lake is almost always in the top three. On a statewide level in 2011 Devils Lake was the 45th most popular water body out of 208 in the state for boat use, with a total of 14,168 boat use days (OSMB Triennium Survey, 2011). Total boat use days can be seen in Figure 2.

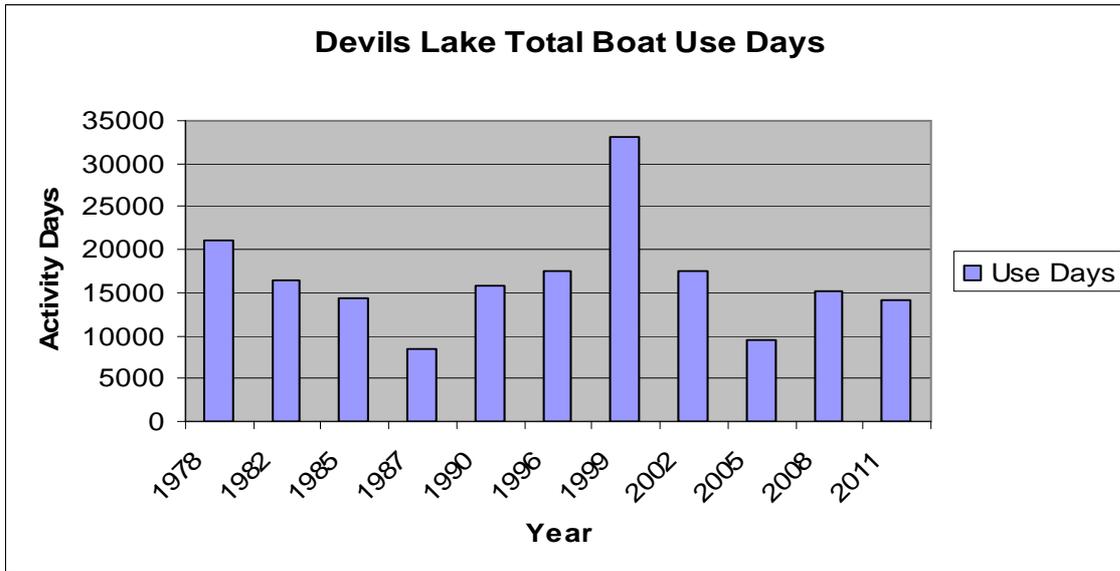


Figure 2. Total Boat Use Days

The Oregon State Marine Board also surveys for type of boat use activity. Reporting has changed somewhat over the years, but the Marine Board does have information on the following activities: fishing, water skiing, sailing, cruising, and total boat use days. The data show that the most popular uses on Devils Lake are fishing and waterskiing. Sailing and Personal Watercraft Use (PWC) are less popular but still substantial. Although the final category of “cruising” does not have the highest numbers there is had been consistent and steady rise in this boat use activity up until 2002, with numbers becoming more variable after that (See Figure. 3).

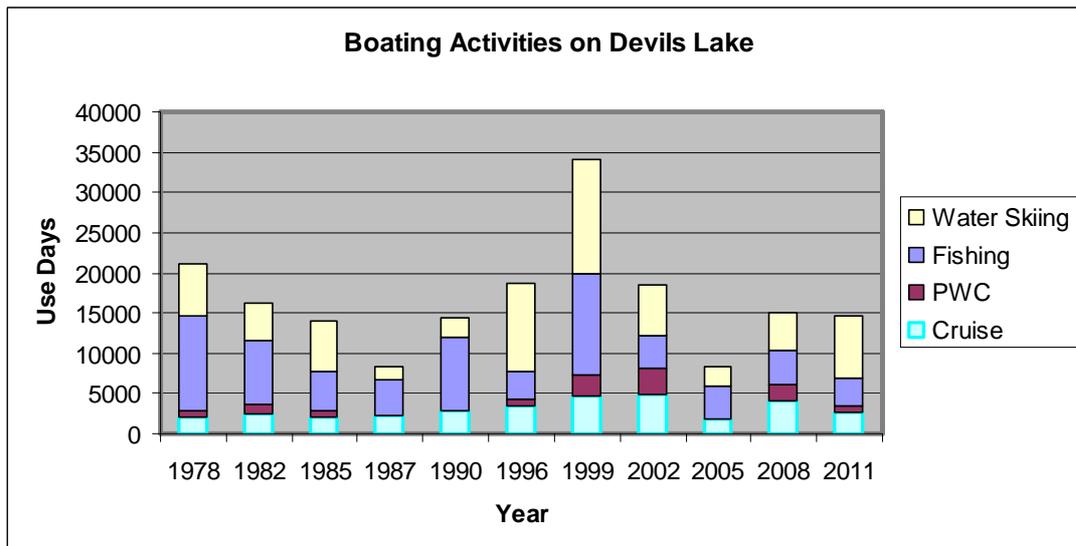


Figure 3: Total Boat Use Days by Activity³

³ Sailing was not included in this chart, due to insignificantly low numbers compared to all other uses.

The most recent OSMB statistics on boating come from the 2011 triennium survey, which has yet to be published. Where possible 2011 boat use numbers will be used, but the 2008 Triennium Survey which has the most comprehensive numbers and is the most recently published will be predominantly used. Boat use is broken down into three categories: trips, boat use days, and activities. A trip is defined as a single trip to a water body, regardless of the duration of the stay. A boat use day is any day that a boat is used. Activity refers to the activity that the boater took part in. In the 2008 triennium survey activities included fishing, personal water craft use, water skiing, sailing, and cruising. To better explain the designations, the Oregon Boating Law Administrator from the Oregon State Marine Board provided the following example (Henry, Personal Communication. January, 2013):

“A trip is a visit to a waterway. Go to Devils Lake and camp for three days and you’ve made one trip. If you put your boat in the water two of those three days, you rack up two boat-use days. If you skied in the morning and fishing in the afternoon, that’s two activity days.

As would be expected, boat use and activity days are fairly close, Devils Lake had 15,255 use days, and 15,143 activity days in 2008 (OSMB Triennium Survey 2008). What is unexpected is that activity days are lower than boat use days. This is most likely due to reporting error either in compiling the data or those taking the survey. Since this study is focused on the economic impact, use days and visits are more important than the specific activity, although activity will help to determine number of individuals in each water craft.

The Oregon State Marine Board also gathers information on trips, which can be used to define trip length. A trip is any visit to a water body, whether that is a day trip by someone who lives down the street from Devils Lake or a week long trip by someone from another county.

In addition, the Oregon State Marine Board also surveys for boat use by county residence. This is very helpful to determine where trips to Devils Lake are likely originating. In the 2008, there were 114,450 boat trips made in Lincoln County, of those 38,713 were local trips, and the remaining 75,737 trips were from out of the county. These numbers break down to about 66% of boat trips in Lincoln County originate outside of the county. For this study these users will be further broken down by day trip or overnight visit.

A second important piece of information to know is how long the trip is occurring. In order to calculate average trip length, the number of use days (15,225) was simply divided by the number of trips (10,475) which equals 1.45, and therefore the average boat trip to Devils Lake is about 1.5 days.

Determining the economic value of boat use requires looking at boat use days, and activity. The Oregon State Marine Board does not look at number of boaters per boat, simply boat use. In order to determine the economic value of boating though, not only is the boat important but

how many people were in the boat. Since economic values pertain to individuals when considering lodging, food and beverage, retail purchases, transportation, and recreation. Since it is not possible to know exactly how many people are in each boat, three multipliers were chosen. Three members per boat was chosen for water skiing, since legally in order to water ski, there must be a driver and spotter. Two members per boat was chosen for cruising, fishing and sailing which is the OPRD multiplier per vehicle entering East Devils Lake State Park. Lastly, one member per boat was chosen for personal water craft, since most PWC's are single occupancy, although the trend for PWC's is towards double and even triple occupancy.

Table 7 summarizes boat use days and accompanying number of boaters. Lastly, OSMB boating numbers are broken up by county. As previously stated for Lincoln County, 34% of boating trips are from local residents, and 66% originate outside Lincoln County (OSMB Triennium Survey 2008).

