

**Deschutes Estuary Feasibility Study:
Net Social and Economic Benefit Analysis**

Final Report

Prepared for

Capitol Lake Adaptive Management Plan Steering Committee
and
Washington Department of Fish and Wildlife

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1 Glossary of Terms

2 **Contingent valuation** – a methodology to determine money measures of change in welfare by
3 describing a hypothetical situation to respondents and eliciting how much they would be willing
4 to pay either to obtain or to avoid a situation.

5

6 **Environmental valuation** – procedures for valuing changes in environmental goods and
7 services whether or not they are traded in markets, by measuring the changes in the producer and
8 consumer surpluses associated with these environmental goods.

9

10 **Existence value** – see non-use value.

11

12 **Hedonic method** – a methodology for estimating the relationships between the prices of a good
13 (e.g., housing) and the characteristics of the good (e.g., number of bedrooms, air quality,
14 proximity to amenities, etc.). Can sometimes be used to value changes in environmental
15 characteristics.

16

17 **Input-output model** – a methodology that models the linkages between input supplies, outputs,
18 and households in a regional economy that can be used to predict the impact of changes on
19 economic activity (e.g., industry revenues and household incomes) within the region.

20

21 **Market benefits** – benefits from good and services bought and sold in normal commerce so that
22 there is a revealed price that reflects consumers' willingness-to-pay for the quantity offered and
23 supplies marginal production costs.

24

25 **Non-market benefits** – benefits that accrue to individuals for good, services, experiences, or
26 states of nature that are not normally traded in commerce.

27

28 **Non-use value** – value of knowing that something exists in a particular state even though there is
29 not sensory contact with the resource.

30

- 1 **Travel cost method** – a methodology which relies on travel-related costs as a surrogate for price
2 in a non-market situation in order to estimate demand and money measures of willingness-to-
3 pay.
4
- 5 **Use value** – value derived from either the consumption of a good, the utilization of a service or
6 that otherwise involves some sensory contact with the resource. For example, whale-watching is
7 not consumptive but involves visual contact with the whales.
8
- 9 **Value** – what one is willing to give up in order to obtain a good, service, experience, or state of
10 nature. Economists try to measure this in dollars.
11

Executive Summary

Introduction

Capitol Lake in Olympia and Tumwater, Washington, is a significant feature within the region, both visually and in terms of the ecosystem functions and other services it provides, such as recreation, cultural identity, and tourism. The **Capitol Lake Adaptive Management Plan (CLAMP)** Steering Committee, formed in 1997, developed a plan in late 2002 to represent a 10-year vision for the future management of the lake. One of the plan's management objectives included conducting a study of whether it is feasible to restore estuary processes to Capitol Lake. The **Deschutes Estuary Feasibility Study (DEFS)** is designed to provide information needed to make an impartial decision about what is best for the long-term management of Capitol Lake. The study is not, however, a commitment to return the lake to an estuary.

The subject of this report is an assessment of the social and economic implications (**Net Benefit Analysis**, or NBA) of restoring the Deschutes River estuary. Our assessment builds on four other studies prepared as part of the DEFS. These include:

- A Hydraulic and Sediment Transport Analysis
- A Reference Estuary and Biological Conditions Report
- An Engineering Design and Cost Estimates Report
- A Stakeholder Involvement Report

Our analysis draws primarily upon the findings of these individual studies in order to address the economic and social benefits associated with the anticipated physical and biological changes from a restored estuary, to the extent that they can be determined. In particular, the study addresses all of the attributes identified in the **Stakeholder Involvement Report** sponsored and administered by the CLAMP Steering Committee.

Organizing Stakeholder Attributes into Economic Categories

In order to provide a complete assessment of changes in economic and social benefits from restoration of the Deschutes River basin we structure the collection of attributes reported in the Stakeholder Involvement Report. This assures that *all* of the attributes identified in the Stakeholder Involvement Report find a 'home' within the economic and social benefit categories that we analyze.

We group the attributes into two broad types. One type of attribute describes environmental services and recreational uses of the basin (listed in the Stakeholder Involvement Report under

the headings *Sustainable Future*, *Everybody's Basin*, *Web of Life*, *Come Play Outside*, *It's the Water*, *From Here to There* and *Spiritual Connection*). Measuring the benefit of these attributes requires using non-market valuation techniques and survey data. The second type of attribute reflects the health of the local economy, a vital and vibrant downtown, and tax implications (listed in the Stakeholder Involvement Report under the heading *Healthy Economy*). Measuring the benefit of these attributes requires the use of economic impact techniques.

The attributes that reflect the health of the economy are organized into an economic impact category. The remaining attributes are organized using a framework known as the **Millennium Ecosystem Assessment** (MA) into a collection of ecosystem goods and services provided by the Deschutes River Basin. The MA involves a synthesis of information from the scientific literature, datasets, and scientific models, and has been adopted internationally and within a number of federal resource agencies in the United States. It groups ecosystem goods and services as follows:

- Supportive Functions: Services necessary for production of other ecosystem services (e.g., wildlife habitat);
- Regulating Services: Benefits obtained from ecosystem processes (e.g., improved water quality and flood control);
- Provisioning Services: Goods produced or provided by ecosystems (e.g., shellfish and salmon);
- Cultural Services: Non-material benefits from ecosystems (e.g., recreation and aesthetics).

Within the categories of ecosystem services are the subcategories representing specific aspects that pertain to the DEFS. These benefit subcategories are shown in Table ES-1.

**Table ES-1
Summary of Organizing Stakeholder Attributes of the Deschutes Basin
into Benefit Categories**

Ecosystem Goods and Service Values	Supportive Functions
	<i>Biodiversity</i>
	<i>Habitat</i>
	Regulating Services
	<i>Flood protection</i>
<i>Sea-level rise protection</i>	
<i>Water quality</i>	
Provisioning Services	
<i>Food</i>	
Cultural Services	
<i>Recreation</i>	
<i>Ecotourism</i>	
<i>Aesthetic</i>	
<i>Cultural Heritage</i>	
<i>Education</i>	
<i>Spiritual and Inspirational</i>	
Economic Impacts	

Assessing Social and Economic Effects of a Restored Estuary

Our work plan follows standard economic analysis practices to assess the social and economic effects of restoring a naturally functioning Deschutes River estuary. Those practices involve four primary steps:

- Establish the Geographic Extent or Scale of the study;
- Identify the Existing Conditions;
- Determine the Physical Change to the existing condition as a result of a proposed action; and
- Assess the Social and Economic Effects of the physical change, either quantitatively or qualitatively.

Two categories of data are required for the development of this net benefit analysis. The first describes the physical change expected if an estuary is restored. For example, how would habitat conditions change from the present Capitol Lake under a restored estuary? The second is environmental, economic, and social value and impact data. That is, how do we translate a change in the physical habitat into a discussion about social and economic effects?

To conduct our analysis, we reviewed the economics literature for studies conducted in similar settings or addressing similar environmental or economic goods and services. We contacted

knowledgeable persons in the area about specific local conditions, ongoing analyses, and other available information. In order to assess the social and cultural attributes, we conducted an e-mail survey of community representatives who had previously participated in the Deschutes Estuary community involvement process. The purpose of the survey was to provide additional insight into some underlying social perspectives in the community on natural resource issues.

Summary of Results

The majority of the stakeholder attributes outlined in the Stakeholder Involvement Report indicate that many people in the greater Olympia community connect to the Deschutes Basin through the Cultural Services category, as we might expect. We found that estuary restoration would most likely lead to changes in Cultural Service values. However, changes in the value of many of the categories under **Cultural Service reflect personal preferences that cannot be objectively weighed against each other** such as Aesthetics, Cultural Heritage and Spiritual and Inspirational.

Based on the narrow sample taken in the survey, effects on values such as aesthetics and civic pride are divergent but generally negative. Effects on Education values were generally positive. While the survey illustrates the likely range of opinions among stakeholders, the small sample size prevents us from assuming how many people in the broader community would share these personal preferences. The results of the survey do demonstrate that deep cultural values for the Deschutes Basin are held.

The benefit category Recreation is also organized under Cultural Services. **The effects on recreation would be negative based** on limiting access to boat launches in parks due to tidal influence. Additionally, **moorage at the OYC and marinas along Percival Landing would be negatively affected by a restored estuary due to sediment buildup**. The fact that such well-defined entities are so directly and negatively affected suggests a need to mitigate. The magnitude of the impact is uncertain due to data limitations.

Information in the Stakeholder Involvement Report and results from our survey indicate that many people hold values for aspects of the environment that they may not directly use. These attributes generally fell into the Supportive Functions and Regulating Services. **Restoring the estuary would increase the benefits from Supportive Functions and Regulating Services**. In particular, a restored estuary would likely improve both habitat and biodiversity; however, the magnitude of the benefit is not known. Also, a restored estuary would improve water quality (dissolved oxygen levels) in Budd Inlet. The benefit was not quantified but rather framed in terms of the cost to treat water to achieve water quality improvements.

We found that the **Economic Impacts could be negative overall**. We focused primarily on two categories; 1) boat moorage and 2) tourism. Sedimentation in Budd Inlet impacts not only the recreational marinas but also the Port of Olympia. If a cost-sharing arrangement can not be reached then the Port may likely face increased costs of doing business due to sediment deposits. Tourism could either increase or decrease as a result of estuary restoration. Increases could be due to habitat viewing, such as bird watching. Decreases could occur if visitors to such events as Lakefair choose not to attend if it is located beside an estuary. Data on changes in tourist visits were not available so an economic benefit was not assessed.

Summary of Recommendations

In general, our recommendations relate to reducing the uncertainty of the information that is currently available. We found uncertainty in both the physical and biological as well as the economic and social data available to us. Uncertainty in physical and biological data arises in two ways. First, data about the physical and biological change as a result of restoration may simply not be known, as we found to be the case, for example, in understanding the existing habitat conditions of Capitol Lake, or the change in tourist traffic. The second type of uncertainty about the physical and biological change arises from modeling. For example, an existing study indicates that restoring the estuary will improve the dissolved oxygen problem in Budd Inlet. However, Washington Department of Ecology (Ecology) is in the process of updating this study. The results of Ecology's study may impact the results of this analysis with respect to water quality improvements.

Uncertainty about social and economic value and impact estimates can arise because economists frequently draw upon existing studies (benefits transfer). Uncertainty can be related to (1) the economic data that was used in the initial study, or (2) the level of applicability of a given analysis to the current study site. We found that there are relatively few economic studies that were appropriately applicable to our study. Our recommendations, as outlined in our conclusions, indicate several studies or data assessments that could be conducted to further reduce uncertainty in a NBA, and thereby assist the CLAMP Steering Committee in making informed decisions.

Section 1

Introduction

1.1 Background and Setting

Capitol Lake in Olympia and Tumwater, Washington, was created in 1951 through construction of a dam on the Deschutes River.¹ The primary purpose of the lake was aesthetic, to create a reflecting surface for the state capitol that is positioned on the east side of Capitol Lake. Since the time of its construction, the lake has established itself as a distinct entity within the community, both visually and in terms of the ecosystem functions and other services it provides, such as recreation, cultural identity, and tourism.

In the 1970s and 1980s, lake management activities increased to support public recreation, but also to address water quality issues and increased levels of sedimentation. By the mid-1990s, management of sediment became complicated by a lack of a comprehensive management plan to address the sometimes competing demands of habitat, fisheries, public recreation use, flood control, and aesthetics.

In 1997, Washington Department of General Administration, which has responsibility for Capitol Lake, formed the **Capitol Lake Adaptive Management Plan (CLAMP)** Steering Committee, a partnership of nine jurisdictions including state agencies, local government, and a tribe. With the contributions of staff and resources from each of the jurisdictions, the CLAMP Steering Committee developed an interim adaptive management plan in June 1999. A new plan was approved and adopted in late 2002, and represented a ten-year “vision” for the future management of the lake.

1.1.1 Deschutes Estuary Feasibility Study

In the 2002 plan, CLAMP identified management objectives, one of which includes conducting a study of whether it is feasible to restore estuary processes to Capitol Lake. The objective of the estuary feasibility study is to evaluate the possibility of a restored estuary as an alternative to the continued management actions necessary to maintain a lake in this setting. This study includes evaluating the potential benefits and possible shortcomings of estuarine alternatives and identifying those alternatives that (1) have a reasonable likelihood of success, (2) could be permitted by the regulatory agencies, and (3) are supported by the local community. The study will provide information needed to make an impartial decision about what is best for the long-

¹ Appendix C provides a socioeconomic profile of Olympia and Thurston County.

term management of Capitol Lake. The study is not, however, a commitment to return the lake to an estuary. Among the tasks of the **Deschutes Estuary Feasibility Study (DEFS)** is an assessment of the social and economic implications (**Net Benefit Analysis, or NBA**) of restoring the Deschutes River estuary.

1.1.2 Stakeholder Involvement

In preparation for the analysis, the CLAMP Steering Committee sponsored a series of focus group meetings and an open public forum to gather input from stakeholders regarding the social and economic benefits they derive from the Deschutes Basin. The objective of this process was to engage stakeholders in defining the scope of the net benefit analysis by describing goods and services they associate with Capitol Lake and the lower Deschutes River Basin. The methods and results of this process are presented in the document, “Deschutes Estuary Feasibility Study Net Benefits Analysis: Stakeholder Involvement Report,” June 26, 2006. That report presents a table that provides a summary of attributes of importance to the stakeholders to be addressed, either quantitatively or qualitatively, in this NBA.

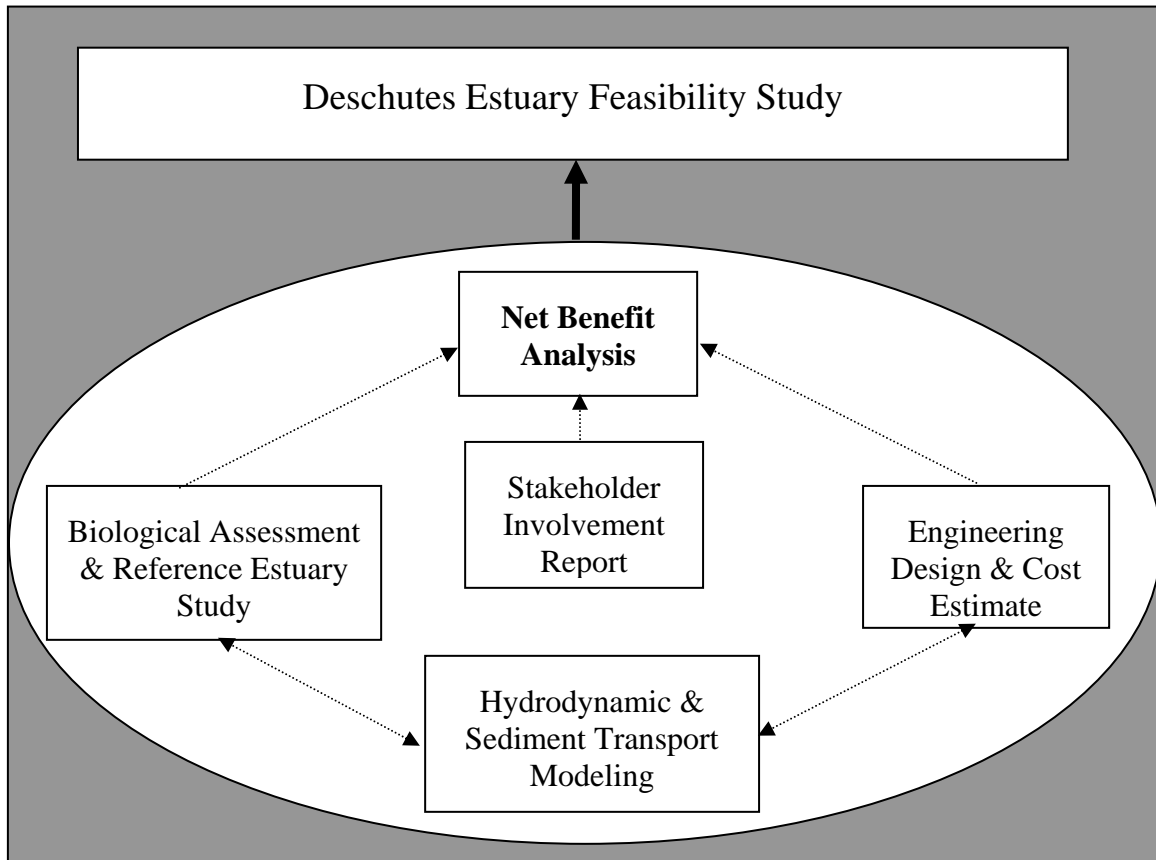
1.2 Objective

The purpose of this study is to assess the net benefits (social and economic) of restoring the Deschutes River to an estuary. The term “net benefits” is used here to describe both positive and negative changes in economic and social values and economic impacts. . Our assessment builds on four other studies prepared as part of the DEFS. These include:

- A Hydraulic and Sediment Transport Analysis
- A Reference Estuary and Biological Conditions Report
- An Engineering Design and Cost Estimates Report
- A Stakeholder Involvement Report

Figure 1 represents the relation of the NBA with the other DEFS studies. Our analysis draws primarily upon the findings of these individual studies in order to assess the economic and social benefits associated with the anticipated physical and biological changes in a restored estuary. In particular, the study addresses all of the attributes identified in the Stakeholder Involvement Report sponsored and administered by the CLAMP Steering Committee. For those benefit categories where the change 1) can not be forecasted, 2) is undetermined or highly uncertain, or 3) is not supported by available information as determined by the previous DEFS reports, our analysis is limited. For this reason, we frame our analysis based on the level of certainty of the physical and biological effects previously reported and or identified by expert witnesses and the certainty in measures of social and economic benefit changes.