Table 7. 2008 Individual Boat Users

Activity	Boat Use Days	Total Boaters
Fishing	4,260	8,520
Sailing	43	86
PWC	1,969	1,969
Water Skiing	4,816	14,448
Cruising	4,137	8,274
Total	15,225	33,297

Knowing the number of users is an important first step, but in order to determine what the economic input is of these users, a value must be added to each user. This study will use the Longwoods USA, 2009 Oregon Coast Study on visitors as a basis to determine average expenditures per visitor. The Longwoods USA Oregon Coast Study only focuses on over night visitors (Longwoods, 2009). In order to account for individuals making a day trip or for local users, it was necessary to make assumptions and adjust the Longwoods number in an effort to more accurately reflect real expenditures.

To make the most accurate assumptions possible, Sandy Pfaff, the Executive Director of the Lincoln City Visitor and Convention Bureau, was consulted about tourism and tourist behavior. Pfaff states that the general rule is that a visitor would like to have enough activities to occupy them four times longer than the amount of time it took for them to get there. For example, a visitor from Portland which is two hours away from Devils Lake is looking for eight hours of activities a day. Pfaff estimates that this equation equals a total of three to four, two hour activities per day. However, it is expected that most boaters will spend more than two hours on the water, especially those traveling. Thus, for overnight visitors and day trippers then it is

reasonable to expect that boating accounts for at least 50% of their activities and therefore 50% of the total economic value that Longwoods contributes to each visitor.



Figure 4: Average Expenditure Per Oregon Coast Visitor⁴

According to Longwoods study, the average overnight visitor expenditure is \$131. The majority of that, \$82, is on lodging and food as shown in Figure 4. Figure 4 also shows that the remaining \$49 is a combination of retail purchases, transportation at destination, and recreation/sightseeing/entertainment.

When contributing a value to each boater, three categories were created based on where the trip originated in the OSMB Triennium Survey: local boaters, day trip users, and visitors. Locals are defined by those trips originating in Lincoln County. Day trips are for trips originating in one of the adjacent counties of Benton, Linn, Marion, Polk, Tillamook, or Yamhill. Visitors who began their trips further away are most likely going to spend the night and fall into the overnight visitor category. Table 8 shows boat use by local, day trip, and visitor and the associated percentage of each user group.

Table 8. Lincoln County, Local, Day Trip, and Visitor Boat Use Days

Trip Type	Local	Day Trip	Visitor	Total
Boat Use Days	5,177	7,003	3,045	15,225
Percentage of all Trips	34%	46%	20%	100%

⁴http://industry.traveloregon.com/upload/otc/departments/consumer/research/regionalreportsjan20/coastregionalreport_jan20.pdf

As previously explained one half or 50% of the Longwood study's multiplier of \$131 of spending per person/per day was applied to each overnight boater, which equals \$65.50. (Longwoods, 2009). For those making day trips, the lodging fee was not applied, but 50% of the remaining four categories in Figure 4, were applied, totals \$41.00 per boater. Finally for local boaters, 50% of retail, transportation, and recreation was applied which equals \$24.50 per boat use day.

Table 9 is an estimated summary of local, day trip, and visiting boaters annual economic input, which equates to \$1,244,694. Boat fishing accounts for an additional \$264,518 which is not shown in this chart since those values will be included in the fishing section of this report.

Table 9. 2008 Boater Revenue by User Type

Activity	Boat Use Days	Total Boaters	Local	Day Trip*	Overnight Visitor	Totals
Sailing	43	86	\$716	\$1,622	\$1,058	\$3,396
PWC	1,969	1,969	\$16,402	\$37,135	\$24,219	\$77,756
Water Skiing	4,816	14,448	\$120,352	\$272,489	\$177,710	\$570,552
Cruise	4,137	8,274	\$68,922	\$156,048	\$101,770	\$326,740
Rentals		6,250	\$45,000	N/A**	\$221,250	\$266,250
Total	10,965	24,777	\$251,392	\$467,294	\$526,007	\$1,244,694

*Local includes, Benton, Lincoln, Linn, Marion, Polk, Tillamook, and Yamhill counties

**It was not possible to separate day trips from local trips for renters, so all non overnight visitors are considered local.

The Oregon State Marine Board Triennium Survey reports on private boaters, but it does not monitor private marinas or boat rentals. In order to estimate the amount of revenue generated by boat rentals at Devils Lake the owner of the local marina was interviewed. The owner did not offer exact figures, but was willing to offer estimates on how much revenue is generated by boat rentals, and associated expenditures in an average year. The owner reported that the marina generated about \$110,000 in direct boat rentals, and an additional \$27,000 in associated activities like boat moorage and fuel. The owner was also able to provide the estimate of 6,250 annual boat renters or users. The owners reported that at least 60% of visitors are most likely overnight visitors, based on how far they travelled, many of which from out of state.

Not only are renters just spending money to rent a boat, they are also spending money on lodging, fuel, restaurants, retail, and recreation. Theses expenditures are accounted for in table 9, and the losses are accounted for in Table 10. Local and visiting renters were both attributed the same per day spending as local and visiting boaters.

Economic Impact

The economic input of boating to the local economy is considerable. Visiting boaters like all other visitors, need a place to stay, dine at local restaurants and shop at local grocery stores. In

addition all boaters both local and visitor need fuel to haul and operate their boats, as well as equipment and other boat related materials. All of this spending helps to support local businesses primarily in Lincoln City, but county wide as well.

As of today, there does not appear to be a comprehensive study describing the relationship between boat use numbers and aquatic invasive vegetation. It is possible though to speculate a few reasonable results when combining statewide data, anecdotal information, and past experiences when Devils Lake was infested with aquatic invasive species.

Statewide Data

The Devils Lake boat use data is strikingly different from the state wide data as shown in Figure 5. Statewide there was a 20 year trend of boat use increasing, with the most significant jump between the 1985 and 1988 triennium surveys. During much of that same period Devils Lake use is doing the opposite, losing boaters. Although there may be other causes, the most obvious reason for the decline is attributed to poor boating conditions due to an excess of aquatic invasive species.

Coinciding with the Introduction of grass carp, Devils Lake boat use does rebound from the lowest boat use numbers in 1987. Once the grass carp began reopening boating areas boat use numbers quickly increase (1990 – 2002) and again begin to follow state trends. After 2002 statewide boat use numbers begin to decline and Devils Lake boating numbers follow this same trend.

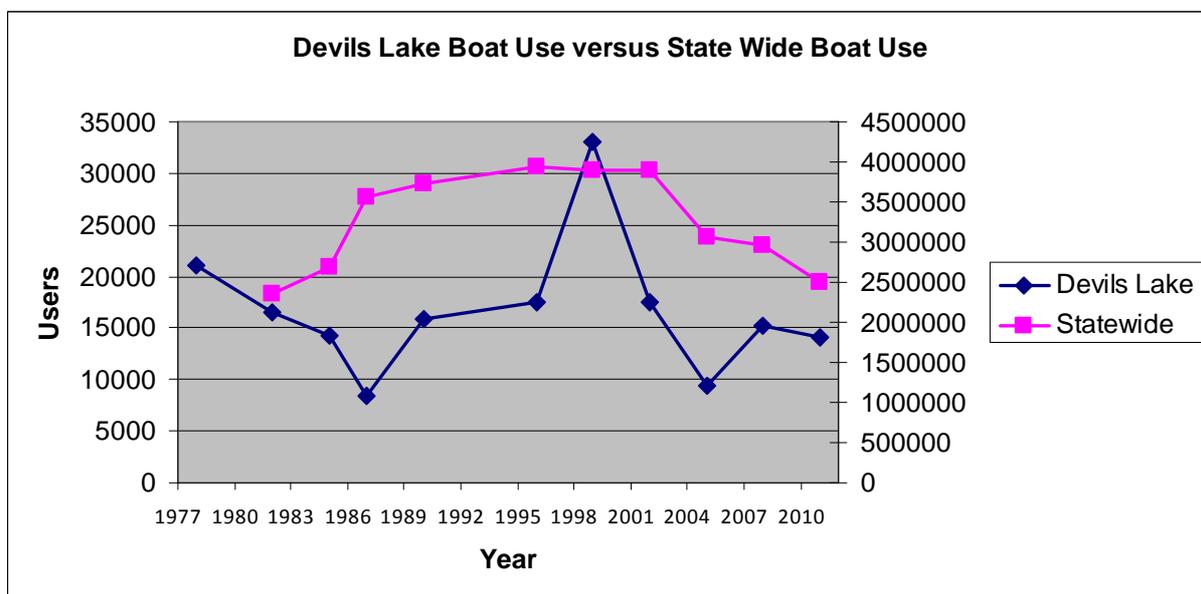


Figure 5: Total Boat Use Days, Devils Lake and Statewide.

Similar trends are seen when Devils Lake is compared to the 50 most popular water bodies for boating. What is seen when looking at Devils Lake data is a consistent decline in boat use,

particularly in jet skiing and fishing from 1978-1987. In 1990, boating begins to recover and by the time that the aquatic plants are no longer hindering boat use, numbers have recovered.

A Lake User's Perspective

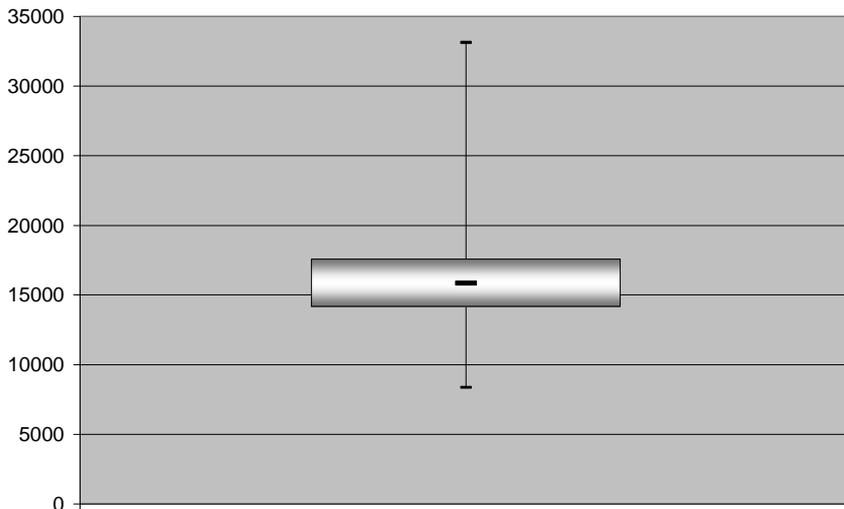
Craig Selvidge is a full time lakefront resident of Devils Lake, a boat enthusiast, part of the organizing team of the Rocky Stone Memorial Kilos, past president of the Preservation Association of Devils Lake, and past DLWID board member. Selvidge has been using Devils Lake since 1971, and he and his wife bought lakefront property in 1984. Selvidge is an avid lake user and well connected with other boat users on Devils Lake.

Due to Selvidge's active boat use and that from his home he is able to monitor boat use at the two most popular boat launches, Selvidge offered the following boat use numbers. Selvidge confidently estimates that when the aquatic invasive vegetation was at its worst, there was about 20 hours of PWC use a week during the peak season (June-October). After grass carp had removed the weeds he estimates that number up to 500 hours a week.

Selvidge also talked about jet ski boats and how the condition of the lake was not appropriate for such use, "the weeds were so thick in the summer months that ducks could walk from my house across the lake to Regatta Park", Selvidge said. He continued, saying that the weeds would wash up on his property, and other parts of the lake, and they smelled bad. From a weed infestation perspective the lake was very polluted, he added.

The weeds made power boating very difficult and people who lived on the lake during that time consistently state there was little jet skiing or boating. These observations are backed up by OSMB data in Figure 3. Selvidge stated that in 1990 he had one of the only ski boats and boat lifts on the lake. Today there are 35 – 40.

By analyzing the OSMB boat use numbers and considering Selvidge's observations, it is possible to come up with a reasonable economic estimate of the impact of aquatic invasive species on Devils Lake. It is clear boat use on Devils Lake increased after the introduction of grass carp. Figure 6 shows the range of the boat use numbers from 1978 – 2010. The box plot in Figure 6 represents the 25-75 percentiles. Average boat use is 14,995 while the median boat use on Devils Lake is 15,547. Devils Lake had its lowest boat use in 1987, with 8,370 boat use days. The maximum boat use was in 1999, but that number was removed from the list since it is statistically an outlier, and there is no apparent reason for the high boat use that year. Therefore, the highest boat use was in 1978, with 20,999.



Devils Lake Boat Use Numbers BoxPlot

Figure 6: Box plot of Devils Lake Boat Use Numbers 1978-2010, 1999 shown as an outlier, but not calculated in mean.

By looking at the boat use over the period from 1978 – 2010, it is possible to determine potential boating loss should aquatic invasive species return.

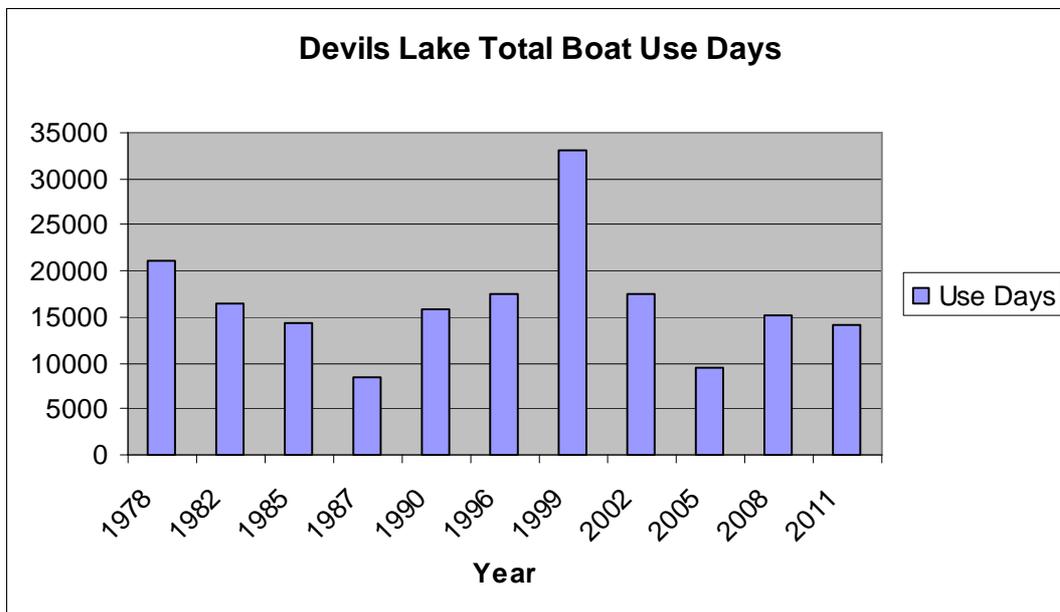


Figure 7: Boat Use Days on Devils Lake.

Figure 7 shows the same trend Selvidge described for boating turnout. Selvidge stated, “There was very low turnout for the boat races from 1981-1992”. As Figure 7 shows, as aquatic plants began to become less of hindrance to boating, the boat use days increase. The result is that

from 1990 – 2000, boater numbers increase significantly as confidence in Devils Lake boating returns.

With the information shown, it is possible to state with significant confidence that boating loss from 1978 – 1987 was due to the dominance of non-native aquatic weeds, or that minimally aquatic invasive plants played a resounding role in the decrease in boat use days. If this loss is to be totally attributed to non-native aquatic species it would be responsible for causing a 60% reduction in boat use. From 1990 – 2002, numbers remained at or above the median until 2005 when boat use days dipped, similar to what was seen at the state level shown in Figure 5.