Figure 1
Deschutes Estuary Feasibility Study



1.3 Report Organization

This report is organized into four additional sections:

- Section 2: Benefits Assessment Framework. This section provides a general discussion of the methodologies used to assess various benefit categories.
- Section 3: Organizing Stakeholder Attributes into Economic and Social Categories. This section describes the multi-step process that we used to organize, into economic categories, all the social and economic attributes of restoring a naturally functioning Deschutes River estuary that are identified in the Stakeholder Involvement Report. Each economic category has subcategories and associated methods of assessment.
- Section 4: Analysis and Results. For each benefit category, we outline related Stakeholder Involvement Report attributes, existing physical and biological conditions, the methodology used, and analysis, results, and recommendations for reducing uncertainty. Each economic category is treated quantitatively or qualitatively, depending upon the availability of data, information on physical or biological changes attributable to restoration, and the method for valuation.

- Section 5: Conclusions. This section provides a summary of findings, implications, limitations to the study, and recommendations for additional analysis.
- References
- Appendices

Section 2

Benefits Assessment Framework

2.1 Assessing Social and Economic Effects of a Restored Estuary

The general work plan for this study follows standard economic analysis practices to assess the social and economic effects of restoring a naturally functioning Deschutes River estuary. Those practices involve the primary steps listed below.

- Establish the Geographic Extent or Scale of the study;
- Identify the Existing Conditions;
- Determine the Physical Change to the existing condition as a result of a proposed action; and
- Assess the Economic Effects, either quantitatively or qualitatively.

Each of these steps is discussed in the following subsection in more detail. Before discussing these steps in detail, however, it is worthwhile to have a discussion about data uncertainty. Two categories of data are required for the development of this net benefit analysis. The first describes the physical change expected if an estuary is restored. For example, how would habitat conditions change from the existing conditions at Capitol Lake under a restored estuary? The second is environmental, economic, and social value and impact data. That is, how do we translate a change in the physical habitat into a discussion about social and economic benefits? Uncertainty in either kind of data can affect results.

Uncertainty about the physical data arises in two ways. First, data about the physical change may simply not be known, as we found to be the case in understanding the existing habitat condition of Capitol Lake. The second type of uncertainty about the physical changes arises from modeling. For example, an existing study indicates that restoring the estuary will improve the dissolved oxygen problem in Budd Inlet. However, Washington Department of Ecology (Ecology) is in the process of updating this study. The results of Ecology's study may impact the results of this analysis with respect to water quality improvements. Throughout this report, we make note of areas where we are aware of uncertainty in data related to the physical change to the Deschutes Basin that could occur if the estuary is restored.

Uncertainty about economic value and impact estimates can arise because economists frequently draw upon existing studies (benefits transfer). Uncertainty can be related to (1) the economic data that was used in the initial study or (2) the level of applicability of a given analysis to the current study site. We found that there are relatively few economic studies that have focused on assessing economic value in Puget Sound. Where we found ourselves with limited literature

from which to draw we either note the questionable applicability of the or simply state that there are no applicable studies on which to rely.

2.2 Geographic Extent and Scale of Analysis

An important aspect of measuring net benefits is defining a “boundary of analysis”. That is, over what geographic area (local, regional, state, national) will benefits be measured? The decision is typically dependent upon who benefits and who will bear the cost. In the case of Capitol Lake, and reflected in large part by the range of attributes identified in the Stakeholder Involvement Report, the effects are generally local (within a mile or two of the lake) or regional (watershed or countywide). As such, the geographic scope of our analysis is the state of Washington as a whole, with a focus on the Deschutes River Basin. Specific stakeholder groups that will be affected include those outlined in the Stakeholder Involvement Report. For the benefits categories delineated in our analysis, we will identify who will benefit or where the benefits are concentrated.

2.3 Existing Conditions and Estimation of Change

The first step to an assessment of social and economic benefits is developing the “with and without” project conditions. In general, the with-project condition is the state when a proposed activity, circumstance, and/or policy change occurs. The without project condition is defined as “existing conditions”, i.e. when a change does not take place. In the case of the Deschutes Basin, our study can provide useful information to the feasibility analysis when the benefits of estuarine restoration (the proposed action) can be compared to a uniform “without restoration project” baseline. The without case is associated with Capitol Lake, which requires some form of active management plan in order to maintain a lake environment into the future. The “with restoration project” suggests a set of biological and physical changes that have been described in earlier DEFS reports.

We have not been able to fully quantify specific benefit estimates (economic impacts or environmental values) for the categories we have identified for the Deschutes Basin “without restoration” (i.e., a lake environment). However, we are able to assess where it is likely that benefits will change in the “with restoration” state.

2.4 Common Methods for Measuring Net Benefits

There are a number of commonly accepted methods that economists use for valuing social and economic benefits (both economic values and impacts). These methods vary in their application depending upon the type of benefit being measured, available information and certainty of the physical effects of a proposed action, and fiscal resources available for conducting the analysis and level of detail sought.

In this section, several of these methods are described briefly in order to provide some context for our analysis of individual benefits categories. In the case of each benefit category, one or more of the specific methods described below are used directly by our team, or were used in

other studies upon which we rely for information. The methods discussed include: Regional Impacts Analysis, Benefits Transfer, and a Social Impacts Survey.

2.4.1 Regional Impact Analysis

Economic impact analysis is a methodology for determining how some change in regulation, policy, or technology affects regional income and other economic activities, including revenues, expenditures, and employment. Economic impact analysis does not account for social benefit or economic value. Regional economic impacts are commonly quantified through the use of an input-output model. Such a model allows for measuring the flow of commodities and services among the businesses and industries present within a region. Businesses within a local economy are linked together through the purchase and sales patterns of goods and services produced in the local area, such that a *direct* impact on one or more local industries is likely to have an *indirect* impact on many other businesses in the region. Transactions then link with other sectors within the county before purchases are made of goods and or services from other areas.

Because household income is affected by regional economic activity, additional economic impacts occur. Changes in demand by consumers will further affect the demand for local goods and services, leading to additional economic impacts throughout the economy. These additional effects generated by changes in household spending are known as induced economic impacts.

Following conventional impact analysis methodology, the total impact of some change can be decomposed into direct, indirect, and induced impacts. These are measured in terms of output, sales or operating budget, employment as measured by jobs or full-equivalents, and income as measured by employee payments and compensation for contractual services.

The regional impacts model is useful only to the extent that “direct impacts” are properly measured. Direct impacts reflect changes in revenue (or “Total Industry Output”) for goods and services to area businesses that are attributable to restoration, including associated construction activities.

We do not conduct a new economic impacts analysis but draw upon economic impact estimates generated in other studies to indicate potential changes in economic activity we might expect as a result of restoring the Deschutes River estuary.

2.4.2 Benefits Transfer

One common method of linking economic and environmental outcomes involves assessments of the economic consequences of ecological management outcomes often using market or non-market valuation techniques. Several methods may be used to assess the value of estuarine resource goods and services depending upon the resources in question and the specific issues of concerns. Original value estimates are typically generated using a set of valuation methods including market analysis, the travel cost and random utility method, hedonic pricing, and the contingent valuation method (see Lipton, et al., 1995, for a description of these methods). However, these methods can often be costly and time consuming. When fiscal resource and time constraints prohibit the performance of original research to quantify environmental values, the benefits transfer approach is considered a reasonable methodology. This approach essentially

“borrows” estimates of value for the same environmental good or service from studies in other areas and applies them to a new site or setting.

For example, researchers at the University of Maryland undertook an extensive project to assess the recreational benefits of increasing water quality in the Chesapeake Bay region. Using benefits transfer methodology to assess the economic benefits of restoring the Deschutes Estuary would include a review and application of results from such studies.

The conditions under which the use of benefits transfer is valid are well discussed in the economics literature. Both the Office of Management and Budget and the Environmental Protection Agency provide guidance for an appropriate use of benefits transfer methods, including criteria for their use. In general, however, the closer two sites are in terms of key physical and economic factors, the more likely it is that the transferred value is appropriate for the new setting. In addition, the literature cautions that values be used conservatively; i.e., that among those previous estimates judged to be appropriate, lower bound estimates should be used for the new application or setting. Finally, it is necessary that the estimates be taken from studies that have been subjected to peer review.

We conducted several benefit transfers to estimate quantitatively the potential change in non-market (use and non-use) environmental values associated with the restoration of the Deschutes estuary.

2.4.3 Cost Avoided and Replacement Cost

These two methods are related methods that estimate the economic value of environmental services based on either the cost of avoiding damages due to lost services, the cost of replacing ecosystem services or the cost of providing substitute services. These methods do not provide a strict measure of economic values in the classical view of the term. Instead they assume that the costs of avoiding damages, replacing ecosystems or their services provide useful estimates of the value of these ecosystems or services. This is based on the assumptions that if people incur costs to avoid damages caused by lost ecosystem services, or to replace the services of ecosystems, then those services must be worth at least what people paid to replace them.

2.4.4 Social Impacts Survey

One well established strategy for eliciting public opinions about natural resource policy issues such as the Deschutes estuary restoration is the *self-administered public survey* (Mangione, 1995). Whereas most interview surveys such as face-to face or telephone surveys need to be contracted by professional organizations and are quite expensive, self-administered surveys, whether through mail or internet e-mail, are an alternative that can provide decision makers with insights into public sentiment in a cost-effective manner.

For this study we conducted an internet-based, e-mail survey in February 2007 with a targeted sample of community representatives who had previously participated in the Deschutes Estuary stakeholder involvement process. The survey questionnaire was developed by the project team in consultation with Washington Department of Fish and Wildlife (WDFW) staff and was explicitly designed to draw out greater information on four specific dimensions of cultural services identified in the DEFS Stakeholder Involvement Report (2006):

- Aesthetics
- Cultural heritage
- Spiritual and inspirational
- Education

To learn more about the attitudes and values for each of these four categories, a series of close-ended and open-ended questions were developed (Appendix A). The close-ended responses allow us to generate frequencies from which we can examine the distribution of respondent attitudes towards key issues. The open-ended responses allow us to supplement the qualitative results obtained during the DEFS community involvement process with more detailed written comments drawn from individual respondents. Responses to the survey are included in Appendix B.

An advance e-mail and cover letter with the support of the WDFW was included. The target sample for the e-mail survey included 27 individuals who had originally participated in the community involvement meetings hosted in 2006. We received responses from 18 of the 27 individuals surveyed, for an overall response rate of 67 percent.

Because the survey did not follow a randomized design, the results of this report are *not statistically generalizable to the greater Olympia-Tumwater communities*. The results provided here nevertheless do provide insights into the range of thoughts and feelings of community stakeholders that would be affected by estuary restoration.

Section 3

Organizing Stakeholder Attributes into Economic and Social Benefits Categories

3.1 Overview

In order to provide a cohesive and complete assessment of changes in economic and social benefits resulting from restoration of the Deschutes River basin, it is necessary to put some structure to the collection of values, feelings, and attributes of stakeholders associated with and affected by the area. An important component of our overall work plan involved organizing stakeholder attributes previously gathered and collected in a methodical manner. Once organized, we used a well-accepted process to translate the attributes into a collection of functions and services representing the characteristics of the Deschutes River Basin. A system known as the **Millennium Ecosystem Assessment (MA)** was selected for this process. Finally, the function and services provided by the Basin ecosystem are arranged into various “economic services.” This final step provides an opportunity for each category, and the relevant components within them, to be measured by the study team. It further provides assurances that *all* of the identified attributes of the stakeholders will find a “home” within the economic categories that we analyze.

3.2 The Stakeholder Findings

In preparation for the NBA, the CLAMP Steering Committee sponsored a series of focus groups and an open public forum to gather input from area stakeholders regarding the social and economic benefits they derive from the Deschutes River Basin. The objective of this process was to engage stakeholders in the identification of priority areas for social and economic data collection by describing goods and services they associate with Capitol Lake and the lower Deschutes River Basin. The methods and results of this process are presented in the document, Deschutes Estuary Feasibility Study Net Benefits Analysis: Stakeholder Involvement Report, June 26, 2006.

The DEFS Stakeholder Involvement Report was developed out of a structured community involvement process held in collaboration with WDFW and National Oceanic and Atmospheric Administration’s Coastal Services Center (NOAA CSC) staff throughout the month of March 2006. The process included two facilitated meetings with focus group participants identified by targeting local organizations and soliciting interested citizens in the Olympia region and a third public meeting held to present results and solicit feedback. Although Capitol Lake is located in

Olympia and Tumwater, it represents the State of Washington through its inclusion in the Capitol Campus. Thus, a regional perspective was an important facet of the focus group process. The invitation list included local and regional business and trade associations, local and regional environmental groups, an educational organization, neighborhood and historic groups, and a local tribe. Structured focus groups were conducted to brainstorm a list of ideas and issues associated with Capitol Lake estuary restoration.

Following the two structured focus groups, a public meeting was held on March 21, 2006. Meeting participants were sought through a combination of advertisement, distributing fliers, and e-mail distribution. The public meeting was advertised in the local paper, on local radio stations, and fliers were posted at locations around town, including Evergreen State College. Fliers were distributed in hard copy and electronically to Focus Group participants and via e-mail to several Capitol Lake distribution lists.

At the focus group and public meetings, three main objectives were met: 1) the process identified the key attributes of concern related to the Deschutes Basin; 2) the focus groups suggested whether to quantify or qualify these attributes; and 3) citizens brainstormed ideas for continued public involvement. In the final report, a table is presented that provides a summary of the categories of attributes of importance to the stakeholders that should be addressed, either quantitatively or qualitatively, in this project. Table 1 is a reproduction of this table.

**Table 1
Summary of Focus Group’s Deschutes Basin Attributes**

SUSTAINABLE FUTURE	HEALTHY ECONOMY	EVERBODY'S BASIN	WEB OF LIFE	COME PLAY OUTSIDE	IT'S THE WATER	FROM HERE TO THERE	SPIRITUAL CONNECTIONS
A place to teach kids about nature	Safe haven for mooring boats	Unique cultural amenity (community celebrations, Capitol history)	Accessible natural habitat close to downtown	Old Brewhouse becomes vital historical focal point	Aesthetic value of water	Connects Chehalis & Woodland trails	A wonderful broad learning experience
Model for thoughtful stewardship	Destination for visitors	"Central" public resource	Seasonal change	"Green Lake" atmosphere	Reflecting pond for our grand Capitol	Various basin areas unique and integrated	Causes me to pause/slow down
Risk management of water level rise (climate change)	Drawing card for economic activity	Shared community asset	Peaceful beautiful natural open space	Community events (Proc of Species, Lakefair, Lighted Ships)	Views of Puget Sound & mountains	Waterway connects from West Bay to Falls	Spiritual connection to something larger
Demonstrates sustainable environmental practices	Not a large tax burden	Lake is point of civic pride	Ecological & social link to Puget Sound and Pacific Ocean	Expand and develop land use	Castle @ st. Heller Jersey C.I.	All the improvements completed at Heritage Park	Close-in quiet space
Sustainable natural environment within an urban setting	Economic driver (inc. transportation, tourism, port, marine businesses, yacht club)	Waterway tells story of the history of the community	Wildlife habitat	Family and romantic getaway	A reflecting estuary for our Capitol		
Deal with sewage pollution	Help keep downtown alive and healthy		A place to observe salmon	Walk, run safely			
Provide food protection	Lake/estuary attracts downtown business		Honoring local (NW) flora and fauna	Picnicking & watching kids swim			
	Ecotourism and wildlife viewing		Extension of Puget Sound	Wonderful safe area to exercise			
	Promotes water based activities			Canoe/kayak to experience tides			
				Swimming			
				Getaway boat fantasy			

Source: Reproduced from “Deschutes Estuary Feasibility Study Net Benefits Analysis: Stakeholder Involvement Report,” June 26, 2006.