What could be the expected loss of boating if aquatic invasive species returned? If similar trends repeat themselves, there could be up to a 60% reduction in boat use days. Based on the boat use data in the 2008 OSMB Triennium Survey a 60% reduction in boat use days would result in the loss of 8,500 boat use days per year.

Table 10. 2008 Boater Economic Input with Hypothetical 60% Loss due to Resurgence of Non - Native Vegetation

Activity	Boat Use Days	Total Boaters	Local	Day Trip*	Overnight Visitor	Totals
Sailing	17	34	\$287	\$649	\$423	\$1,358
PWC	788	788	\$6,561	\$14,854	\$9,687	\$31,102
Water Skiing	1,926	5,779	\$48,141	\$108,996	\$71,084	\$228,221
Cruise	1,655	3,310	\$27,569	\$62,419	\$40,708	\$130,696
Rentals		2,500	\$18,000	N/A**	\$88,500	\$106,500
Total	4,386	9,911	\$100,557	\$186,918	\$210,403	\$497,877

*Day Trip includes, Benton, Lincoln, Linn, Marion, Polk, Tillamook, and Yamhill counties

**It was not possible to separate day trips and locals for renters

Table 10 shows what the boater contribution would be to Devils Lake, if the lake again experienced a 60% loss in boat use days. When the total values of local, day trips, and visitor spending in Table 10 is compared to that of Table 9, hypothetical total losses equal \$150,835 from local trips, \$289,376 in day trips, and \$315,604 in overnight visitors (See Sample Calculation below). This equals a total hypothetical loss of \$746,816. When this number is combined with a hypothetical loss of 60% in marina rentals and sales the total annual loss increases to \$829,016.

Sample calculation:

1. Total trip type revenue * 60% = hypothetical annual loss
2. Total trip type Revenue – hypothetical annual loss = hypothetical revenue after resurgence of non-native aquatic species, which are the totals in Table 10.

For example, for local boaters:

1. $\$251,392 * 60\% = \$150,835$
2. $\$251,392 - \$150,835 = \$100,557$

Camping

Devils Lake State Recreation Area Campground is a popular place to camp especially through the summer months when it is full most weekends. The park is unique in that it is the only state campground situated within a municipality, literally just blocks from the heart of town. The park is also nestled among a forested area on the bank of Devils Lake, so that campers are protected from urban noise and other disturbances.

OPRD records the number of campers on a monthly basis. Table 11 shows total annual campers from 2008-2012, as well as an average over the 5 year period. As the table shows, Devils Lake State Recreation Area averaged 47,312 campers per year since 2008.

Table 11: Total Campers at Devils Lake State Recreation Area

Year	Total Campers
2008	49,621
2009	51,227
2010	46,482
2011	44,912*
2012	44,318
5 year Average	47,312

*Due to Devils Lake State Park being closed from January - April 2011 for renovations, 6984 campers were added to the raw 2011 numbers, which is the average of January - April use in 2010 and 2012.

In 2012 Oregon State Parks completed a study on coastal park use entitled "Spending and Economic Activity from Recreation at Oregon State Park Units – Coastal Region and Milo McIver State Park, an update". In this study researchers looked at total park use by visitors, but did not specifically come up with a per camper value. However, the study states that an average camping group in the central Oregon Coast is 4.2 people and on average that group will spend \$274.62 on a non local overnight visit (White, Goodding, and Rosenberger). In discussion with lead researcher Eric White, he suggested that by simply dividing the overnight amount by average group would yield a good estimate for per person expenditure. This calculation applies a value of \$65 per camper. White did suggest that this number is probably high but suitable for this study since this study treats all campers the same, as opposed to separating non local and local campers, as done in OPRD study (E. White, Personal Communication. May 8, 2013).

Table 12 shows what the expected expenditures of campers was from 2008 – 2012. As shown in 2012, total expenditures were about 2.8 million dollars, and the 5 year average is just over 3 million dollars.

Table 12. Total estimated expenditures by camper at Devils Lake State Campground

Year	Total Campers	Average per person expenditure	Total Camper Expenditures
2008	49,621	\$65	\$3,225,365
2009	51,227	\$65	\$3,329,755
2010	46,482	\$65	\$3,021,330
2011	44,912*	\$65	\$2,919,280
2012	44,318	\$65	\$2,880,670
5 year Average	47,312	\$65	\$3,075,280

*January - April numbers for 2011 are an average of January - April numbers of 2010 and 2012, since the Park was closed those months in 2011 due to construction

Economic Impact

The campground at Devils Lake State Park is not totally dependant on Devils Lake to draw in campers. The campground does offer lake access and several activities including fishing, and a boat moorage area that are widely used. Rangers there also offer education activities about the lake, and offer kayak tours. That being said many campers main draw to the park is still probably cheaper prices, nice campground facilities, and the parks proximity to the ocean and Lincoln City amenities. Therefore, there are no clear data that can be used to determine how many people camp at Devils Lake State Park solely to recreate on the lake.

In an effort to get a sense of camping numbers, District staff contacted Park Rangers and asked them about their observations regarding the impact of the lake on camping numbers. Janice Lascano has been a Ranger at Devils Lake State Campground since 1996 and interacts with many campers. Lascano stated that about 25% of campers come to Devils Lake to use the lake (Lascano, Personal Communication. February 2013). Many bring their boats or go fishing, which she says are the two most popular activities for campers. Although she says that 25% of campers come to use the lake, probably only 5% - 10% make the lake their primary focus while staying at the campground. Lascano did say that she was also concerned about possible smells from Devils Lake if the invasive aquatic species returned, since the lake is so close to the campground. She stated that would also impact camper numbers, maybe more so then the recreational aspect.

Table 13. Total estimated expenditures by camper at Devils Lake State Campground

Year	Total Campers	Total Camper Expenditures	Revenue lost at hypothetical 25% decrease in campers	Revenue lost at hypothetical 10% decrease in campers
2008	49,621	\$3,225,365	\$806,341	\$322,537
2009	51,227	\$3,329,755	\$832,439	\$332,976
2010	46,482	\$3,021,330	\$755,333	\$302,133
2011	44,912*	\$2,919,280	\$729,820	\$291,928
2012	44,318	\$2,880,670	\$720,168	\$288,067
5 year Average	47,312	\$3,075,280	\$768,820	\$307,528

*January - April numbers for 2011 are an average of January - April numbers of 2010 and 2012, since the Park was closed those months in 2011 due to construction

Table 13 is based on estimates from Lascano. The table depicts both the potential loss in revenues due to hypothetical 25% and 10% decrease in campers. The 25% or 768,820 loss based on the 5 year average may be too high, since the pros of the park, like location and the amenities of Lincoln City will probably continue to draw many people to the park. On the other hand, 10% or \$307,528 does seem possible, especially, if what Lascano says is true about smells driving people away. To her point, she added that after the new restroom facilities were put into the park, she heard from several campers who had stopped staying at the park, but who now have returned due to the new facilities.

Fishing

Fishing is a popular sport on Devils Lake and draws many locals and visitors. There are a number of public fishing docks including Devils Lake State Park, Regatta Park, Holmes Road Park and EDLSRA. There are also public boat launches at Regatta Park, Holmes Road Park, and EDLSRA.

The Oregon Department of Fish and Wildlife (ODFW) annually stock the lake with 20,000 rainbow trout, which is the main draw for anglers. Devils Lake is also home to a small, warm water, non-native fishery.

This report breaks up fishing into two groups, boat angling and dock or bank angling. The 2008 Oregon State Marine Board triennium survey on boating reported there were 3,561 boat angling days. Assuming that an average fishing boat consists of two anglers, Devils Lake had 7,122 boat fishing days. As shown in the boating section of this report, it was also determined that 80% of those boaters were either local or took a day trip to Devils Lake, and the remaining 20% were overnight visitors.

Dock fishing is also an important activity on Devils Lake. The best available data for dock fishing at Devils Lake is a few days of creel data from the Oregon Department of Fish and Wildlife.

Data are available for three different Saturdays, April 27, 1996, May 10, 1997 and May 17, 1997. On April 27, there were a total of six bank anglers. May 10th had 24 bank anglers, and there were 34 on May 17th.

Therefore, for bank fishing, in addition to limited creel data, observational data will also be relied on. One source is the Lake Manager for the Devils Lake Water Improvement District, Paul Robertson. Robertson and an assistant collect water samples every Monday morning from Memorial Day to Labor Day at public access points around Devils Lake. Subsequently, they revisit all the sites to post the results of the water quality samples. The postings generally take place on Tuesday afternoons. The District also collects water samples every other Wednesday for a portion of the summer. District staff makes frequent trips to the lake during the summer months which includes the regular trips for water sampling and posting the results.

Robertson estimates (Table. 14) seeing a total of 4 – 12 anglers while sampling either in the morning and/or afternoon (Robertson, Personal Communication. January 2013).

Table 14: Estimated Daily Bank Angler Numbers

Park	# of Anglers AM	# of Anglers PM	Total
Devils Lake State Park	1-2	1-2	2-4
Regatta Park	2-6	2-6	4-12
Holmes Road Park	1-2	1-2	2-4
EDLSRA	1-2	1-2	2-4
Total	5-12	5 - 12	10- 24

These numbers remain the same throughout the day, with most individuals fishing for 2 -4 hours (National Survey of Hunting, Fishing and Wildlife, 2012). Therefore it is expected that there are between 12 – 36 anglers a day, which is within in the magnitude of the ODFW creel data. The busy season on Devils Lake begins in mid- April, when ODFW stocks the lake with 20,000 rainbow trout. Spring and summer are both very busy, and angler numbers begin to drop off after Labor Day, reaching winter levels by November 1.

For this study, it is assumed that from April 20, when ODFW stocks fish through November 1, there are about 21 dock anglers a day. That equates to 3,990 during the peak season. For this report it is estimated that fishing effort is only about 25% during the off season months, November 1 – April 20. Therefore, an additional 1,000 fishing days are added, to create a total 4,990. Although this number has some basis in anecdotal evidence, it is supported by limited creel data, DLWID staff observation, and boat use numbers.

To determine the economic impact of the 4,990 bank angling days and 7,122 boat angling days, the Dean Runyan and Associates report on, Fishing, Hunting, Wildlife Viewing, and Shellfishing in Oregon was reviewed. According to the report the Central Oregon Coast brings in about \$50 million dollars in fishing, and generates \$5 million in local revenues. The majority of that is boat fishing, and specifically ocean based. Freshwater streams, rivers, and Devils Lake, within

Lincoln County still account for \$11,508,000 travel generated dollars, and \$1,932,000 local dollars (Dean Runyan and Associates, 2009).

Table 15. Economic Contribution of Anglers

Activity	Anglers	Local Trip		Day Trip		Overnight		Total Revenue
		Anglers	Value	Anglers	Value	Anglers	Value	
Bank Angling	4,990	1,697	\$26,569	2,295	\$97,348	998	\$61,417	\$185,334
Boat Angling	7,122	2,421	\$37,920	3,276	\$138,940	1,424	\$87,658	\$264,518
Totals	12,112	4,118	\$64,489	5,572	\$236,288	2,422	\$149,074	\$449,852

It is also possible to derive per angler spending from the Dean Runyan report. According to an economist from the Oregon Department of Fish and Wildlife, for the Central Coast per person trip expenditures for freshwater fishing are \$61.54 for overnight trips, \$42.41 for day trips, and \$15.66 for local trips (within 50 mi). This study will assume that bank angling numbers follow similar trends regarding local, day trip and overnight visitors as boat angling.

The Oregon Marine Board Triennium Survey shows that 34% of boat trips originate in Lincoln County. Of the remaining 66%, it can be extracted that 46% of trips originate outside of Lincoln County but within a reasonable day trip distance, and that 20% of boaters come far enough away they are most likely overnight visitors.

With this information it is possible to assess the angling numbers. As stated earlier there are 4,990 bank angling days. There are also 7,122 boat angling days. Table 15 summarizes the expenditures both by angler type and type of trip. Revenues for local, day trip, and overnight were determined using Equation 4.

Equation 4. Trip Revenue by Trip Type

$$\# \text{ of Anglers} * \frac{\% \text{ Trip Type}}{\text{Anglers}} * \frac{\$ \text{ Expenditure}}{\text{Trip Type}} = \text{Trip Revenue by Trip Type}$$

This same equation was then used for local, day trips and overnight trips substituting the average per person expenditures, \$42.41 for day trips, and \$61.54 for overnight visitors. Bank and boat angling were both done in the same way.

The 4,990 bank anglers account for an estimated \$185,334 in local revenue, with the largest contribution coming from day trips. The 7,122 boat anglers equate to total estimated revenue of \$264,518 or \$37.14 per angler day.

Economic Impact

The economic impact of aquatic invasive species on angling is not completely clear. Fishing is still possible with aquatic invasive species, and bank anglers unlike boat anglers, would not be hindered by weeds in transport. It may even be possible that bank angling would increase, as anglers may prefer not to use their boats? In contrast however, anglers may also become frustrated with losing gear in the excessive aquatic plant growth.

A second consideration is fish habitat. Devils Lake does have non-native warm water species populations, like bass and perch. Increasing aquatic invasive species habitat would likely increase non-native fish species, which may increase fishing.

It is assumed that the local contribution of \$26,569 from bank anglers will continue and would not be impacted by aquatic invasive species. Perhaps, these anglers will take a few more trips to better fishing spots, but they will likely continue to buy gear in the area, and still use Devils Lake due to its convenient location. The day trip and overnight visitor combined contribution of \$158,765 on the other hand is probably more susceptible since visitors have a choice on their destination. So, what is the expected decrease?

According to the Longwoods USA Oregon Coast Study, 26% of people who visit the coast say that the outdoors is their number one reason for the trip. Although it is reasonable to assume that for the majority of visiting Devils Lake anglers, the lake is their primary outdoor activity, in order to be conservative, this study will use 13%, which is roughly half of the 26% that would be expected based on the Longwoods study. Therefore, by multiplying the current value of \$158,765 by 13% it could be expected that the local economy could lose anywhere from \$19,857, if fishing conditions were to be degraded.

It is expected that boat anglers would be more severely impacted and decreases would be across the spectrum of users. Boat angling could see the same hypothetical losses seen in other boating activities, where it was projected that boating numbers would decrease by 60%. That would result in an estimated total loss of \$158,710. When the boat angling loss is combined with the possible \$25,962 from bank angling a total hypothetical annual loss of \$184, 672 is found.

Events

Rockey Stone Memorial Kilos

Devils Lake is known as the World's Fastest Lake when it comes to boating, and has been home to power boat racing for more than 60 years. The American Power Boat Association began their stock races on Devils Lake 1956. In 1995 these races officially became the Rockey Stone Memorial Kilos named after Rockey Stone (pictured in Plate 1.) who had been promoting Devils Lake Racing since the early 1950's.



Plate 1. Rockey Stone Racing on Devils Lake

These annual races, and more importantly the high number of world record setting times, are what put Devils Lake on the map for speed boat enthusiasts. When exactly Devils Lake first earned the title of Word's Fastest is unknown but Craig Selvidge can explain why the lake is so fast. Selvidge says it has to do with three things, first the shape of the lake, which is long and narrow and allows racers to pick up speed, second the elevation, at about 10 feet above sea level the racers benefits from higher air pressure, which is better for combustion. Finally, Selvidge says the blue green algae blooms on the lake make boats faster, since the blooms increase water density and the propellers have more to catch on to.

The Rockey Stone Memorial Kilos which takes place in early October draws about 100 racers annually (Selvidge, Personal Communication, January 22, 2013). The event is two days and racers stay throughout the weekend. According to Selvidge racers travel with their families, friends or team (companions) and 80% stay in local hotels. Not only is revenue generated by racers and their families, but the event also draws a reasonable amount of spectators too. Selvidge estimates that about 600 people come down to the park to at least check out the event over the two day period.