3.3 Mapping the Focus Group Attributes to the Millennium Ecosystem Assessment

In 2001, the United Nations launched the Millennium Ecosystem Assessment, a work effort “designed to meet the needs of decision makers and the public for scientific information concerning ecosystem change for human well-being and options for responding to those changes.”² We adopted the principles of the MA for this project in order to add a tested structure to the organization and assessment effort.

The MA focuses the benefits people obtain from natural systems. The MA synthesizes information from the scientific literature, datasets, and scientific models, and includes knowledge held by the private sector, practitioners, local communities, and indigenous peoples. The effort took four years, and involved some 1,360 experts in 95 countries in a rigorous peer review. The MA has been adopted internationally and within a number of federal resource agencies in the United States.

One of the products of that effort is a way to categorize ecosystem goods and services. These include:

- Supportive Functions: Services necessary for production of other ecosystem services, e.g., wildlife habitat;
- Regulating Services: Benefits obtained from ecosystem processes, e.g., water quality;
- Provisioning Services: Goods produced or provided by ecosystems, e.g., shellfish; and
- Cultural Services: Non-material benefits from ecosystems, e.g., recreation.

The attributes identified in the Stakeholder Involvement Report are mapped according to the MA typology. Figure 2 displays the mapping. Within the four primary categories of ecosystem services are the subcategories representing specific aspects that pertain to the DEFS.

In addition to the ecosystem services indicated in the MA framework, there are a several attributes delineated in the Stakeholder Involvement Report that reflect “economic impacts.” That is, the attributes are not strictly economic values that reflect what society as a whole gains, but rather they address changes in, or measures of, economic activity at the local or regional level. Because these attributes differ from ecosystem services, per se, we treat them separately and outside of the MA typology. Stakeholder attributes addressing economic impacts are displayed in

Figure 3.

² See <http://www.millenniumassessment.org/en/About.Overview.aspx> for an overview of the MA.

Figure 2
Millennium Assessment Mapping of Stakeholder Involvement Report Attributes

Key:

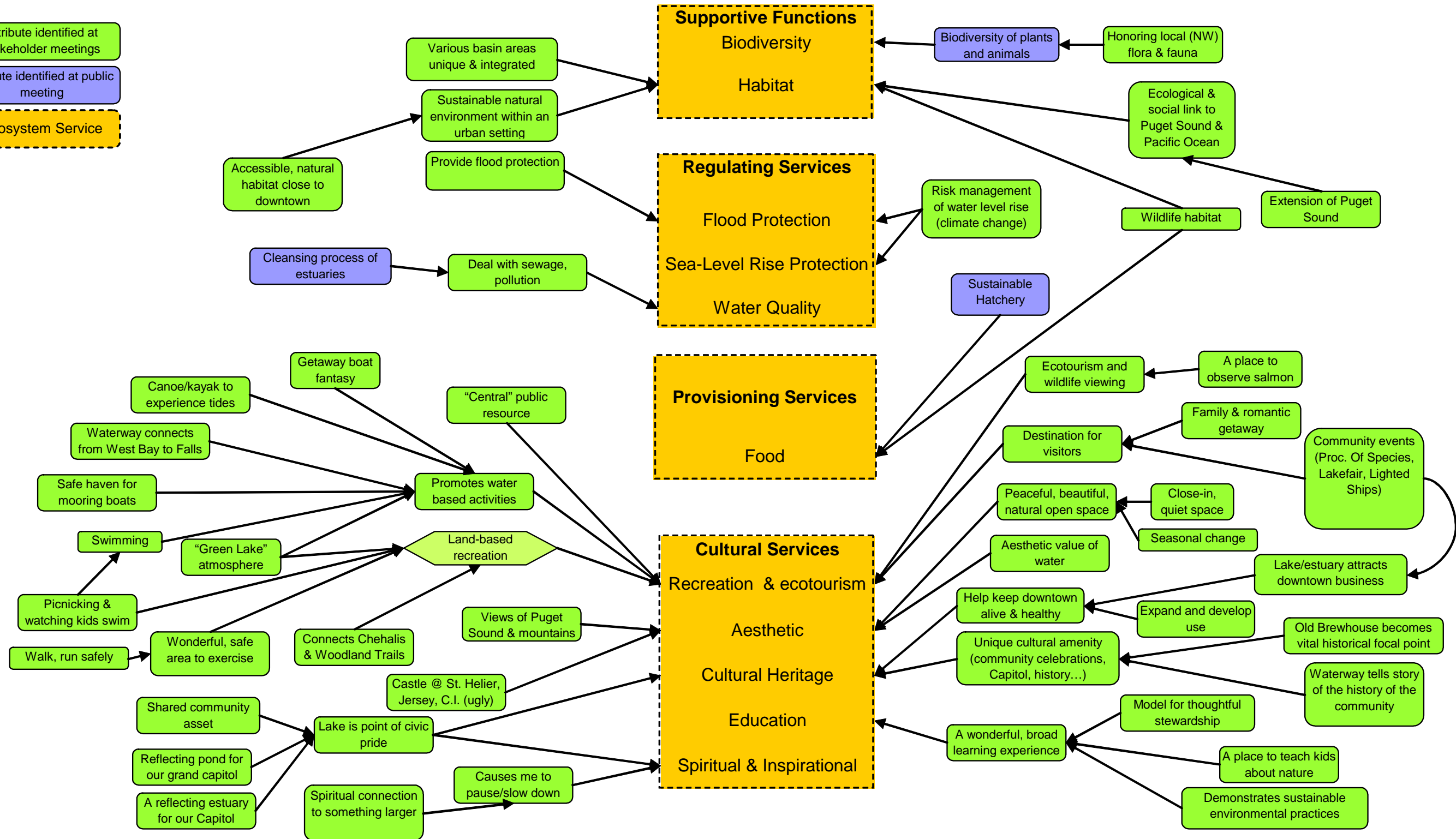
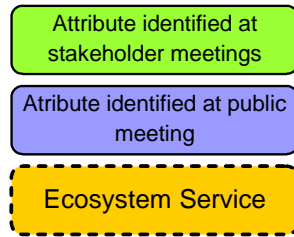
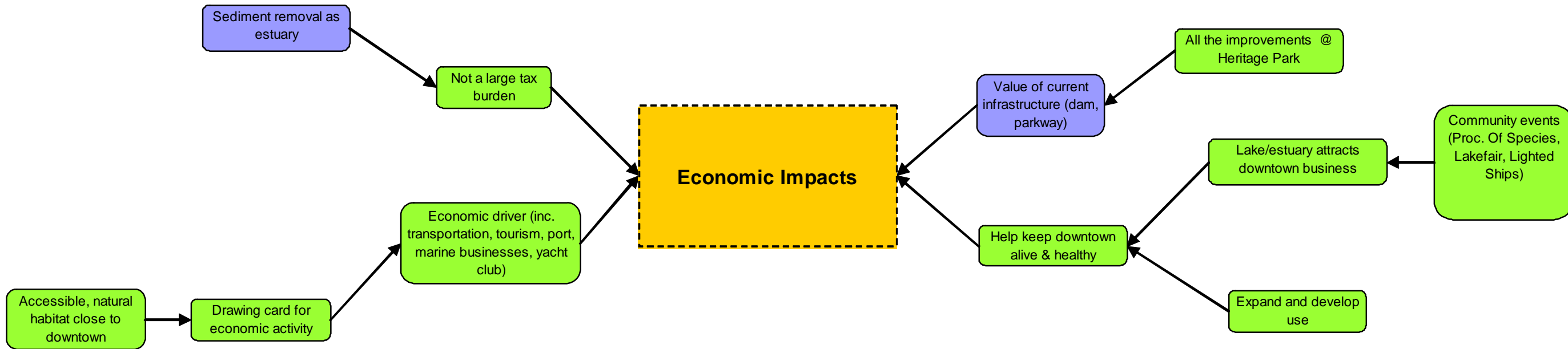
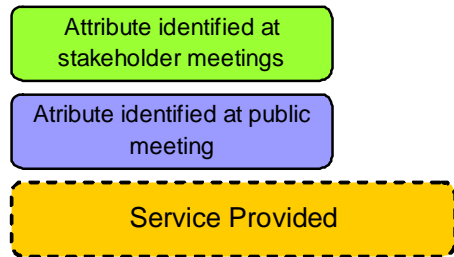


Figure 3
Economic Impacts Mapping of
Stakeholder Involvement Report Attributes

Key:



3.4 Economic Benefit Categories

The estuary goods and services, described above, provide various types of benefits over time. Environmental and ecological economists have a commonly accepted framework to value to such benefits. In general, the various types of benefits of the goods and services can be direct (e.g., commercial fish catch), or indirect (e.g., the contribution of an estuary to the natural production of fish harvested elsewhere). Moreover, not all benefits can be measured in the market, and not all benefits can or should reasonably be measured in quantitative terms. Benefits of goods and services may be traded in traditional markets with market prices (e.g., commercial fish) or may be valuable outside of traditional markets so that non-market approaches are needed to estimate social values (e.g., wildlife viewing). Additionally, there are subcategories of consumptive and non-consumptive, and use and non-use values.

The organization of the estuarine goods and services provided by the Deschutes River Basin are summarized in Table 2. It includes the economic benefit category, the economist's classification of the category, and the method used to determine benefits.³

We provide an extensive list of non-market components which included explicitly “non-economic” social and cultural values. Within the non-market values, both use and non-use values are represented. It should be emphasized that mere recognition of a component in these categories is not a demonstration of its relative size or importance.

³ Please note that the table demonstrates that there are few market value components associated with the DEFS. In fact, we determined that no specific analysis of market value was warranted in this assessment. No commercial products are derived or harvested from Capitol Lake or would be from a proposed restored estuary. Furthermore, the effect that a restored estuary would have on commercial fish harvest within Budd Inlet or Puget Sound is not easily measurable. While estuarine habitat can have a beneficial effect generally on salmonids of commercial importance in Puget Sound, an extended time series of empirical data would be required to confirm the extent to which a restored estuary on the Deschutes River contributes to regional increases in salmon populations. It would also be difficult to attribute any improvement in fisheries, and commercial fishery harvests, to the estuary restoration in isolation of other effects within the environment.

**Table 2
Economic and Social Benefit Categories**

Economic and Social Benefit Category	Economic Service Classification				Method of Measurement
	Direct or Indirect	Market or Non-Market	Use or Non-Use	Consumptive or Non-Consumptive	
Supportive Functions					
<i>Biodiversity</i>	Indirect	Non-Market	Non-Use	Non-Consumptive	Benefit Transfer
<i>Habitat</i>	Indirect	Non-Market	Non-Use	Non-Consumptive	Benefit Transfer
Regulating Services					
<i>Flood Protection</i>	Direct	Non-Market	Use	Non-Consumptive	Replacement and Avoided Cost
<i>Sea-Level Rise Protection</i>	Direct	Non-Market	Use	Non-Consumptive	Replacement and Avoided Cost
<i>Water Quality</i>	Direct	Non-Market	Use	Non-Consumptive	Replacement and Avoided Cost
Cultural Services					
<i>Recreation</i>	Direct	Non-Market	Both	Non-Consumptive	Benefit Transfer
<i>Ecotourism</i>	Direct	Non-Market	Both	Non-Consumptive	Benefit Transfer
<i>Aesthetic</i>	Direct	Non-Market	Both	Non-Consumptive	Benefit Transfer and Social Impact Survey
<i>Cultural Heritage</i>	Direct	Non-Market	Both	Non-Consumptive	Social Impact Survey
<i>Education</i>	Direct	Non-Market	Both	Non-Consumptive	Social Impact Survey
<i>Spiritual and Inspirational</i>	Direct	Non-Market	Both	Non-Consumptive	Social Impact Survey
Economic Impact	Direct	Market	Not Applicable	Not Applicable	Regional Impact Analysis

Section 4

Analysis and Results

4.1 Overview

In this section, the assessments of individual economic and social benefits are presented by category. The subsections are organized according to MA mapping of Stakeholder Involvement Report attributes as shown in Figure 2 on page 14, and

Figure 3 on page 15. Each benefits category sub-section is generally structured as follows:

- List of the Stakeholder Involvement Report attributes to be addressed;
- Existing Conditions;
- Methodology;
- Analysis;
- Results
- Recommendations for Reducing Uncertainty

4.2 Supportive Functions

The benefit categories under Supportive Functions include biodiversity and habitat.

4.2.1 Biodiversity

The Stakeholder Involvement Report attributes addressed in this subsection are:

- *Biodiversity of plants and animals*
- *Honoring (NW) flora and fauna*

Existing Condition

Currently, the dam at 5th Avenue blocks saltwater intrusion from Budd Inlet into Capitol Lake through two tide gates; and has a five-foot wide fish ladder for migrating Chinook and coho salmon and cutthroat trout. Fish species found in the Deschutes Basin include hatchery origin

Chinook, coho, winter steelhead, and cutthroat trout. Bull trout and chum utilize nearshore habitats of southern Budd Inlet adjacent to Capitol Lake. The watershed also supports a number of other fish species whose survival is of concern, including Dolly Varden trout, bull trout, Olympic mud minnow, pygmy whitefish, and sea run cutthroat trout (WDFW, 1993).

Capitol Lake has been invaded by two well-known nonnative plant species: purple loosestrife and Eurasian watermilfoil. Purple loosestrife takes over native grasses consumed by local wildlife yet has limited food value for most wildlife species (Coombs, et al., 2004). Watermilfoil robs oxygen from water by preventing wind mixing between the oxygenated surface and deeper waters. This decreases the fitness and success of many organisms that live on the bottom of the lake. Watermilfoil mats also increase sedimentation. When watermilfoil invades new territory the total species diversity of aquatic plants typically declines (Biological Conditions Report, Garono, et al., 2006 – referred to here after as Garano et al, 2006). We could find little additional relevant information regarding current levels and makeup of species diversity in the Deschutes watershed and Capitol Lake.

Methodology

The benefits or value of biodiversity are highly uncertain due to the complexity of the potential new set of ecosystem functions resulting from the restoration of the lower Deschutes River. As such, we discuss changes in benefits from changes in levels of biodiversity from Deschutes Basin restoration qualitatively. We conducted this assessment through review of other DEFS reports and information provided by WDFW biologists.

Analysis

According to Garono, et al. (2006), the flushing action associated with a restored Deschutes estuary would counteract many of the negative impacts of siltation, high temperature, noxious weeds, and other measures of the water quality problems in Capitol Lake and Budd Inlet (see section 4.3.3, Water Quality for a complete discussion). Elimination of the low DO problem will likely enhance biodiversity (Chuck Gibilisco, Watchable Wildlife Section Manager, WDFW, Personal Communication, 2007). Services provided by biota that are of vital importance and easily recognized by people are fishing, hunting, and wildlife viewing. In terms of wildlife viewing, it is expected that Deschutes estuarine restoration will create a more diverse species assemblage than currently exists (Gibilisco, 2007). Generally speaking, we will most likely see an increase in the number of native wildlife species of mammals, fish, waterfowl, and shorebirds, in particular, with wider viewing opportunities throughout the calendar year (Gibilisco, 2007). The level of biodiversity will, of course, be dependent on what extent species are drawn an urban setting, but may look similar to those found in the Kennedy Creek and Mud Bay reference estuaries.

The change in environmental values from an increase in wildlife viewing opportunities is discussed in Section 4.5.1, Recreation. How wildlife viewing could change under a restored estuary is referenced here as an indicator of potential increase in benefits related to increases in levels of biodiversity.

Results

While we can say that there is a potential for positive changes in net benefits related to biodiversity in the Deschutes Basin as a result of estuarine restoration, until a clear delineation of

current and potential changes in biota in the Deschutes Basin is made, no estimates of the economic benefits related to changes in biodiversity can be made at this time.

Recommendations for Reducing Uncertainty

Three recommendations to improve upon this work are:

1. Generate a clear list of existing species (at all trophic levels) currently considered part of the Deschutes Basin ecosystem.
2. Conduct an environmental valuation study that specifically assesses the change in the value of biodiversity in the Deschutes Basin (or some reference study) area from restoration.
3. Model the integration of Deschutes Basin ecosystem and economic and social systems. Linked natural and social science models could more accurately supply input to an assessment of social and economic benefits changes resulting from estuary restoration.

4.2.2 Habitat

The Stakeholder Involvement Report Attributes addressed in this subsection are:

- *Accessible, natural habitat close to downtown*
- *Various basin areas unique and integrated*
- *Sustainable natural environment within an urban setting*
- *Wildlife habitat*
- *Extension of Puget Sound*
- *Ecological and social link to Puget Sound and Pacific Ocean*

Existing Conditions

Capitol Lake is a 260-acre water body ranging in depth from -8 to 6 meters (NGUD29 USGS referenced vertical datum plane) (George, et al., 2006). The deepest waters are found in the north basin, though generally it is characterized as a shallow lake environment (CLAMP, 1999). According to the Biological Conditions Report (Garono, et al.(2006), and the Engineering Design and Cost Estimates Report (hereafter referred to as Moffatt and Nichol (2007)), Capitol Lake currently has a host of ecological concerns. Sediment loading from the Deschutes River and non-point source pollution from stormwater runoff and sewer/septic malfunctions has caused a decrease in the quality of habitat in the lake. In addition, the lake is on the state list of impaired waterbodies (see section 4.3.3, Water Quality for a complete discussion). The noxious weeds purple loosestrife and Eurasian watermilfoil has invaded the lake. Capitol Lake dam is a significant barrier to the Deschutes River hatchery salmon runs; it restricts upstream passage and increases mortality as fish are delayed and vulnerable to predation. Passage of juvenile fish and other fish species may be reduced or prevented as well.

Methodology

In order to assess the economic benefits of changes in habitat resulting from a restored estuary, we have used two approaches. One is to consider the value of the restoration program and its impacts on habitat as a whole (a change in total value) and the other is to consider how a restored estuary will act (a change in functions). In the first case, we apply benefits transfer from other studies that have considered the non-market (both use and non-use) value of or willingness to pay for restoration of estuarine habitat. Reference studies used the contingent valuation method. The other approach is to consider specific non-market services provided by habitat that could be impacted by restoration of the Deschutes Basin. In this case, we direct the reader to our sections on the valuation of recreational fishing and wildlife viewing

Analysis

Habitat for a particular plant or animal consists of the elements it needs to survive. These elements are tied to temperature, water, soil, sunlight, source of food, refuge from predators, place to reproduce, and other living and nonliving factors. Existing habitat will be affected by the introduction of salt water into the basin as well as by tidal fluctuations in water level if the estuary is restored (Moffatt and Nichol, 2007). Removal of some dying vegetation and invasive species and planting of desirable plants will be done as necessary (Moffatt and Nichol, 2007). Additionally, the shoreline along much of Deschutes Parkway is currently steep and protected with rock providing relatively low habitat value. The proposed shoreline restoration treatment of the area would be to place material dredged from Capitol Lake over the rock buttress to provide intertidal estuarine habitat (Moffatt and Nichol, 2007). After placement of marine sediments, the slope would be improved and treated with topsoil to allow a variety of riparian vegetation to flourish. Plantings might include brackish sedges and rushes and wetland herbaceous plugs at the intertidal and upper intertidal zone, and native seeding and woody trees and shrubs in the riparian zone (Moffatt and Nichol, 2007).

According to the Biological Conditions Report (Garon, et al., 2006), the range of conditions predicted for the restored Deschutes estuary is well represented in nearby estuaries. They found that a restored Deschutes estuary will probably look somewhat like the reference study areas of Mud Bay or Kennedy Creek. It is not expected that the restoration project will produce expansive vegetated salt marshes unless an unanticipated shallowing of the basin occurs. The estuarine communities of a restored Deschutes will be instead predominately intertidal and subtidal sand and mudflats, with some sandy channels in deeper areas.

We found limited studies in the literature from which to draw for our assessment of the change in habitat benefits from restoration. While we did find several studies that do indicate that dam removal and estuarine habitat restoration lead to positive total economic value (e.g., existence, option and recreation value), their applicability to the Deschutes Basin is questionable due to differing geographic and demographic scope. We do, however, outline results from several studies that we feel shed some light on potential changes in habitat benefits.

Loomis (1996) for example, conducted a study to measure the total non-market economic value for restoring the Elwha River (a significant Chinook spawning stream) and its fisheries to residents of Clallam County, Washington. He used the contingent valuation method to obtain estimates of willingness to pay values for removing the two dams on the Elwha River and restoring the ecosystem and its mix of salmon and steelhead fisheries. The mean annual value per

households was \$59 (1996 dollars) in Clallam County and \$73 for the rest of Washington residents. Benefits to residents of the State of Washington (including Clallam County) are \$138 million annually for ten years. Hanemann, et al. (1991), estimated the total non-market value of increasing Chinook salmon populations in the San Joaquin River from the current estimates of about 100 fish to 15,000 fish. They estimated the value per household to be \$181 to \$336 per year. Another contingent valuation study by Olsen, et al. (1991), for a doubling of salmon and steelhead runs in the Columbia River drainage estimated sport, option, and existence value averaging about \$50 per household, yielding a total value of \$93 million in Washington. Finally, Sanders, et al. (1990), used an open-ended willingness to pay question contingent valuation format and calculated annual willingness to pay of \$58 per household (in 1994 dollars) to preserve the undammed portions of these rivers.

In terms of habitat services, a restored Deschutes estuary is expected to result in enhanced waterfowl, fish, and invertebrate habitat. This function is based on less-visible processes such as carbon transformation and primary productivity. Sometimes the animals themselves provide important functions in estuaries. For example, waterfowl are valuable to estuarine food webs as transformers and transporters of both terrestrial and aquatic organic matter (Adamus, 2005). Fisheries of commercial and recreational importance such as salmonids depend on estuarine habitat for part of their life cycle. Both resident and migratory bird species use Pacific Northwest estuaries for foraging and roosting (Simenstad, 1983). As indicated in the analysis of recreation benefits, we suggest that there may be positive changes in environmental value in terms of wildlife viewing and recreational fishing, services provided by habitat.

Results

The quantification of benefits related to Deschutes Basin habitat is a difficult task in part because of the significant complexities of estuarine systems in general, and the lack of quality information on existing local habitat conditions and the uncertainty as to the long term outcomes of the proposed restoration project specifically. However, as indicated above, review of the limited existing literature suggests in general that estuary restoration programs and dam removal projects lead to positive change in total economic value (as measured by use and non-use measures). Reference study value estimates suggest an annual household willingness to pay for restoration and or dam removal of approximately \$50. In addition, if restoration leads to improvement of habitat for wildlife, we might see increases in fish and wildlife species leading to increased value of recreational opportunities. At this time we do not have sufficient evidence to suggest that such an increase would in fact occur in the Deschutes Basin.

Recommendations for Reducing Uncertainty

Three recommendations to enhance this work are:

1. Conduct a comprehensive assessment of existing habitat goods and services provided by Deschutes Basin.
2. Conduct an environmental valuation study that specifically assesses the change in the value of habitat in the Deschutes Basin (or some reference study) area from restoration.
3. Model the integration of Deschutes Basin ecosystem and economic and social systems. Linked natural and social science models could more accurately supply input to an assessment of social and economic benefits changes resulting from estuary.

4.3 Regulating Services

The benefit categories under Regulating Services include:

- Flood Protection
- Sea-Level Rise Protection
- Water Quality

The benefits assessments for each of the above categories are discussed below.

4.3.1 Flood Protection

The Stakeholder Involvement Report Attributes addressed in this subsection are listed below:

- *Provide flood protection*
- *Risk management of water level rise (climate change)*

Existing Condition

Of all natural hazards that affect Thurston County, floods are the most common and, on an annual average basis, the most costly (Thurston County, 1997). Four types of flooding occur in the county: river or stream building floods, flash floods, tidal floods, and groundwater flooding. The Deschutes River reacts in the manner of a flash flood, characterized by a quick rise and fall of water level. Flash floods generally result from intense storms dropping large amounts of rain within a short period of time onto watersheds that cannot absorb or slow the flow, making them more difficult to forecast. Since 1972, major flooding on the Deschutes has occurred approximately once every four years. A major flood is defined by recommended evacuation of threatened neighborhoods and communities and the expectation of major damage (Thurston County, 1999).

Whether restoration of the Deschutes Estuary would reduce the occurrence of a flood is not known with certainty. There is not one recent report that uses the same modeling methodology to estimate flood elevations in both a lake and estuary context. The USGS *Hydrodynamics and Sediment Transport Modeling*, developed for the DEFS, estimated the water elevations for four estuary alternatives and the pre-dam condition but did not model water elevations under the existing lake condition. Without a lake condition to use for comparative purposes an estimate of how flood risk would change if the estuary is restored can not be determined.

An early report done by Entranco in 2000 did use the same modeling methodology to estimate the water elevation of both the lake and a restored estuary. Estimates from that report state that the base flood elevation of the estuary would be 3.2 feet lower than under the lake alternative, a potentially significant flood control benefit (Entranco, 2000). However, conditions have changed since the Entranco report was completed. During the development of the Heritage Park, the Washington Department of General Administration (GA) raised the park's perimeter to reduce flood risk of the surrounding properties in downtown Olympia.

Restoration of the estuary would not increase the risk of flooding (Moffatt and Nichol, 2007). The primary benefit pointed out in the Moffatt and Nichol report is that restoring the estuary

would provide a natural connect between the Deschutes River and Budd Inlet so that flood control would not be dependent on mechanized operation of gates on the Capitol Lake dam.

Methodology

Two types of potential flood benefits are considered in the following discussion: 1) avoided costs of flood damage and of flood insurance, and 2) the loss of tax revenue from the relatively lower values of properties located in the floodplain. The methodologies used in the following discussion for each of these types of benefits are: 1) avoided costs, and 2) benefits transfer, respectively.

Analysis

The first type of flood control benefits considered is the avoidance of actual economic and social costs of flood damage. These costs are generally relatively large and occur in the aftermath of a flood. For example, the record floods of February 1996 cost the Thurston County government in excess of \$2 million. Costs to other government entities and utilities exceeded \$20 million. Uninsured private losses exceeded \$22 million (Thurston County, 1999).

In addition to these real economic and social losses of a flood event, costs are also incurred annually as a consequence of the risk of a flood. Property values, and consequently property tax revenue, in floodplains can be relatively less than that of nearby property located outside the floodplain. Floodplain property owners also buy flood insurance. These costs are incurred regardless of the actual occurrence of a flood.

Estimating the benefits of a reduction in the risk of flooding around the Capitol Lake without a FEMA-approved floodplain study is speculative. A Federal Emergency Management Agency (FEMA) study would establish the base flood elevations for a restored Deschutes estuary and could support FEMA-issued Letters of Map Revision (LOMRs) and Flood Insurance Rate Maps (FIRMs). The FIRMs report on the estimated geographic extent, and probability of occurrence, of a flood event. Of particular importance is the geographic extent of the 100-year floodplain, as flood insurance rates are based on this information. Without an understanding of whether a restored Deschutes estuary would prompt a change in the FEMA-drawn floodplain, this analysis will describe potential flood control benefits and estimate ranges of benefits. Annual flood-related costs will consider the change to: (1) private property owners' cost of flood insurance; and (2) property values, and consequently property tax revenue, related to a change in the floodplain map.

Cost Reductions to Private Insurance

If the Deschutes estuary was restored a Flood Insurance Study (FIS) conducted by FEMA could be warranted. Such a study could ultimately provide a revision to the FIRM of the City of Olympia, the City of Tumwater, and Thurston County. If the FIS resulted in a reduction of the 100-year floodplain, then there is potential to reduce the cost of flood insurance to private property owners in the affected area.

The affected area would be property located on land where the flood rating, which is a parameter in the cost of flood insurance, changes. For example, if a property had formerly been in the 100-year floodplain, and after the FIS is no longer in the 100-year floodplain, then the cost of flood

insurance for the private property owner would decrease. Property owners within a 100-year floodplain are required to obtain flood insurance by banks holding liens on the property.

Precedent for revising flood maps is the 2003 FEMA LOMRs to the City of Olympia, the City of Tumwater, and Thurston County increasing the geographic boundaries of the Capitol Lake floodplain. Both the historical and revised floodplain maps for the Olympia area are available. The primary revision to the Capitol Lake floodplain was the incorporation of area northeast of the North Basin, near the arc of statehood, and northeast of the Capitol Lake dam.

The estimated increase in the cost of insurance for the property owners in the affected area can not be known with certainty. However, the National Flood Insurance Program (NFIP) provides information on its website that estimates the cost of insurance premiums. Below are two estimates for insurance premiums for non-residential property outside the 100-year floodplain and inside the 100-year floodplain.

The FEMA estimates of flood insurance premiums for a non-residential building located in the 600 block of Columbia Street in downtown Olympia are shown in Table 3. The annual premiums range between \$500 and \$2,300 for varying levels of coverage if a property is outside the 100-year floodplain. The same property inside the 100-year floodplain would pay between \$1,827 and \$8,665 annually for approximately the same level of coverage.

Table 3
FEMA-Estimates of Flood Insurance Premiums Outside and Inside the 100-year Floodplain

Outside the 100-Year Floodplain		Inside the 100-Year Floodplain	
Building & Contents Coverage	Annual Premium	Building & Contents Coverage	Annual Premium
\$50,000/\$50,000	\$500	Data Not Available	
100,000/100,000	800	\$100,000/\$50,000	\$1,827
150,000/150,000	1,050	Data Not Available	
200,000/200,000	1,300	200,000/100,000	3,549
250,000/250,000	1,500	Data Not Available	
300,000/300,000	1,700	300,000/200,000	5,205
350,000/350,000	1,850	400,000/300,000	6,612
400,000/400,000	2,000	500,000/400,000	8,004
500,000/500,000	2,300	500,000/500,000	8,665

Source: <http://www.floodsmart.gov/floodsmart/pages/index.jsp>.

Change in Property Values and Property Tax Revenue Related to a Change in the Floodplain Map

Several studies have documented the price reduction from location in a floodplain (Shilling, Benjamin, and Sirmans, 1985; MacDonald, 1989; Speyer and Ragas, 1991; Harrison, Smersh, and Schwarts, 2001; and Bin and Polasky, 2004). These studies examined the impact on residential properties, however the results are likely transferable to businesses. A common finding in these studies is that locating within a floodplain lowers property values anywhere from 4 to 12 percent. Many of the studies also found that the sale price reduction was more than the capitalized value of insurance premiums, suggesting that there may be a non-insurable costs

associated with flood. The impact this difference in sales price lowers property tax revenues by the same 4 percent to 12 percent.

Results

Until there is a modeling effort to determine whether a restored estuary provides a flood control benefit, the results of this section are indeterminate, but not likely negative. While the physical effects of estuary restoration on flood elevations are uncertain, the methods by which to calculate economic benefits are straightforward.

Recommendations for Reducing Uncertainty

Two recommendations to improve upon this work are:

1. Estimate the change in flood elevations under both a lake and estuary context using the same model. These estimates would provide an authoritative determination of whether there is a flood control benefit of a restored estuary.
2. Consult with FEMA about the possibility of developing a study to examine the impact on the FIRM of GA's recent work to raise the ground elevation of the parks to reduce the risk of flooding around the Capitol Lake.

4.3.2 Sea-Level Rise Protection

The Stakeholder Involvement Report Attributes addressed in this subsection are listed below:

- *Risk management of water level rise (climate change)*

Existing Condition

According to the University of Washington's Climate Impact Group, glaciers in the Cascade and Olympic Mountains have been retreating for 50 to 150 years. Pacific Northwest temperature is rising faster than the global average. Puget Sound waters are warming and river and stream flows are changing (Snover, et al., 2005). In particular, and relevant to this study, the Climate Impacts Group states that accelerated rates of sea level rise are found especially in south Puget Sound where the effects of sea level rise are compounded by sinking land. In Puget Sound, sea level rise is documented to have been occurring at rates of just over two mm per year (Zervas, 2001). In southern Puget Sound, these rates in sea level rise are predicted to continue and a rise of approximately 3.3 feet is expected at the end of the century (Snover, et al., 2005). More specifically, scientists predict a rise of 2.9 feet over the next 100 years in the Olympia area. This estimate is based on information from the UW Climate Group and Department of Ecology's interpretation of the United Nations International Panel on Climate Change estimates of sea level rise, predications of sea level rise, subsidence, and climatic influences (El Nino effect) (Haub, 2007).