To estimate the economic input of the event, two categories were created. The first is the racers and companions. The second is spectators (See Table 16). Since the racers and their companions are coming to Devils Lake specifically for the race, the Longwoods Oregon Coast average for visitor expenditures of \$131 per day average is applied to this group. There is less certainty in how many spectators come to Devils Lake simply for the races. In order to calculate for that uncertainty, this study assumes that 50% of attendees are visitors. In addition, for spectators, the assumption is made that going to watch the races is just one of the activities that either brought them to the coast or adds to their stay. Therefore, only 25% of average per person per day expenditure is being attributed to spectators. The result is that the Rockey Stone Memorial Kilos adds about \$117,900 to the local economy, as shown in Table 16.

Table 16. Economic Input of the Rocky Stone Memorial Kilos

	# of event participants	Expected Per Person Expenditures	Total
Racers and families	300	\$131	\$78,600
Spectators	600	\$33	\$39,300
Total			\$117,900

The Kilos though were not always well attended. Selvidge says “from 1981 – 1992, the event had very low turnout, due to racers not being to race in the weedy conditions”. Not only was there low turnout but the event changed format. It went from being a linear race, similar to drag racing, to being a circle race event in a small area of the center of the lake that had less aquatic plants. After the introduction of grass carp the Kilos reverted back to their adopted format and by the mid 1990’s the number of racers was comparable to pre -1981 numbers (Selvidge, Personal Communication. January 22, 2013).

Devils Lake Revival

The Devils Lake Revival is a festival hosted by the Devils Lake Water Improvement District. It is an ode to the Grass Carp Festival that took place from 1989 – 1993. The Revival consists of a number of events and activities including educational booths, live music, stand up paddle board lessons, kayak rentals, pontoon boat tours, sailing regatta, water polo, and an in water safety demonstration. There is food sold by the Backpack for Kids program. “The Revival began in 2011, as a way to draw attention to Devils Lake and celebrate the great resource”, said event organizer Seth Lenaerts.

The event drew about 250 people in its inaugural year and closer to 300 in 2012. Of those people who attended the event, Lenaerts estimates that about 50% were local. “The event is advertised up and down the coast and has drawn attention both years from the Statesmen Journal in Salem. In addition, both of our bands came from Portland and 20 – 30 water polo players who came from the Willamette Valley or beyond”, Lenaerts said.

To determine the economic input of attendees, the Longwoods Travel USA, Oregon 2009 Coastal figures will be used with the 2012 estimated attendance of 300. In order not to inflate the economic input, the 150 local attendees will not be considered. Although Lenaerts says some attendees come specifically for this event, it is expected that those who attend also take part in other activities while on the coast. Therefore, to be consistent 25% of the Longwoods Oregon Coastal value of \$131 will be applied to the 150 attendees. This equates to \$4,912. In addition to the attendee contribution, DLWID also spends at least \$2,500 locally to host the event. Therefore the Revival is expected to add at least \$7,400 to the local economy.

Sprint Triathlon

The Sprint Triathlon is another event that Devils Lake plays a vital role in. The event is staged at Regatta Park; the swimming portion takes place in Devils Lake, and the biking and running elements use East and West Devils Lake Roads. The Sprint Triathlon drew 61 participants in 2012. Of the 61 total athletes, 25 travelled 50 miles or more to take part and another 25 travelled at least 30 minutes. Generally, participants travel with at least one other person if not their whole family.

Table 17. Economic input of non-local sprint triathletes

	# of Athletes	Avg. # of Companions	Expected Per Person Expenditure	Total
Travelled greater than 50 miles*	25	1	\$131	\$6,550
Travelled greater than 30 minutes	25	1	\$11	\$550
Total				\$7,100

* Salem and Keizer were not included since it is expected that the majority of those athletes drive home after the event.

Table 17 is an overview of the expected revenues into Lincoln City by athletes who travelled to take part in the event. Athletes who travelled more than 50 miles are expected to spend the night and spend the Longwoods USA, Oregon Coast Average of \$131 for at least one night. For those travelers who travelled more than 30 minutes but less than 50 miles, they are expected to conservatively spend \$11, which equals one meal. All athletes are expected to travel with at least one companion. The total of all expenditures equals \$7,100 as shown in Table 17.

Open Swim and Stand Up Paddle Board Races

The Masters Open Swim competition was an event that was first held in 2011. Unfortunately it did not take place in 2012, but may return in the future, or be replaced by an exclusive stand up paddle board event. This event drew a number of swimmers from around the state and country. City staff says they had roughly 50 participants in 2011. Information on where these swimmers were from was not available. Therefore, this study will assume an equal break down as was seen in the Sprint Triathlon. The summary of non-local swim participants is in Table 18.

Table 18. Economic Input of non-local Open Swim participants

	# of Athletes	Avg. # of Companions	Expected Per Person Expenditure	Total
Travelled greater than 50 miles*	21	1	\$131	\$5,502
Travelled greater than 30 minutes	21	1	\$11	\$462
Total				\$5,964

Jet Ski Races

In addition to the events listed above, Devils Lake does continue to be an attractive site for future events. One is a stand up paddle board competition, which could draw as many or more participants as the Sprint Triathlon. A second event that is set to go for May 2013 is two days of Jet Ski races coordinated through the Northwest Jet Sports Association and local representatives. Organizers are expecting a positive turnout for this event. Roger Harnack of the Northwest Jet Sports Association expects at least 50 teams to attend; each team consists of about four racers. Since this will be the first year, spectator attendance is unknown. However, by simply taking the 200 people that make up the racing team and multiplying each by the Longwoods 2009 average expenditures of \$131 per visitor this equates to \$52,400.

Economic Impact

Inherently, good water quality is necessary for Devils Lake to continue to be an attractive site for local, statewide, and national events. For such events like the Rockey Stone Memorial Kilos, and the open swim, unimpeded travel through the lake is necessary. As Selvidge described earlier in the report turnout was very low when the lake was plagued with invasive species. Although the event will most likely continue, it is expected that numbers would again drop, 60% was selected since that is the total drop in use expected for all boating, if the lake is again inundated by invasive species. The Sprint Triathlon and Open Swim would also both be severely impacted. Swimming events would most likely be cancelled, therefore the Sprint Triathlon would no longer continue. A 50% loss was selected for Open Swim/ Stand Up Paddle Board event. This is speculating that the swim event would end, but SUP may continue. Finally, the Devils Lake Revival would be the least impacted. The District will most likely continue to hold the event, but some activities may have to be cancelled which could impact attendance.

Finally, the Jet Ski Races were not included since the event has yet to take place. However, if aquatic plants would grow to a level that jet ski racing is severely curtailed, the local economy is at risk of losing an additional \$52,400. In total a resurgence of aquatic invasive species has the potential to cost the local economy \$81,932 as seen in Table 19.

Table 19. Total Economic Contribution of Events

Event Name	Current Investment	Potential Loss (%)	Potential Economic Loss
Rockey Stone Memorial Kilos	\$117,900	60%	\$70,740
Devils Lake Revival	\$7,400	15%	\$1,110
Sprint Triathlon	\$7,100	100%	\$7,100
Open Swim	\$5,964	50%	\$2,982
Total	\$138,364		\$81,932

Lakefront Lodging

Lincoln City offers many lodging and vacation rental options. Although the vast majority of hotels in Lincoln City are oceanfront, Devils Lake does offer multiple lodging options. There are three hotels that are situated near enough to Devils Lake that they could be directly impacted by the lake. One is technically a lakefront hotel, although the main access point is from Highway 101 and it is across the street from the Pacific Ocean. A second is across the street from the lake. The third has direct lake access via a city park, and the hotel offers views into an adjacent Devils Lake wetland, but rooms do not have direct views of the lake.

In addition to the standard hotels and motels, Lincoln City has many vacation rental dwellings. There is also at least one bed and breakfast and one RV Park that is very close to the lake. Finally, Devils Lake State Park campground (see camping) is another option to spend the night close to the lake. Vacation rental dwellings are popular around the lake too, of which there are 12 within in city limits. The county does not maintain records on VRDs, but through phone calls with rental companies, it was possible to confirm at least 6 VRD's in the county.