This change in sea level rise will disrupt the mix of fresh and saline waters in estuaries where many organisms are dependent upon certain salinity characteristics. Warming waters may also cause shifts in organism ranges and productivity levels which in turn will affect predators and prey of individual species (Snover, et al., 2005). Climate change will also affect estuarine vulnerability to eutrophication and decrease ability to store sediment (Herrera, 2005) and water

quality (Garono, 2006). The rate of rise in the Pacific Northwest is projected to be faster than the global average and is likely to increase both the pace and extent of the erosion and nearshore habitat loss already affecting Puget Sound shorelines. During the modest sea level rise of the 20th century, most salt marshes were able to keep pace through accretion or the accumulation of sediments, generally rising as a result of sediment capture (Thom, 1992). More recent sea level rise may lead to further loss of salt marsh habitat, particularly where land areas are already sinking and where sediment supply is reduced or where upland migration of marshes is prevented by shoreline armoring, and coastal development.

In addition, with more of the region's winter precipitation falling as rains rather than snow, flooding in Puget Sound watersheds would likely increase. If winter precipitation increases, as some models suggest, the risk of flooding would be compounded (Mote, et al., 1999). Flooding increases in free-flowing rivers are a concern because management of high flows is not an option. In managed systems high stream flows can be controlled to a certain extent (as has been the case with Capitol Lake). Most urban areas located on a river mouth, such as Olympia, have been partially protected by upstream flood control reservoirs or were developed sufficiently far above the waterline to protect against flooding. However, increases in natural flows could still cause increased flooding in managed systems when these protective measures are overwhelmed and or fail at critical times.

Methodology

Changes in benefits resulting from the restoration of the lower Deschutes River related to climate change and sea level rise are highly uncertain. We attempted to quantitatively assess such benefits in terms of the potential costs avoided from increased storm surge and flooding due to climate change and sea level rise using the data collected through an expert witness survey. This turned out to not be feasible due to lack of data and certainty as to actual physical changes. Therefore, we provide the following qualitative discussion.

Analysis and Results

According to Doug Myers, Habitat Restoration Program Manager for the Puget Sound Action Team (personal communication, 2006), removal of the Capitol Lake dam could make the Deschutes Estuary less subject to sea level rise because natural sedimentation processes in Budd Inlet will help mitigate sea level rise by the build up of natural tidelands adjacent to Olympia waterfront. From an economic perspective, this suggests potential benefits associated with the removal of Capitol Lake dam to local downtown Olympia businesses and port facilities.

However, climate change is a process that will affect all coastal waters, not just the restored Deschutes Estuary. While the general outcomes of climate change include rises in sea level, warming waters, and an amplification of other disturbances in estuaries (Thom, 2001; Snover, et al., 2005), it is difficult to predict what will actually occur in Puget Sound estuaries. With rising water levels predicted, an increase in the possibility of flooding during spring tides could occur, along with a change in biological communities adapted to certain inundation levels. Warming water temperatures could change existing habitats by altering carbon transformations and nutrient cycling, or by favoring species adapted to warmer temperatures; therefore warming temperatures can be expected to alter estuarine communities and process. Since the intricacies of how climate change could alter a restored Deschutes Estuary are unknown, we can not at this

time make any quantitative or qualitative statements as to the economic benefits or costs of restoring Capitol Lake to a naturally functioning estuary.

4.3.3 Water Quality

The Stakeholder Involvement Report attributes addressed in this subsection are listed below:

- *Cleansing process of estuaries*
- *Deal with sewage, pollution*

Existing Condition

Capitol Lake, the Deschutes River, Budd Inlet, and tributaries were placed on the Clean Water Act Section 303(d) list of impaired waters in 1996 and 1998 (Ecology, 2004). The Deschutes River is on the list for: temperature, fecal coliform, pH, and fine sediment. Capitol Lake is on the list for the parameters: fecal coliform and total phosphorus. Budd Inlet is on the list for dissolved oxygen (DO), total nitrogen, and pH. The single largest non-point source of nutrient loads in Budd Inlet is Capitol Lake (LOTT, 1998) The single largest point source for nutrient loads in Budd Inlet is the wastewater treatment plant (WWTP), operated by the LOTT Alliance, serving the cities of Lacey, Olympia, Tumwater, and parts of Thurston County.

The LOTT Alliance operates the discharge of treated water into Budd Inlet under a Washington State Department of Ecology (Ecology) issued National Pollutant Discharge Elimination System (NPDES) permit.⁴ In September 2001, following completion of the long-range planning process, LOTT submitted an application for modification and renewal of its existing NPDES permit (LOTTonline, March 2, 2007).

On September 1, 2005, Ecology issued the new LOTT NPDES permit (WA0037061), effective October 1, 2005. The permit imposed a decrease in the summer critical season pollutant discharges, rather than a limit on volume of waste water discharged. Limits for Biochemical Oxygen Demand (BOD) were decreased from what was then the current load of 3,670 pounds/day to an interim level of 1,050 pounds/day during summer critical season until final new effluent limits took effect on November 1, 2006, at which point in time the summer load limits were reduced to 671 pounds/day (Memorandum from Karla Fowler, May 22, 2007). This current load limit will be in place until LOTT's current NPDES permit expires, in 2011. At that time, Ecology could change the discharge limits for the LOTT WWTP based on the findings of Ecology's study of the total maximum daily loads (TMDL), the purpose of which is to estimate Budd Inlet's ability to assimilate loads.

The TMDL study, begun in 2003, will be used to determine how much pollution point sources and nonpoint sources can contribute to Budd Inlet without exceeding numerical standards

⁴ The NPDES is a system for issuing permits for wastewater discharges to surface waters. The purpose of the permits is to control pollutants as a means to achieve the goals of the federal Clean Water Act. In the state of Washington, the U.S. Environmental Protection Agency has delegated NPDES permit authority to Ecology. NPDES permits place limits on the quantity and concentrations of contaminants that may be discharged. Permits may require certain levels of treatment for wastewater or impose other operating conditions to ensure that permit limits are met.

(Ecology, 2004). If the natural capacity of Budd Inlet falls below the numerical water quality standard then all human sources combined, from both point and nonpoint sources must be restricted (e-mail from Mindy Roberts, May 11, 2007). The outcome of the study will be a recommendation for point source wasteload allocations and nonpoint source load allocations, the sum of which cannot exceed the capacity of the waterbodies minus a margin of safety. The study is due for completion in 2008.

For the purposes of this discussion of the potential benefit of water quality improvements available under an estuary condition, one existing study is relevant. That study is an extension of the Budd Inlet Scientific Study (see LOTT, 1998). The Budd Inlet Scientific Study was developed in 1997 and 1998 to help the LOTT Alliance determine to what extent Budd Inlet could be relied upon for continued and/or expanded discharge of the community's treated wastewater flows in the future (LOTT, 2000). In 2000, the GA requested that Brown and Caldwell Engineering, the consulting firm that developed the model for the Budd Inlet Scientific Study, extend the work to provide an estimate of the impact an estuary would have on water quality in Budd Inlet (Brown and Caldwell, 2000). The measure of water quality in that report is dissolved oxygen (DO).

It should be noted that Ecology is currently working on a Quality Assurance Project Plan of the South Puget Sound Water Quality Study Phase 2: Dissolved Oxygen. The purpose of the plan is to determine how nitrogen from a variety of sources affects dissolved oxygen levels in South Puget Sound.⁵ Although not yet complete, the draft states that the results of the study may show that human-related sources of nitrogen need to be reduced to keep South Puget Sound healthy and where these reductions would occur (Ecology, 2006). As a part of the DO and nutrient study, Ecology will simulate water quality in Budd Inlet both with and without Capitol Lake. The simulations of water quality in Budd Inlet with and without Capitol Lake are scheduled to be available for public review in 2008. Until Ecology completes its analysis of Budd Inlet, Capitol Lake, and Deschutes River Dissolved Oxygen and Nutrient Study, the 2000 memorandum to GA from Brown and Caldwell will be used as a basis for a discussion about the water benefits of restoring the Deschutes estuary.

Methodology

We estimate the cost of engineering a water quality treatment solution that would provide similar levels of treatment capacity as a restored estuary. This replacement value allows us to estimate the benefit of the estuary's capacity to treat water and improve dissolved oxygen levels.

Analysis

Ecology has stated concerns that rapid population growth is outpacing South Puget Sound's capacity to assimilate nutrients, and potentially degrading dissolved oxygen levels. The LOTT Alliance estimates that its operating capacity needs by 2030 will be 20 million gallons (MGD) per day up from current operational capacity estimates ranging between 12.0 MGD and 15.8

⁵ Nitrogen is the main pollutant that causes low dissolved oxygen levels (Ecology 2006). Discharges from wastewater treatment plants, septic systems and other sources add nitrogen to Puget Sound. Excess nitrogen causes excess algae growth. As the algae dies and decays, they rob the water of dissolved oxygen.

MGD (LOTT 2006).⁶ The LOTT Alliance's 2007 Capital Improvement Plan and Budget include investments in significant process control upgrades in order to maximize the plant's efficiency and increase the volume of discharge water allowed under the existing permit.

The outcome of Ecology's TMDL study may impact the loading limits placed on LOTT when the existing NPDES permit expires in 2011. If water quality in Budd Inlet improves significantly, for example from a restored estuary's ability to take up nitrogen, LOTT could continue to discharge at its existing levels (telephone conversation with Mindy Roberts May 9, 2007). If continuing development degrades water quality in Budd Inlet beyond current levels, Ecology could potentially restrict the load limits on LOTT's discharge under the 2011 NPDES permit.

The discussion of water quality benefits in this assessment focuses on the potential water quality improvement a restored estuary may have on DO levels in Budd Inlet. Water quality is measured as improvements in DO because the only existing report that estimates any potential water quality impact of a restored Deschutes estuary on Budd Inlet measures water quality in terms of DO (Brown and Caldwell, 2000).

DO levels can fluctuate over the day and night in response to changes in climatic conditions as well as the respiratory requirements of aquatic plants. Since the health of aquatic species is tied predominantly to the pattern of daily minimum DO concentrations, the criteria are expressed as the lower one-day minimum DO concentration that occurs in a waterbody. The numeric criteria for South Puget Sound taken from Ecology are as follows:

1. *To protect the designated 'extraordinary quality' category of aquatic life the lowest one-day minimum DO level must not fall below 7.0mg/l more than once every ten years on average.*
2. *To protect the designated 'Excellent quality' category of aquatic life the lowest one-day minimum DO level must not fall below 6.0mg/l more than once every ten years on average.*
3. *To protect the designated 'good quality' category of aquatic life the lowest one-day minimum DO level must not fall below 5.0mg/l more than once every ten years on average. (Ecology, 2006, p. 17.)*

The results from the Brown and Caldwell memorandum to GA state (p. 6):

A substantial water quality improvement (an increase of 1.0 mg/l to 5.0 mg/l dissolved oxygen) is realized in south and central Budd Inlet as a result of returning Capitol Lake to a tidal estuary...

The actual DO levels in Budd Inlet, for all months, range between approximately 5.0 mg/L and approximately 12.0 mg/L (Ecology, 2007). Brown and Caldwell estimated the maximum difference in DO under a restored estuary condition as "a substantial water quality improvement (an increase of 1.0 mg/l to 5.0 mg/l DO)." The estimated improvements in DO levels occur most frequently in June. If the natural capacity of Budd Inlet falls below the numerical water quality

⁶ Under LOTT's existing NPDES permit, with its performance-based loadings approach, the actual level of treatment capacity is dependent upon what level of operating efficiency the Budd Inlet Treatment Plant can achieve, thus the range of capacity estimates.

standard all human sources combined from both point and nonpoint sources must be less than 0.2 mg/L of DO, it is understandable why the Brown and Caldwell memo describes the estimated change in water quality ranging between 1.0 mg/L and 5.0 mg/L as “substantial.” The improvement in DO is largely attributed to the increase in continuous hydraulic flushing induced by the tidal action through a restored estuary.

Estimating how a reduction in DO in Budd Inlet under a restored estuary condition could reduce water treatment costs is speculative. However, one way to quantify the regulating benefit of the estuary’s capacity to treat water is to understand the cost of building additional water treatment capacity. Below are descriptions of the costs of water treatment provided to frame the magnitude of water treatment costs.

In its 2007 CIP, LOTT estimates that significant process control upgrade projects will cost approximately \$35.2 million.⁷ Since publication of the CIP LOTT estimates these process control upgrades are now \$61.0 million accounting for preliminary design changes and escalated construction costs. The upgrades will reduce existing costs of removing biological nutrient from the existing configuration of the plant. In its capacity planning, LOTT is estimating that the efficiency of the existing plant, which achieves a reduction in total inorganic nitrogen (TIN) down to 3.0 mg/l, can be improved to 2.25 mg/l of TIN thereby allowing for a larger volume of water to be discharged into Budd Inlet under the existing NPDES Permit.

Another data point for treatment costs is LOTT’s “rule of thumb” estimate of the cost of building new treatment capacity at \$14.00/gallon. LOTT is currently re-evaluating that cost estimate (memorandum from Karla Fowler, May 22, 2007).

Results

One study exists which models the water quality impact of Capitol Lake and a restored estuary on the water quality of Budd Inlet. That study found a substantial water quality improvement under a restored estuary condition measured in terms of DO. The value of this potential water quality improvement is positive, but the magnitude is indeterminate. The measurement of value is framed in terms of the cost of replicating the water quality improvement provide by an estuary with an engineering solution.

Recommendations for Reducing Uncertainty

The analysis will benefit from the data that will be available from Ecology upon completion of the simulation of the effects of a restored estuary on the water quality in Budd Inlet. In conjunction with those simulation results a dialogue about the impact those results could have on LOTT’s existing NPDES Permit, and the future renewal of that Permit in 2011, could provide insights into the value a restored estuary could have on the future costs of treating wastewater in the Cities of Lacey, Olympia, Tumwater, and Thurston County.

⁷ The process improvement upgrades are described in the LOTT Alliance 2007 budget and Capitol Improvement Plans as the Folded Tanks and Primary Sedimentation Tanks projects (personal communication with Karla Fowler at LOTT).

The future costs of treating wastewater should be compared to the costs of estuary restoration. Both the initial costs of estuary restoration and any annual cost of maintaining an estuary in an urban area should be considered in a net benefits analysis.

4.4 Provisioning Services

4.4.1 Food

The DEFS Stakeholder Involvement Report attributes considered in this section of the NBA are listed below.

- *Sustainable hatchery*
- *Wildlife habitat*

These two attributes were taken as indications of the concern for fish resources (as a source of food) that may or may not be affected by dam removal. There is no information indicating that a restored estuary will have an effect on hatchery operations, nor is there any likelihood that the estuary will become a new source of harvestable food. For these reasons, we expect to see no change in this benefit category.

4.5 Cultural Services

The categories of benefits discussed below are; Recreation, Ecotourism, Aesthetic, Cultural Heritage, Education and Spiritual and Inspirational. Information about the benefit change for the categories Aesthetic, Cultural Heritage, Education and Spiritual and Inspirational was obtained by the survey, described section 2.4.4, Social Impacts Survey. The full survey results are included in Appendix B.

4.5.1 Recreation

The **DEFS Stakeholder Involvement Report Attributes** considered in this section of the NBA are listed below.

- *Destination for visitors*
- *Promotes water-based activities*
- *Safe haven for mooring boats*
- *Getaway boat fantasy*
- *Canoe/kayak to experience tides*
- *Waterway connects from West Bay to Falls*
- *Swimming*
- *'Green Lake' atmosphere*
- *Land-based recreation*
- *Picnicking and watching kids swim*
- *Walk, run safely*
- *Wonderful, safe area to exercise*

- *Connects Chehalis & Woodland trails*
- *'Central' public resource*
- *Community events (Proc of Species, Lakefair, Lighted Ships)*
- *Family and romantic getaway*

The geographic extent of the study area for this recreational benefits assessment includes the Capitol Lake area and portions of Budd Inlet. The Capitol Lake area is associated with Heritage Park, Marathon Park, the Deschutes Parkway, the Interpretive Center, Percival Cove, and Tumwater Historical Park. Heritage Park, Capitol Lake, Marathon Park, and the Interpretive Center are all owned and maintained by GA (GA, 2006). Tumwater Historical Park, owned and maintained by the City of Tumwater, is located on the western shore of the Capitol Lake's South Basin. The portions of Budd Inlet considered under this benefit assessment include the Olympia Yacht Club (OYC) and the marinas adjacent to Percival Landing.