Hotels

It is expected that many lake using visitors like all visitors to Lincoln City spend nights in local hotels. This study accounts for hotel expenditures that can be attributed to Devils Lake through the \$49 per person spent on lodging per the Longwoods study. However, in an effort to determine if lakefront hotels are especially impacted by the lake, interviews were conducted with managers at two of the three lakefront hotels. Although both of the managers interviewed did state that being on the lake was an advantage to their business, they were not able to offer tangible numbers. The hotel manager at the Quality Inn, Chester Smith said that his hotel has a number of lakefront rooms. He stated that visitors enjoy the lake view, especially the wildlife viewing. However, he stated that most people do not select these rooms for the lake view. The second manager interviewed manages the Comfort Inn and he stated that many visitors do tend to walk down to the lake and some use the lake, it does not appear to him to be a deciding factor for people when selecting that hotel.

Vacation Rental Dwellings

Vacation Rental Dwellings (VRD) as they are called in Lincoln City also known as Vacation Rental By Owners are a different story. Through conversations with city staff and calling rental companies it was determined that there are at least 18 VRD's on the lake. For the most part it appears people who rent on Devils Lake do so for the lake amenities. At least that is the case in summer. "Summer users choose to be on the lake, for the sake of the lake, most like to boat and fish", said one VRD owner and operator. When asked how that changes in the winter, she said. "In the winter occupants are just looking for a place to stay, it is too cold to do lake activities, so they go the mall, the casino, or just hang out". Lakefront VRD rentals drastically decline in the winter for this owner too. She says that in 2012 there were only three days the VRD was not booked in July and August as opposed to the winter where the house may not be rented for a month or more at a time. The owner estimated that at most off season occupancy rates (Oct 1 – May 31), are 15% of summer months. These numbers are backed up by a second owner who said the same thing, the VRD is full July – September and then guest numbers plummet.

A final interview took place while DLWID staff was calling rental companies to determine how many VRDs were around the lake. The manager of the company said that they no longer rent VRDs on the lake. "In the summer it was busy, but in the winter we couldn't give the houses away". All of these testimonials show that the benefit of the lake is use. Simply, having the lake be there does not put heads in beds, if visitors are going to come to Lincoln City to be near a lake, they want to use it.

To determine the economic value of the VRDs, five different VRDs and their prices were averaged. One night rates ranged from \$310 – \$410, and the average was \$375. With the assumption that the VRDs are filled 80% of time from June – September, that equates to total VRD income of \$823,500 over the 122 day peak season.

Economic Impact

After completing the economic summary of lake front hotels and Vacation Rental Dwellings, it is apparent that the Vacation Rental Dwellings would be the most impacted by a resurgence of invasive aquatic plants. Hotels as a whole would see a decrease in occupancy due to less people coming to the area to recreate on Devils Lake but after talking with hotel managers, it does not appear that the lakefront hotels would be more susceptible than the rest of the hotel population. However, an over abundance of aquatic non-native species does tend to cause bad smell problems, and potentially if that part of the lake became inundated, the smells could cause some problems for hotel users.

Lakefront VRDs on the other hand would clearly be severely impacted by a lake that is not usable or appealing. The winter is a good example of this. One owner said occupancy rates were down to 15% or less of summer months. A second VRD company manager said figuratively she could not give lakefront VRDs away in the winter. Therefore it is expected that

regardless whether the lake is inundated in non-native aquatic species or not, winter lake use would probably not be impacted, since for the vast majority of people, the lake is unusable for recreational activities due to weather.

The summer months on the other hand may experience heavy losses in VRD rentals. As a baseline, 15% occupancy rates seen in the winter months can be expected even in the worst case scenarios. In an effort to make comparisons between Devils Lake VRDs, and non lake VRDs, DLWID staff attempted to talk with VRD rental companies, but were told those numbers could not be made available. Sandy Pfaff the Executive Director of the Visitor and Convention Bureau was also consulted. Pfaff was asked about hotel occupancy rate changes throughout the year and she stated those numbers are not available. She estimates that winter occupancy rates range from month to month, but if she had to make an estimate based on her experience she would say occupancy rates range between 30% - 60%.

What could be expected for Devils Lake then if the lake becomes mostly unusable to VRD users? Even in the winter months, when there are an abundance of rooms and VRDs available occupancy rates of 15% are still seen on the lake. In the summer months that is sure to climb regardless of what state the lake is on. The difference is clearly going to be to what extent. Currently, VRD owners experience high occupancy rates, 80% or more in some instances, whereas the hotel rates are probably closer to 50 - 60%. Although not conclusive, a reasonable and possibly still low estimate would be that lakefront VRDs could credit at least 40% - 50% of their summer business to being on a recreational lake, If that is case, a 40% - 50% loss in peak season revenue would equate to an annual lose of \$329,400 – \$411,750.

Public Investment

The majority of this report has focused on individual users, and impacts on businesses, but in order to understand the entire economic picture, public investment must be considered. Public investment in Devils Lake takes many forms, but will focus on dollars invested into restoring the lake, investment into secondary projects around the lake, and a final note on Endangered Species specially, Coho salmon.

In 1981, when Devils Lake had become as many people said unusable, and totally choked up with weeds for much of the year, the City of Lincoln City applied for and was awarded an Environmental Protection Agency (EPA) Clean Lakes Phase 1 Grant for \$100,000. Phase 1 grants are for studies and planning. Much of the money went to conducting a Devils Lake Diagnostic and Feasibility Study completed by KCM in 1983. Subsequently, when the Devils Lake Water Improvement District was formed, the District applied for a Phase II Clean Lakes Grant to begin the restoration. A second grant was awarded to the District, this one for 1 million dollars. Therefore, EPA has invested 1.1 million dollars in direct contribution.

A second major public investment into Devils Lake was the formation of the Devils Lake Water improvement District. Devils Lake Water Improvement District is considered a special District and was formed under Oregon Revised Statue 552 – Water Improvement Districts. Local

residents had to pass a referendum to create the District, and in doing so also voted to raise their taxes. Voters in Lincoln City and on the east side of Devils Lake raised their tax rates by either \$0.2499 or \$0.1208 per \$1,000 assessed value. The two different rates are dependant on where the property is located with those in the Devils Lake watershed being assessed the higher rate. The District began to levy taxes in Fiscal Year 1985 – 1986. Since then the District has levied taxes every year, for a total of \$3,441,221 in additional public investment. The EPA grants and the community’s economic support of creating the District are the two obvious public investments into the restoration of Devils Lake, but there are several others.

Additional public investment is less direct, but still certainly important. Since the addition of grass carp, and with the lake again becoming a usable part of the community, additional investment has is seen. Most recently, the Ford Family Foundation Leadership cohort from Lincoln City decided that their community project would be to rebuild a stage at Regatta Park. The estimated cost of this project is \$12,000, and many hours of volunteered time. Another example of community investment is a recent art installation at Regatta Park, the Lake Creature, who was formally named Sparky the Wish Guardian (Plate 2). Sparky is 13 feet tall, 18 feet wide and weighs over two tons. He greets visitors as they enter the park. This project was completed by local artist Heidi Erikson who stated the price of the piece was \$28,000 however actual project costs were \$108,000.⁵ An additional project was the building of the Sandcastle playground at Regatta Park. The large playground was built almost entirely with donations, volunteer labor and had an enormous amount of volunteer support. Organizers stated that the project cost was at least \$500,000, most of which was donated time and materials.



Plate 2. Sparky the Wish Guardian at Regatta Park

5. The difference was made up with artist time and material donations.

Assessing the economic input of public investment is different than the previous sections in this report (a summary of public investment is provided in Table 20). In previous sections, this study has followed a model where it first summarized the current economic conditions. Next the *Economic Impact* section explained expected losses to the local economy if the lake is again plagued by non – native aquatic plants. This Public Investment section is simply intended to show a few examples of the different type of investment that goes into Devils Lake. As the previous examples have shown Devils Lake receives not just local investment, but also investment from the state and federal levels too.