The recreational benefits provided by these parks and the marinas are briefly described below in two categories. First is a discussion about access to the recreational amenities offered by the parks and marinas such as hiking trails and boat launches. Second is a discussion about recreational activities that depend in part on habitat quality such as wildlife viewing or recreational fishing.

Access to Recreational Amenities

For the purpose of assessing a recreational benefit or costs, we assume that if the access to the amenity, for example a trail, is unchanged under an estuary condition then there is no change in the recreational benefit. We recognize that access to a recreational amenity may not capture the quality of the recreational experience for different individuals. Some individuals may prefer recreating beside a lake, as is likely indicated by the Stakeholder Involvement Report attribute "Green Lake [Seattle, Washington] atmosphere." While other individuals may prefer a restored estuary for their recreation as is indicated by the Stakeholder Involvement Report attribute "canoe/kayak to experience tides," we do not assess the difference in these recreational experiences because it shows a personal preference. Given divergent views of stakeholders about the recreational experience of a lake versus an estuary, we assess the recreational benefits based on access to trails, walking paths, and the marina and not on the quality of the recreational experience.

Existing Condition

What follows is a description of the existing condition of the parks and marinas that provide recreational opportunities in the study area.

Heritage Park is a 24-acre state-owned property adjacent to Capitol Lake and downtown Olympia. The park is the northern extension of the Capitol Campus and is managed by the State Department of General Administration.⁸ Funding for Heritage Park was authorized by the 1991 legislature. Completion of the basic park is scheduled for 2007 which will include the park's physical formation, paths, edges and minimal infrastructure and trees. Future planned improvements at the Park include plazas, plantings, memorials, and visitors' facilities. The park

⁸ <http://www.ga.wa.gov/Heritage/index.html>, April 29, 2007.

is used more as a local resource, and less as a venue for political expression (GA, 2006). The park is used for numerous community gatherings including those listed below (Olympia, Lacey, Tumwater Visitors Bureau website, <http://www.visitolympia.com/>):

Lakefair is a five-day event held in mid-summer on the shores of Capitol Lake. Lakefair offers all residents and visitors the opportunity to exhibit their talents and provides non-profit organizations a venue for yearly charity fundraising. Lakefair began in 1957 with a budget of less than \$500 and has grown into a festival with a budget of approximately \$200,000 (www.lakefair.org, March 10, 2007). The 2007 Lakefair festival marks the 50th anniversary of the community event.

Procession of Species is an annual, community, arts-based Earth Day celebration started in 1995 by a group of Olympia residents to commemorate the 25th anniversary of Earth Day and to support Congressional renewal of the Endangered Species Act. Participants use a wide range of artistic approaches and mostly donated or scavenged materials to express appreciation for the natural world: costumes, banners, floats, puppets, drumming, community bands, and more. An estimated 3,500 people attended the 2007 Procession (Olympian, 2007).

Dragon Boat Festival was first held in 2006 by the Saint Martins University. Dragon boat races are traditionally held to commemorate the death of Qu Yuan, a Chinese poet, making dragonboating the only sport to be celebrated as a Chinese national holiday.

Marathon Park is a 2.25-acre state-owned property located in the southwestern corner of the north basin. The park was constructed by the state in 1970 by placing 58,000 cubic yards of fill material next to an existing railroad berm. The park provides a venue for outdoor events like picnics, family reunions, weddings, and dances. The park facilities include 50 parking stalls, a restroom building, a dock, benches, and tables.

Deschutes Parkway was constructed as a part of the 1951 Deschutes Basin Project. The parkway, a 1.68 mile roadway between Interstate 5 and 5th Avenue, provides a transportation connection between Olympia and Tumwater. The parkway is used as a mass transit route, a bike route, and as a jogging path. The loop around the north basin is 1.52 miles which the full lake loop is 4.95 miles. These pathways connect downtown Olympia, Tumwater, Heritage Park, Marathon Park, Tumwater Historical Park, and the Capitol Lake Interpretive Center.

Capitol Lake Interpretive Center is located on what was originally an 18-acre dewatering basin used to process the spoils of the 1979 dredging of Capitol Lake, and future dredging activity. In the mid-1990s, when the state was preparing to dredge the lake, portions of the basin were considered to be a wetland and could not be disturbed. When Heritage Park was being developed in 1997, the state committed to designating the 18-acre site to an Interpretive Center. The high quality engineered wetlands that are maintained at the site have helped mitigate the loss of open-water habitat and the loss experienced by expansion of park grounds into formerly submerged areas (GA, 2006). The Center's facilities and infrastructure include buildings, bridges, kiosks, boardwalks, and a dock.

Tumwater Historical Park was built in 1980 at the base of Tumwater falls, on the western edge of Capitol Lake South Basin. The 17-acre park encompasses at least part of the historic district of the City of Tumwater. It has a shelter, picnic facilities, restroom, play toys, river access, and trails.

Percival Landing is one of Olympia's three waterfront parks. The park encompasses 3.4 acres with a 0.9-mile boardwalk that extends along the eastern shoreline of West Bay from the Fourth Avenue Bridge to Thurston Avenue. Park amenities include picnic areas, open space areas, art overnight boat moorage, restrooms/showers and a playground. The park is the beginning and ending point for the annual holiday Parade of Lighted Ships as well as the venue for other community events including the Wooden Boat Festival and Harbor Days.

Olympia marinas that are located on West Bay in close proximity to the Capitol Lake dam include **OYC, Fiddlehead Marina, One Tree Island Marina and Martin Marina**. Collectively these marinas provide moorage and guest berth facilities for a range of sizes and types of boats. The OYC is located adjacent to Percival Landing on the eastern side of Budd Inlet. In addition to membership activities related to sailing and socializing, the OYC has been conducting summer fee-based basic sailing programs for the community's young people for the past 18 years.

Methodology

Two methodologies are used to assess recreational benefits. First, the analysis considers the replacement costs of changing access to the recreational resources in the Capitol Lake area and around Budd Inlet specifically, whether there is a change in the ability of people to use trails, docks, picnicking locales, communities meeting places, etc. We do not attempt to value a change in the aesthetic experience that someone may have if the estuary is restored. For example, if there is data to indicate that the trails around the Lake will still be accessible if the estuary is restored then we state the recreational opportunity would be unchanged. The second methodology applies to recreational activities where there is data to indicate that a restored estuary would clearly increase the recreational opportunities for some activities, for example if a restored estuary increases the number of bird species that can be viewed, we indicate as such. In the case of wildlife viewing and recreational fishing, we use a net benefits transfer methodology to suggest a magnitude of benefit.

Analysis

The analysis discusses access to parks first followed by a discussion of boat moorage at the marinas.

The DEFS Engineering Design and Cost Estimates developed by Moffatt and Nichol (2007) describes the impacts to park facilities in the Capitol Lake area under a restored estuary condition. In general, the trails in most parks will not be affected by fluctuating tidal-water elevations that would occur if the estuary is restored. Boat launches would be impacted, as they would be stranded in mudflats over parts of the tidal range. The summary of conditions by park is listed in Table 4.

Table 4
Summary of the Change in Park Access

Park	Change in Access to Trails and Boat Launches
Heritage Park	No change in the access to existing recreational facilities and community meeting places
Marathon Park	The existing boat launch would be stranded at low tides. If the launch is not relocated or modified there would be a reduction in access to the restored estuary at Marathon Park
Deschutes Parkway	Under all alternatives, slope stabilization will occur so that there will be no change to the access to use the parkway for biking/running/walking.
Capitol Lake Interpretive Center	Access to some existing trails may be limited at high tide unless modifications are made to raise the trail.
Tumwater Historical Park	The marsh trails would be flooded at high tide, preventing access unless the trails were replaced with boardwalks. Low tide will limit access to the boat launch.

Source: DEFS Engineering Design and Cost Estimates – Final Report. Moffatt and Nichol, 2007 and e-mail communication with Steven Morrison, Senior Planner Thurston Regional Planning Commission.

If the Deschutes estuary is restored, sediment that is currently captured behind the dam would be deposited at the site of the existing marinas and Port (USGS, 2006). Under all alternatives, the Moffatt and Nichol report recommends dredging sediment prior to establishing tidal flow. The recommended dredging quantities approximate the estimated range of the sediment quantities that would be eroded during the first three years after restoration. This dredging is being proposed for two reasons: 1) to approximate the long-term, evolved estuary bathymetry which would also reduce the quantity of sediment that would be flushed from the newly restored estuary into the marine and port; and 2) the dredging spoils would be used to develop intertidal habitat along the Deschutes Parkway.

In the long-term, after the initial flushing of the newly restored estuary, annual sediment loads from the Deschutes into the marinas and Port are estimated to be 43,000 cubic yards (USGS). Dredging would be required for recreation opportunities at the marinas to remain the same as before restoration. The full impact of this sediment on the marinas' ability to maintain their existing boat moorages has not been measured or modeled. If a cost-sharing arrangement to pay for dredging is possible among various agencies and stakeholder groups, the estuary restoration would not impact recreational boating. If a cost-sharing arrangement can not be reached, then the existing recreational benefits of the marinas would be negatively impacted. This benefits assessment does not speculate on the value of the negative impact because the frequency of dredging and the cost of dredging have not been estimated.⁹

⁹ Ecology began investigations to determine the extent and possible sources of dioxin contamination of sediments in Budd Inlet. Ecology initiated this investigation after elevated levels of dioxins were discovered by the Port of Olympia in an area scheduled for routine maintenance dredging in the fall of 2006. The presence of dioxins may

Results

Access to most parks and trails will not be affected by a restored estuary, so there would be no loss of land-based recreation as consequence of restoring the estuary. Some boat launches could be stranded at low tide. Without improvement or relocation of these boat launches boat-based recreation would be negatively impacted. The marinas and the overnight boat moorage at Percival Landing would be impacted by the increase in sediment from the Deschutes River. Without a cost sharing arrangement the marinas and the City of Olympia would be negatively impacted by the restoration of the estuary.

Recommendations for Reducing Uncertainty

This recreation benefits assessment could be improved if a more definitive plan for addressing the boat moorage, and those trails at the Tumwater Historical Park and the Capitol Lake Interpretive Center that would have limited access during low tide events were known.

Recreation Activities Related to Habitat Levels

Wildlife Viewing

This section of the report focuses on bird watching.

Existing Condition

We were not able to find literature that clearly and consistently evaluated the types or number of bird species found in and around Capitol Lake

Methodology

We used a benefits transfer method to evaluate the benefit of increased wildlife viewing opportunities.

Analysis

We found only one estimate in the literature alluding to changes in the value of wildlife viewing. Johnson et al (2002) estimated the value for non-residential bird watching and wildlife viewing in the Peconic Estuary (Rhode Island) to be \$49.83 per person per trip using a travel cost model. Because of noted differences in geography and demographics the applicability of this study is questionable.

Results

Due to limitations in data we are not able to speculate as to the change in restoring the estuary.

Recommendations for Reducing Uncertainty

This analysis would be improved if information on whether estuary restoration would result in changes in the number of species and/or the populations of those species were available. Such

change the cost of dredging if an estuary is restored, however, this report does not speculate on how the presence of dioxins would impact dredging that might occur if the estuary is restored.

data could be used to understand whether restoration would lead to changes in the frequency of wildlife viewing trips and the quality of the experience allowing us to say something about the effect of restoration on wildlife viewing benefits.

Recreational Fishing

The economic benefit of recreational fishing is discussed below.

Existing Condition

Fish species found in the Deschutes Basin include hatchery origin Chinook, coho, winter steelhead, and cutthroat trout. Bull trout and chum utilize nearshore habitats of southern Budd Inlet outside Capitol Lake. The watershed also supports a number of other fish species whose survival is of concern including Dolly Varden trout, Bull Trout, Olympic num minnow, pygmy whitefish, and sea run cutthroat trout (WDFW, 1993).

Currently the Deschutes Chinook Hatchery Program is responsible for most of the salmonids found in the Deschutes. The program contributes substantially to recreational fisheries and partially to commercial fisheries and tribal harvest in Puget Sound, especially in marine areas near Port Townsend, Seattle, Tacoma, and Olympia. The program produces four million Chinook salmon each year, representing 35 percent of all hatchery Chinook released into South Puget Sound. According to WDFW data, the annual recreational value of all Chinook sport catch regardless of origin is \$504,804. The value to fishermen (or price paid to fishermen) of Washington fall Chinook commercial fisheries is \$88,896 for yearlings and zero age fish combined (Applby, 2007).

Methodology

We used a benefits transfer method to evaluate the benefit of increasing fish populations to recreational fishers.

Analysis

We were able to find several studies that estimated the value per fish to a recreational fisherman in the Pacific Northwest. In a 1990 study of the summer steelhead fishery in the John Day River Basin of Eastern Oregon, Adams, et al. (1990), used a travel cost model to estimate the recreational value of an additional fish for various increases in catch rate. They estimate the marginal value of a fish ranges from \$28.70-\$35.30. Previously, Johnson and Adams (1989) used a contingent valuation method on the John Day River to estimate the value of an additional steelhead at \$6.65. Loomis (1988) estimated the marginal value of an additional salmon and steelhead caught in various coastal freshwater and ocean fisheries in Oregon and Washington. The values (1984 dollars) ranged from \$7.48 to \$103.00 per fish. Some of the values per fish for both actual and proposed management actions in the Pacific Northwest have ranged even higher. For example, in a benefit-cost analysis of alternative fish protection measures on the upper Columbia River dam, the recreational marginal value for spring Chinook utilized by Scott, et al. (1987), was \$230.00 (1985 dollars). Berrens et al. (1993), applied the contingent valuation method to estimate the value of spring Chinook fishing in the greater Portland, Oregon, metropolitan area. Their results indicated that an additional fish caught was not highly valued by recreational anglers (\$7.82 per fish). It is suspected that is because of the urban nature of the

fishing experience and that there is more held value for “the fishing experience” than for an additional “fish.”

Results

The literature suggests a range of estimated recreational values per an additional fish in the Pacific Northwest between \$7.82 (1993) and \$230.00 (1985). However, because of the uncertainty around the impact of restoration on fish survival rates and related fisheries management regulations, we are not able to estimate quantitatively the change in benefits to recreational fisheries resulting from Capitol Lake dam removal.

Recommendations for Reducing Uncertainty

To reduce uncertainty around the information we provide we would need to know more about changes in salmon survival rates from dam removal and estuary restoration.

4.5.2 Ecotourism

The **DEFS Stakeholder Involvement Report Attributes** considered in this section of the NBA are listed below.

- *Ecotourism and wildlife viewing*
- *A place to observe salmon*

Existing Condition

The concept of ecological tourism (ecotourism) was promoted internationally when the United Nations General Assembly declared 2002 as the International Year of Ecotourism. Ecotourism refers to a method of sustainably developing and managing a tourism industry in countries with pristine and/or fragile ecosystems. The United Nations and the World Tourism Organization sponsored the World Ecotourism Summit, held in Quebec City, Canada in 2002. Over 1,000 participants from 132 countries, from the public, private, and non-governmental sectors met at the Summit.¹⁰ The following definition of ecotourism is an excerpt from the Quebec Declaration on Ecotourism.

...ecotourism embraces the principles of sustainable tourism, concerning the economic, social and environmental impacts of tourism. It also embraces the following specific principles which distinguish it from the wider concept of sustainable tourism:

- *Contributes actively to the conservation of natural and cultural heritage,*
- *Includes local and indigenous communities in its planning, development and operation, and contributing to their well-being,*
- *Interprets the natural and cultural heritage of the destination to visitors,*
- *Lends itself better to independent travelers, as well as to organized tours for small size groups.*

¹⁰ <http://www.world-tourism.org/sustainable/TYE/quebec/anglais/declaration.html>, May 2, 2007.

While the concept of ecotourism generally refers to larger scale destination vacations, its applicability to the DEFS benefits assessment was recognized in Stakeholder’s Report. The concepts of ecotourism, defined in the bullet points above, are discussed in many of the sections of this benefits assessment. Rather than repeating these discussions here, Table 5 provides a reference to the appropriate section and a brief write-up of the results.

Table 5
References to the Location of Ecotourism Concepts within the Benefits Assessment

Ecotourism concept	Reference Benefits Assessment Section	Summary Result
<i>Contributes actively to the conservation of natural and cultural heritage</i>	4.5.4 Cultural Heritage and 4.5.1 Recreation	Respondents indicated that a restored estuary would ‘actively’ demonstrate conservation of natural heritage. There are divergent views about whether a restored estuary would ‘actively’ demonstrate conserving cultural heritage as some respondents felt Capitol Lake is a significant source of civic pride.
<i>Includes local and indigenous communities in its planning, development and operation, contributing to their well-being</i>	1.1.2 Stakeholder Involvement	In preparation for the analysis, the CLAMP Steering Committee sponsored a series of focus group meetings and an open public forum to gather input from stakeholders regarding the social and economic benefits they derive from the Deschutes Basin. The methods and results of this process are presented in the document, “Deschutes Estuary Feasibility Study Net Benefits Analysis: Stakeholder Involvement Report,” June 26, 2006
<i>Interprets the natural and cultural heritage of the destination to visitors</i>	4.5.5 Education and 4.5.1 Recreation	How the interpretation of the natural and cultural heritage of a restored estuary would be presented to visitors is speculative at this time because currently there is not a plan to build an interpretive center. However, the Heritage Park Master Plan does propose a visitor’s center that may provide an interpretive function, but details of the planned build have not been developed.
<i>Lends itself better to independent travelers, as well as to organized tours</i>	4.5.1 Recreation	The Recreation section describes how access to recreational amenities such as trails and boat launches could change under a restored estuary condition. Generally, access to most existing recreational amenities is unchanged except boat launches. To maintain existing access to boat launches for either an independent traveler or an organized tour, an investment in these amenities is required. With respect to organized tours, although the ecotourism concept of ‘organized tours’ speaks more to destination vacations than tours of a restored estuary, organized tours of estuaries do occur in both the Nisqually and Padilla Bay estuaries.

4.5.3 Aesthetics

The Stakeholder Involvement Report attributes addressed in this subsection are:

- *Views of Puget Sound & mountains*
- *Peaceful, beautiful, natural open space*
- *Aesthetic value of water*
- *Close-in, quiet space*

- *Seasonal change*
- *Castle at St. Helier*

Existing Conditions

Focus group and public meeting results summarized in the Stakeholder Involvement Report reveal several aesthetic characteristics associated with the Capitol Lake area that are of concern to community stakeholders. As the report notes, in addition to serving as a reflecting pond for the state capitol building, the basin currently provides an “entrance” to the city of Olympia and offers a visually attractive public space that is widely used by community members and provides a quiet, natural space in an urban area. Participants in the community involvement process explicitly noted concern with the potential changes to aesthetic values that might occur with an estuary restoration alternative including the appearance of tidal mud flats and odors that might be associated with them.

Methodology

Building on the public involvement results documented in the Stakeholder Involvement Report, we designed a series of specific questions to elicit more detailed information about people’s attitudes and values towards the aesthetic impact of estuary restoration in the Capitol Lake area.

Analysis

The survey results reveal that most respondents were satisfied with the current appearance of Capitol Lake. As the distribution of responses clearly reveal, approximately 61 percent of our survey respondents were very satisfied or somewhat satisfied with the current appearance of the downtown area around Capitol Lake, while 39 percent were either somewhat unsatisfied or dissatisfied.

Question 2 asked respondents to think about the possible effects of estuary restoration on the appearance of downtown Olympia. Here, approximately 61 percent of respondents appear to think that estuary restoration would have a negative effect on the appearance of the surrounding downtown Olympia area while only 39 percent appear to think that it will have a positive effect.

This finding appears to be backed up by the weight of qualitative responses drawn from the follow-up, open-ended written responses provided by respondents. Several detailed comments from respondents summarized below in Box 1 reveal the nature of opposing opinions expressed by survey respondents when asked about the proposed estuary restoration on the appearance of downtown Olympia.

Box 1**Written Comments on Appearance of Capitol Lake**

- *“Olympia with Capitol Lake is a jewel waiting to be polished.”*
- *“Capitol Lake is an icon which represents the State of Washington. Visitors to the city of Olympia leave with a vision of the lake with Olympic Mtns’ in the background.”*
- *“Restoring to the natural estuary would provide openness and health. To me this is aesthetically pleasing”*
- *“A naturally functioning estuary will greatly enhance the natural beauty of downtown Olympia.”*

Building on the findings summarized in the Stakeholder Involvement Report, we implemented two specific questions to elicit respondent attitudes towards the presence of green space in the Deschutes Basin area. Almost half of respondents, 49 percent, did not feel that green space would be either gained or lost from estuary restoration and less than 25 percent thought there would be less green space after restoration. When asked about the importance of providing green space to the community following estuary restoration, however, a majority of respondents, 60 percent, reported that it was very important or somewhat important to them. Again less than 25 percent said that it was somewhat or very unimportant to them and approximately 17 percent reported being ambivalent about the issue of green space in the restored estuary.

The written responses summarized below in Box 2 appear to support the survey data reported above with respondents revealing mixed opinions about the role of open green space in the downtown Olympia area.

Box 2**Written Comments on Green Space**

- *“It would increase the variability of the landscape, adding valuable depth and dimension to the area.”*
- *“[A restored estuary] might negatively affect the lovely Heritage Park and lake area...Would certainly affect the yacht club with a heavy silt load. The boats (particularly the sailboats) are part of the aesthetic appearance of downtown.”*
- *“[A restored estuary] would give the urban environment of Olympia more of a sense of place with Puget Sound”*
- *“Maintaining the lake is worth the cost. Grizzly bears once roamed here, yet I would not want to re-introduce them to recreate a ‘natural’ appearance.”*

During the community involvement process reported in the Stakeholder Involvement Report, the issue of returning mud flats along with the restored estuary was raised several times by focus group participants as one of the most important aesthetic changes that might result from the estuary restoration project. A large majority of stakeholder respondents, 77 percent, felt that the presence of mud flats was indeed an important factor in the restored Deschutes estuary alternative. Moreover, as the results to question 5 shows, over 66 percent of respondents also felt that the presence of tidal mud flats would actually have a very negative or somewhat negative effect on the appearance of the restored estuary. Approximately six percent of respondents were ambivalent while less than 30 percent appeared to think that mud flats would have a positive effect on appearance.

The written responses summarized below in Box 3 appear to support the level of importance and controversy surrounding the role of tidal mud flats in a restored Deschutes estuary.

Box 3

Written Comments on Tidal Mud Flats

- *“I am most concerned with the smells, the bugs (mosquitoes) and the potential to not keep the mud flats free of litter and trash and junk...Nisqually Reach is gorgeous - but it is highly protected, access is very limited and I'm not sure THAT kind of control can be issued within such an 'urban' area.”*
- *“I believe that the whole character of the downtown waterfront and Percival landing will change. Who wants to walk around a tidal mud flat?”*
- *“I live...next to a small estuary. I have kayaked this estuary many times during high tide and walked its mud flats at low tide. This is one of the most enjoyable activities I know.”*
- *“Tidal mud flats represent life and a connection with nature.”*

Another significant issue that was raised during the community involvement exercise conducted in 2006 was the aesthetic effect of odor coming from the restored tidal estuary. As a result, the survey team designed two questions to elicit the attitudes and opinions of respondents about the possible aesthetic impact of smells and odors associated with a restored Deschutes Estuary.

A majority of respondents appear to be very or somewhat concerned about the possibility of unpleasant odors in the downtown Olympia area if the Deschutes River estuary were restored. Similarly, 61 percent of respondents reported that the presence of an odor in a restored estuary would be important to them while less than 30 percent reported that it would be somewhat unimportant or not at all important.

As the summary written responses shown in Box 4 reveal, several respondents were very explicitly concerned about the possible bad odor an estuary would have, although one respondent noted that there would be a nice smell associated with the sea and another respondent noted that smells of polluted water would actually be worse than a restored estuary.

Box 4**Written Comments on Odor**

- *“Creating stinky mudflats would be a nightmare to downtown.”*
- *“The smells that come from the seashore bring back good memories for many people who grew up around the sea”*
- *“The odors from polluted waters, boat fuel and exhaust are unpleasant and should be avoided.”*

The presence of a reflecting surface was identified in the 2006 community involvement process as something that provides a unique aesthetic characteristic to the city of Olympia. Interestingly, as the data in Box 5 show, when respondents were asked about the importance of reflecting the Capitol in a restored Deschutes estuary, a notable divergence in respondent attitudes was revealed. Over 72 percent of stakeholders stated that the reflecting surface would be very important or somewhat important to them while 28 percent stated that it would not be important at all. Interestingly, there were no middle-ground positions revealed.

As the written comments summarized below in Box 5 reveal, the issue of the reflecting surface and its role in the restoration of the Deschutes Estuary does indeed remain a source of contention for stakeholders in the community. On the one hand, the reflecting pond is seen as an important differentiating aesthetic factor of Olympia while others seem to believe that the restoration of tidal flows would have little, if any, impact on the reflecting surface for the Capitol.

Box 5**Written Comments on Reflecting Surface**

- *“I think that a reflecting pond in front of the Capitol is aesthetically pleasing and makes the walk around the lower portion of the lake very tranquil and comforting. It provides balance in our busy lives.”*
- *“The tidal changes would also have a real sense of seeing nature at one of its finest moments. It is much more interesting than looking at a pond.”*
- *“The lake was part of the original plan for the Capitol Campus area, including reflection.”*

Results

The results shown here reveal a considerable amount of diversity in stakeholder attitudes and opinions towards the aesthetic impacts of estuary restoration on downtown Olympia. For example, one pattern that clearly emerges from the results discussed above is that survey respondents differ substantially in their beliefs about the impact of estuary restoration on the appearance of downtown Olympia around Capitol Lake. A majority of respondents from our limited survey reported that the presence of mud flats would be very important and would have a negative effect on the appearance of the restored Deschutes estuary. Similarly, a majority of respondents to the survey noted that the presence of odor in the restored estuary would be important to them and that they were very or somewhat concerned about it.

4.5.4 Cultural Heritage

The Stakeholder Involvement Report attributes addressed in this subsection are:

- *Shared, community asset*
- *Lake is a point of civic pride*
- *Reflecting pond for our grand capitol*
- *Reflecting estuary for our capitol*
- *Alive and healthy downtown*
- *Lake/estuary attracts downtown business*
- *Expand and develop use*
- *Old Brewhouse becomes vital historical focal point*
- *Waterway tells story of community history*
- *Unique cultural amenity (community celebrations, Capitol, history)*

Existing Conditions

Many communities place a high value on the preservation and maintenance of historically and culturally important landscapes. As the Stakeholder Involvement Report (2006, pp. 58-59) notes, the Deschutes River has played a defining role in the history of Olympia, and the basin itself serves as a source of cultural, civic, and historical pride for many residents. Community involvement participants in 2006 clearly stated that they valued the basin as a unique, central, and accessible public resource that brings together the community and visitors. Participants also identified the basin as a focal point for the Olympia area and viewed the basin as a place where the natural environment, history, and community could be displayed, protected, and honored. Some participants attributed great value to the improvement of specific historical sites within the basin, namely its importance in Olympia history.

Methodology

Building on the public involvement results documented in the Stakeholder Involvement Report, we designed a series of specific questions to elicit more detailed information about people's

attitudes and values towards the cultural heritage impacts of estuary restoration in the Capitol Lake area.

Analysis

Building on the results in the Stakeholder Involvement Report we designed a series of questions designed to elicit the attitudes and values of stakeholders towards the impact of the Deschutes River estuary restoration on civic pride and community vitality in downtown Olympia.

A majority of respondents clearly believe that restoration of Capitol Lake to a tidal estuary would decrease civic pride in downtown Olympia. Approximately 17 percent of respondents reported believing that there would be no change in civic pride while 23 percent reported that there would be an increase in civic pride around the basin.

The divergence of public sentiments is reflected in the language used by respondents when asked to describe in their own words the cultural characteristics that are important to them when considering the possible removal of Capitol Lake and the restoration of the Deschutes estuary. As the text in Box 6 shows, several respondents noted that the civic pride is currently tied to many aspects of the current lake setting, including the beauty of the reflecting pond, recreational and boating opportunities, and community events. While others maintain that a restored estuary will revitalize civic pride by linking to cultural history.

Box 6

Written Comments on Civic Pride

- *“The lake is integral to downtown pride. It is a place for people to jog/walk, for families to congregate, and for community events such as lake fair.”*
- *“I love the activity of the area, the sense of pride, the "State" Capital, the mental reflections available from the varied water scenes around the lake - I can't even imagine how it would feel if this was gone.”*
- *“If the reflecting surface of the lake in front of the Capitol was maintained and other portions were restored to a more natural state and the water quality improved then I think Civic pride would increase...”*

Community members involved in the DEFS stakeholder process also noted that the celebrations and events held near the water in the basin contributed heavily to feelings of community pride and the vibrancy of the downtown area. Building on this theme, we designed a specific question to elicit respondent attitudes about the effect of estuary restoration on the number of community events that would occur in downtown Olympia.

Most respondents feel that there will be no change, 44 percent, or somewhat more community events, 11 percent, in downtown Olympia if the estuary were restored. Approximately 42 percent of respondents felt that the number of community events would be somewhat or greatly

decreased. Written responses describing the perception of the effect of estuary restoration on community events are shown in Box 7.

Box 7

Written Comments on Community Events

- *“A restored Deschutes estuary increases the opportunity for cultural events that tie into original historic Native American heritage of the waterway.”*
- *“I think there would be little impact...Restoration would probably cause people to visit more frequently when the tide was in. Some people would use the park regardless of the tidal situation”*
- *“Many events are held in that area of downtown. I believe returning the lake to an estuary would discourage those events from taking place.”*
- *“In addition to the disappearance of lower Budd Inlet as a moorage area for small boats, I will miss the many water-oriented activities that have occurred on the Lake and around, Percival Landing, i.e., Lakefair, the speedboat races on the lake, the Wooden Boat Festival, and Harbor Days.”*

The Deschutes Basin is home to the Port of Olympia, which was established in 1922 and serves as an important social and economic catalyst in the area. Focus group and public meeting participants in 2006 identified these water dependent activities and were particularly concerned with the way that altered hydrology and sedimentation patterns might impact the social and economic vitality of downtown Olympia.

Leveraging this insight, we designed a question to elicit the beliefs of survey respondents about the effect of estuary restoration on the social and economic vitality of downtown Olympia.

Approximately 60 percent of respondents believe that the removal of the dam and restoration of a tidal estuary will decrease the social and economic vitality of the downtown Olympia. Further, 17 percent of respondents believe that there will be no change in vitality while 23 percent believe that there will be an increase in the social and economic vitality of the area. These quantitative results are augmented by the comments provided by respondents when asked to tell us in their own words what the social and economic impacts if a restored estuary might be. Examples of these comments are shown in Box 8.

Box 8

Written Comments on Social and Economic Vitality

- *“The Marinas and public docking areas will not be able to function because of increased sedimentation. All the recreational boats will be gone. Who wants to walk around a tidal mud flat?”*
- *“The current lake is a highly identifiable part of our State Capitol and city, an integral part of our urban living and economy, and a destination for all citizens of the state. All of this would decrement by restoring the lake to an estuary.”*
- *“If you want more housing downtown...attracting housing investment is based in part on ‘views of the water---none of us has ever seen housing sold on the ‘views of the mud flats’”*

Results

Taken together, the results reported here support the notion that the Deschutes Basin is a focal point and is seen as a unique resource that brings the local community and visitors together. One of the most significant trends that emerges from this analysis is that a majority of respondents appear to believe that removal of the dam and restoration of a tidal estuary will have a negative effect on the community by decreasing civic pride and decreasing the social and economic vitality of downtown Olympia. On the other hand, it does appear that respondents were somewhat more ambivalent about the effect of estuary restoration on future community events occurring in the area with a majority believing that either there would be no change or somewhat more events after restoration.

4.5.5 Education

The Stakeholder Involvement Report attributes addressed in this subsection are:

- *A wonderful, broad learning experience*
- *Model for thoughtful stewardship*
- *A place to teach kids about nature*
- *Demonstrates sustainable environmental practices*

Existing Conditions

Capitol Lake basin offers an insight into the history and evolution of the cities of Olympia and Tumwater and the surrounding communities.

Methodology

Focus group and public meeting participants attributed value to educational capacity and viewed the basin as an appropriate setting in which to interpret local history, culture, and nature. Additionally, focus group and public meeting participants appeared to value the basin's potential to inform environmental management and decision-making beyond the area itself. Furthermore, participants value the educational capacity of the potential outcomes of the decision-making process, namely the educational value of a model habitat/wetland restoration project. Located adjacent to the state capitol complex, management efforts in the lower Deschutes Basin can serve as a model for all the citizens of Washington.