Table 20. Public Investment Summary

Agency/Project	Investment
EPA Phase I Grant	\$100,000
EPA Phase II Grant	\$1,000,000
DLWID	\$3,441,221
Regatta Park Playground	\$500,000
Community Projects	\$40,000
Total	\$5,166,221

Coho Salmon

Although Devils Lake does have economic value, this system offers value in many arguably more important ways including the socially and ecologically. One of the ecological values is the genetically unique run of Coho salmon that pass through Devils Lake on their way from the Pacific Ocean to Rock Creek, where the fish spawn (Johnson & Bank, 2008).

Coho salmon are a federally listed threatened species (Department of Commerce & NOAA 2005). Therefore, certain protective actions are taken to prevent the species from extinction. As explained in the US Fish and Wildlife Service, Listing a Species as Threatened or Endangered, Section 4 of the Endangered Species Act,

“Once we add an animal or plant to the List, protective measures apply. These measures include protection from adverse effects of Federal activities (through consultations under section 7 of the ESA); restrictions on taking, transporting, or selling a species; authority for us to develop and carry out recovery plans; authority to purchase important habitat; and Federal aid to State and Commonwealth wildlife agencies that have cooperative agreements with us. These efforts contribute to species’ survival and assist in achieving the ultimate goals — conserving plants and animals and maintaining their natural diversity and the ecosystems upon which they depend.”

The Coho salmon that use Devils Lake and Rock Creek, which lies in the Devils Lake watershed are subject to these protective measures in order to aid in the recovery of this species. Not only are they subject to protective measures several projects and actions have taken place in the watershed to improve habitat, remove obstacles to migration, and improve water quality. These projects have been initiated and carried out by a number of local, county, regional, state, and federal agencies and organizations. Ultimately, the goal of these restoration efforts would be the delisting of Coho salmon and providing a sustainable fishery in the lake.

In 2006, the Mid Coast Watershed Council coordinated a large woody debris placement project on Rock Creek. Large woody debris has been shown to improve fish habitat and aid in migration (Fischenich and Morrow, 2000). The Mid Coast Watershed Council Director, Wayne Hoffman provided the following project details. The total project cost was \$67,864. The Oregon Watershed Enhancement Board awarded a \$10,000 match to the project. US Forest Service and Green Diamond Resource Company donated logs with an estimated value of \$48,000, and ODFW contributed \$8,000 in staff time.

A second major project is the removal of dam on Rock Creek, which also took place in 2006. A coalition of partners including, US Fish and Wildlife Service (USFWS), Oregon Department of Fish and Wildlife (ODFW), Oregon Watershed Enhancement Board (OWEB), City of Lincoln City, Devils Lake Water Improvement District (DLWID), and Salmon Drift Creek Watershed Council (SDCWC) removed a dam that had been shown to impede Coho Salmon migration (See Plate 3). Salmon Drift Creek staff provided the details of the funding for this project. The project was funded through grants, \$10,000 of which came from OWEB and \$6,500 from USFWS. ODFW, USFWS, and the City of Lincoln City provided in kind match, and SDCWC and DLWID provided administrative support.



Plate 3. Coho Salmon hitting Dam on Rock Creek Prior to Dam Removal

A third project was the removal of a small “push up” dam and the installation of an infiltration gallery on Rock Creek. This project was implemented in 2007, through the collaborative effort of the Oregon Water Resources Department, DLWID, SDCWC, and private property owner. A “push up” dam had been used to pool water that could be used for agricultural uses. DLWID and SDCWC, secured a \$2,860 grant through OWEB, to replace the dam with an infiltration gallery. Additional in kind contributions were made by the Oregon Water Resources Department, DLWID, and Salmon Drift Creek Watershed Council. Total project cost was, \$3,274, which brings the total value of the three projects listed to \$87,638.

Clearly, in addition to Devils Lakes recreational and real estate values the lake and its tributaries have ecological benefits, specifically to Coho Salmon. These unique ecological benefits provide fiscal value to the community. Although for this study it is not possible to attach a specific monetary amount to Devils Lake and Rock Creek’s value when it comes to the restoration of threatened Coho salmon, the value clearly exists.

Conclusion

Devils Lake is an ecological, recreational, and economic attribute to the Lincoln City area. This study concludes that the recreation and increased tax dollars due to lakefront and lake view properties adds just over 8 million dollars to the local economy on an annual basis and recreation alone contributes just under 4.5 million dollars. In addition lakefront properties values are on average three times the value of equal properties were those properties not lakefront. This accounts for an estimated 119 million dollars of increased real market values. Lake view property values increase by a more modest 24%, but still add an estimated 4 million dollars of increased land values.

The conclusion of this report is that a return of non-native aquatic vegetation would negatively impact the local economy seen in Table 21. Table 21 provides an overview of the hypothetical economic impacts. Overall real market real estate values could hypothetically decrease by as much \$28,933,125, which would result in the annual loss of \$281,905 to property tax rolls. Recreation would also be negatively impacted. Boating, which includes water skiing, personal water craft, sailing, and cruising would be the most severely impacted recreational activity. Boat use days are projected to decrease by as much 60%, causing an \$829,016 decline in annual revenues. Fishing both boat and bank angling would be impacted as well. The total decline is projected to be \$184,672. Camping could decrease by as much as \$307,528.

Lodging would certainly see overall decreases. This report specifically concludes that vacation rental dwellings would be significantly impacts potentially losing up to \$411,750 on an annual basis.

Events on and around Devils Lake would be impacted too. If non–native aquatic species proliferate to the point that they inhibit use, some may have to be cancelled and others curtailed. This report estimates total loss to be \$81,392. Public investment dollars are also at risk. This study did not attempt to quantify what the loss could be, but it simply states that

there is potential loss if the lake is no longer perceived as a viable part of the community due to excessive non–native aquatic plants.

The total result would be a one time loss of \$28,933,125, to market values of lakefront and lake view properties. There would also be annual loss implications. This study estimates that on top of the roughly \$29 million dollar real estate loss, there would also be \$2.25 million dollars in recreation, lodging, and taxes on an annual basis. \$320,929 of that would be in the form of local property taxes, the remaining roughly \$1.81 million would be lost in recreation and lodging.

Finally, it is at least worth considering the multiplier effect of these dollars when spent in the local economy. Dollars that are spent locally whether at local stores or corporate chains have multiplier effect as they circulate in the economy. The result is that \$1.00 spent can actually have the impact \$1.15 - \$1.45. It is not certain how this would impact real estate values but annual losses would be impacted. Therefore, it is possible the annual declines could actually be 1.15 to 1.45 times as severe. If this is the case annual losses could be as high as \$3.1 million.

Whether the multiplier would play this big of a role or not, the results of this study clearly indicate that resurgence of non–native aquatic species would negatively impact the local economy.

Table 21. Total economic value of Devils Lake to the local economy and potential loss due to non native aquatic macrophytes

	Current values	Hypothetical values with non-native macrophytes	Potential loss
Lakefront real estate market value	\$178,500,000	\$155,295,000	\$23,205,000
Lakefront annual tax contribution	\$1,979,936	\$1,722,545	\$257,392
Lake view real estate market value	\$44,062,500	\$38,334,375	\$5,728,125
Lake view annual tax contribution	\$488,745	\$425,208	\$63,537
Boating (Includes boat rentals)	\$1,381,694	\$552,678	\$829,016
Camping	\$3,075,280	\$2,767,752	\$307,528
Angling	\$449,852	\$265,180	\$184,672
Events	\$138,364	\$56,972	\$81,392
Lodging	\$823,500	\$411,750	\$411,750
Public Investment	\$5,166,221	Unknown	Unknown
Local Coho Salmon Restoration	\$87,638	Unknown	Unknown
Total	\$236,153,730	\$199,831,459	\$31,068,412
Total annual contribution	\$8,337,371		
Total annual recreation and lodging contribution only	\$4,486,996		
Total one time loss (real estate market values)			\$28,933,125
Total annual loss (recreation, lodging, taxes)			\$2,135,287
Total annual recreation and lodging loss			\$1,814,358

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