Analysis

Following our review of the stakeholder involvement process, we designed a series of questions that would allow individual respondents the opportunity to share their attitudes and opinions about the educational services that may be provided by estuary restoration in the Capitol lake area. The following analysis describes the results.

A majority of respondents reported that it was personally important to them that the Deschutes river estuary be used as a place to teach people about nature. Only 17 percent of respondents said that it was somewhat or very unimportant to them while 22 percent reported that it was neither important nor unimportant. This level of support is also reflected in the written comments provided by survey respondents below in Box 9.

Box 9

Written Comments on Education about Nature

- *“Deschutes Estuary restoration will have a positive impact on educational opportunities at all academic levels”*
- *“If the new estuary is formed I certainly would support rigorous sustainable actions, information paths and signs, educational activities...”*
- *“In this day and age, I think it’s very important for people to see the big picture—the whole system and how our actions in one area of the system affect other areas of the system. Estuaries are good metaphors for explaining this concept.”*

A majority of respondents responded affirmatively that they believed that restoring the tidal estuary would provide new educational opportunities. Only 12 percent of respondents stated that they believed a restored estuary would decrease educational opportunities and 28 percent stated ambivalence on the subject.

The written comments elicited from survey respondents suggest that some were eager to support the idea of new educational opportunities. As the statements below in Box 10 show, several offered suggestions of the types of educational opportunities that could be provided, from field

trips by elementary schools to college level ornithological classes, a marine educational center, trails, signs, guides, oyster farms, and more. However, we also note that there were some comments that stated a belief that current estuarine ecosystems exist in the surrounding region could serve the same purpose for educational opportunities.

Box 10

Written Comments on New Education Opportunities

- *“A marine oriented educational center would be wonderful...and is viable without the estuary alternative.”*
- *“The possibility of creating an oyster farm would be an example of something that could attract people. However, reading signs about how a mud flat is a working ecosystem is not going to be an attraction.”*
- *“The area could have interpretive signs and displays about our government, the natural surroundings, the history and geography of the area as well as the flora and fauna. Talk about a hands-on museum!”*
- *“You already have mud flats such as Mud Bay but you are doing little or nothing with them from an educational point of view.”*
- *“If you really need an estuary to teach something that is not available for a lake, go a few miles north to the Nisqually River area.”*

Results

There does appear to be support for creating new educational opportunities around the estuary restoration alternative. The majority of survey respondents appear supportive and receptive to the ideas of providing educational opportunities. The responses reviewed here suggest an opportunity for reaching out to the community and involve them in the process of creating experiential education opportunities that may help bridge the gap in community perceptions of estuary restoration.

4.5.6 Spiritual and Inspirational

The Stakeholder Involvement Report attributes addressed in this subsection are:

- *Shared, community asset*
- *Lake is a point of civic pride*
- *Reflecting pond for our grand capitol*
- *Reflecting estuary for our capitol*
- *Spiritual connection to something larger*

- *Causes me to pause/slow down*

Existing Conditions

For many people, ecosystems are closely associated with deeply held ethical, religious, and spiritual values. A particular mountain, forest, or waterbody may, for example, have been the site of an important event in their past, the home or shrine of a deity, the place of a moment of moral transformation, or the embodiment of a social ideal. These are some of the kinds of values this report recognizes as cultural services provided by the Deschutes Basin.

Methodology

The Stakeholder Involvement Report identified the spiritual and inspirational significance of the Deschutes Basin as one of the key issues raised during the public brainstorming sessions. In addition to the aesthetic value of the basin, focus group and public meeting participants identified a “spiritual” or symbolic importance of the basin in that it provides solace from everyday life and embodies the connectivity of all things. In their attribute, “Spiritual Connections,” focus group participants attributed value to the basin’s ability to promote a sense of place and self, its importance to wildlife, and more generally its connection to larger environmental systems. Building on these observations, the research team implemented a series of survey questions designed to elicit the attitudes and values of respondents towards the spiritual and inspirational characteristics of a restored tidal estuary.

Analysis

When respondents were asked if they would seek solace and inspiration from a restored Deschutes estuary a majority, 56 percent, responded negatively while 44 percent responded positively. Despite being given the opportunity, no respondents stated ambivalence on the issue.

The clear divergence of stakeholder opinions on the issue of spiritual connectivity with a restored tidal estuary comes through when reviewing the detailed comments provided by respondents when asked to describe in their own words the spiritual significance of the Deschutes Basin to them. Some of these comments are highlighted below in Box 11.

Box 11

Written Comments on Solace and Inspiration

- *“...people sit and watch the existence, movement and reflections from water for spiritual and inspiration reasons...However, I have never seen a park bench placed for people to observe mud.”*
- *“I don’t find a mosquito infested stinky mud flat spiritually inspiring. If I did, I would spend my days wading in the mud around Mud Bay.”*
- *“A natural estuary would improve the spiritual and inspirational connection with nature that recharges many people.”*

In the survey questionnaire, we also asked respondents whether the Capitol Lake area of the Deschutes Basin currently has any spiritual significance to them and followed up with a question eliciting attitudes about the impact of restoring the tidal estuary on the spiritual significance for them.

A large majority of respondents do appear to find spiritual significance in the presence of the Capitol Lake in the Deschutes Basin. Approximately 22 percent stated that they do not find spiritual significance in Capitol Lake and 11 percent responded that they did not know. Looking more closely at the estuary restoration alternative, we see that 34 percent of respondents state that the spiritual significance of the area would somewhat or greatly decrease while 34 percent of respondents stated that restoration would somewhat or greatly increase the spiritual significance of the area to them. A further 32 percent stated that they were ambivalent about the spiritual impacts of restoration.

The clear divergence in attitudes and values among survey stakeholders is apparent when attention is drawn to the written comments provided by respondents to the open ended questions. Several examples are reproduced below in Box 12 for review.

Box 12

Written Comments on Spiritual Significance

- *“Capitol Lake symbolizes that trying to contain the spirits true expression can only result in stagnation.”*
- *“I do not seek spiritual rejuvenation at the Capitol Lake reservoir because I see the dam as harmful to the natural habitat.”*
- *“Walking along tidal salt marshes, listening to the sounds of shorebirds, watching a heron hunt in the tidal flats all provide spiritual grounding for me.”*

Finally, moving away from spiritual issues to the inspirational qualities of a restored Deschutes river estuary, we asked respondents to tell us what they believe the effect a restored tidal estuary would have on the inspirational qualities of the downtown Olympia area.

Approximately 56 percent of respondents appear to believe that a restored estuary will actually decrease the inspirational qualities of the downtown area while 33 percent believe that the tidal estuary will increase the inspirational qualities of the area. A further 11 percent were ambivalent about the impacts of the restoration alternative.

To augment the quantitative data, in Box 13 we present written comments from respondents that highlight their personal beliefs and values about the impact of estuary restoration on the inspirational qualities of the Capitol Lake area in downtown Olympia.

Box 13

Written Comments on Inspirational Qualities

- *“The presence of trees would be important for inspiration in this value. Trees and water are traditional elements of what gives the Northwest its spiritual splendor - and where humans find renewal.”*
- *“[Estuary restoration] would take away the ability to reflect the beautiful Capitol Group of buildings.”*
- *“While a natural mudflat and habitat can provide a peaceful setting, it does not compare to the tranquility of a water body that reflects it’s historical and natural surroundings at a glance.”*

Results

The results presented above reveal that the Deschutes Basin area in downtown Olympia is closely associated with deeply held ethical, religious and spiritual values for community members; values that are not converging on consensus at the present time.

The issue of tidal estuary restoration at the site reveals significant differences in opinions about both the spiritual and inspirational characteristics of the Capitol Lake area. On the one hand, it appears that many community stakeholders hold a spiritual and inspirational attachment to the Capitol Lake in its current state. The presence of the lake appears to provide solace and inspiration for many respondents. Thus, removal of the dam and restoration of a tidal estuary appears to have negative connotations for some respondents who find spiritual meaning or take solace in the presence of the lake. On the other hand, several respondents expressed the desire to restore the tidal estuary so that they could more effectively connect with nature on a spiritual level, something that the current lake setting does not provide. It appears that these respondents share a belief that restoring the estuary to its natural condition will provide a deeper spiritual connection to nature and will allow them to stay in balance. Given the depth of feeling evidenced in this analysis, the divergence of these two positions is something that decision makers will want to carefully consider as they move forward with the DEFS.

4.5.7 Recommendations for Reducing Uncertainty

One recommendation is to follow up on our sample survey and stakeholder involvement brainstorming sessions and fund an in-depth, randomized, statistically significant social survey of the Olympia community to see if the wider values of the community confirm or contrast with the findings reported in this report and results summarized in the Stakeholder Involvement Report. The survey itself should be fully randomized and the scope of the sampling population large enough to ensure the participation of as wide a range of community residents as possible. Done correctly, this will allow the results to be generalized to the entire population. In addition, we recommend the addition of questions to elicit more specifically what is informing positive

and negative opinions and whether these perceptions would in fact be the case if the estuary restored. The divergence of stakeholder responses to many of the questions posed in the survey questionnaire suggest that there may be some broader underlying issues that need to be addressed in the future.

Finally, given the generally positive responses to the role a restored estuary could play in community education about nature, if decision makers do decide to move forward with estuary restoration, a proactive focus on public involvement in environmental education should be a fundamental aspect of the effort to gain community support. Future efforts could be devoted to working with community members to creatively design educational opportunities based on the estuary restoration process.

4.6 Economic Impacts

The Stakeholder Involvement Report attributes addressed in this subsection are listed below:

- *Not a large tax burden*
- *Sediment removal as estuary*
- *Accessible, natural habitat close to downtown*
- *Drawing card for economic activity*
- *Economic driver (inc. transportation, tourism, port, marine businesses, yacht club)*
- *Value of current infrastructure (dam parkway)*
- *All the improvements @ Heritage Park*
- *Help keep downtown alive and healthy*
- *Lake/estuary attracts downtown business*
- *Expand and develop use*
- *Community events (Procession of Species, Lakefair, Lighted ships)*

Estimating economic impacts is beyond the scope of this particular study, however a discussion of the listed attributes is provided below for completeness.

4.6.1 Existing Condition

Based on the Stakeholder Involvement Report attributes listed above, the areas of interest with regard to the economic impacts of a restored estuary could be categorized as follows:

- the potential of impacting tourism (including but not limited to community events);
- the impact on downtown businesses;
- the potential impact on the Port of Olympia; and
- the tax implication.

We discuss what can be said about each on of these categories based on existing information.

4.6.2 Discussion

Tourism

Tourism spending for the Olympia area in 2003 was estimated at \$209.7 million. Most tourism revolves around the annual session of the state legislature which occur during the winter and spring. Other attractions include the Olympia waterfront area and area tribal casinos. In addition, people come to the area to view wildlife and engage in civic activities such as Lakefair.

If restoration of the Deschutes River estuary results in a wider diversity of wildlife viewing opportunities, there is the potential for the generation of environmental/wildlife festivals similar to those found in other estuarine settings such as the Grays Harbor Shorebird Festival and the Nisqually International Migratory Bird Day. Such programs draw significant numbers of local and non-resident visitors who offer further economic impact through travel and associated expenditures. In addition, they bring life and vitality to the community.

It is doubtful that removal of the Capitol Lake dam will affect tourism related to the state legislature. In addition, Moffatt and Nichol (2007) suggest that access to the area where Lakefair is held will not change under a restored estuary condition. Therefore, we assume there would be no negative economic impacts if the estuary were restored. However, a restored estuary might attract more tourists for wildlife viewing purposes. Given the uncertainty of the latter, we can not state whether in fact we would see positive or negative economic impacts related to wildlife viewing.

Impact on Downtown Businesses

As with tourism, whether a restored estuary would impact downtown businesses is open to speculation. If tourism increased as a result of the restored estuary likely downtown businesses would see a benefit. Conversely, if the individuals that frequent the downtown businesses began to avoid downtown businesses because of a restored estuary businesses could see a loss. It is outside the scope of this report to speculate about this subject.

Port of Olympia Impacts

As with the discussion of the Marina under the “Recreation” section, the Port of Olympia may be negatively impacted if the estuary is restored. The USGS report estimates that approximately 43,000 cubic yards of sediment will be deposited annually at the marinas and the Port. The port essentially operates as one business with four divisions: the Marine Terminal, the Olympia Regional Airport, Swantown Marina and Boatworks, and the Property Development Division. The division that stands to be impacted is the Marine Terminal, which is located on the West Bay of Budd Inlet. In the absence of a cost-sharing plan, the impact to the Port would be increased dredging costs. The magnitude of the impact is not known because the increased cost and frequency of the dredging has not been estimated, nor has a cost-sharing plan been discussed.

Tax implications

In an economic impacts analysis, the tax implications are estimated as a last step. We would need to understand the revenue impacts to business, and the resulting income impacts to jobs to estimate the tax implications of a restored estuary conditions. The impacts on business revenue taxes would be added to any estuary restoration costs. Those costs would be compared to the existing cost of managing Capitol Lake. The difference would be the tax implications. As discussed above, much of the data needed to calculate the tax implications is not available. We do not know what may be needed in the form of maintenance/restoration costs for an estuary. What we do know is that existing lake management is a reflection only of management practices currently in place. In particular, lake dredging that took place in 1979 and 1986 was important in creating the lake as it exists today. While dredging is not currently planned, the CLAMP 10-Year Plan states that the CLAMP seeks additional cost and design information necessary to undertake lake dredging. Nevertheless, existing lake management does *not* include any cost for dredging the lake. It is acknowledged that at the current rate of sedimentation, Capitol Lake loses more than 20 acre-feet of storage every year (George et al, 2006). The following items represent the state costs of existing lake management:

1. GA's annual budget for maintenance is approximately \$125,000.
2. Aquatic weed management, including integrated pest management, takes place annually at a cost of \$80,000.
3. Recreation and habitat enhancements, including shoreline habitat enhancements and contingency shoreline repair, are included at a combined cost of \$95,000 per year.¹¹

4.6.3 Results

The only category, of the four discussed above, which can be commented on is the Port of Olympia impacts. As with the discussion of the marinas in the recreation category, without a cost-sharing arrangement for dredging, the Port would most likely be negatively impacted if the estuary was restored.

4.6.4 Recommendations for Reducing Uncertainty

The analysis would benefit from estimates of the cost of dredging. Two estimates are needed. The first is the ongoing maintenance dredging required under the without-project condition. The second estimate is the impact on dredging costs if the estuary is restored. These two estimates could be compared to understand the magnitude of an impact. An analysis such as this would not address who pays for the dredging but serves as a meaningful step in any such dialogue. Furthermore an analysis like this would shed light on the difference between dredging in Capitol Lake and Budd Inlet, where dioxins have been found in the soils.

¹¹ Assumes riparian habitat enhancement of filled shorelines. The CLAMP 10-Year Plan assumed \$950,000 (pp. 54-55).

Section 5

Conclusions

5.1 Summary of Results

Table 6 summarizes the NBA results by category. The majority of the stakeholder attributes outlined in the Stakeholder Involvement Report indicate that many people in the greater Olympia community connect to the Deschutes Basin through the Cultural Services category, as we might expect. We found that estuary restoration would most likely lead to changes in Cultural Service values. However, changes in the value of many of the categories under **Cultural Service reflect personal preferences that cannot be objectively weighed against each other** such as Aesthetics, Cultural Heritage and Spiritual and Inspirational. Based on the narrow sample taken in the survey, effects on values such as aesthetics and civic pride are divergent but generally negative. Effects on Education values were generally positive. While the survey illustrates the likely range of opinions among stakeholders, the small sample size prevents us from assuming how many people in the broader community would share these personal preferences. The results of the social and cultural survey do, however, demonstrate the importance of including cultural values in the DEFS planning process. Our findings clearly show that the sample of stakeholder representatives we interviewed from the communities of Olympia and Tumwater do hold deep cultural values for the Capitol Lake area and possess strong feelings about removing the dam and restoring a tidal estuary to the basin.

Also organized under Cultural Services are the benefit categories recreation and ecotourism. **Recreation would be negatively impacted based on limiting access to boat launches in parks** due to tidal influence. **Additionally, Moorage at the OYC and marinas would be negatively affected by a restored estuary due to sediment buildup.** The fact that such well-defined entities are so directly and negatively affected suggests a need to mitigate. The magnitude of the impact is uncertain due to data limitations. Regarding Ecotourism, a natural estuary is consistent with the concept of ecotourism. However an estimate change in the number of tourists to the area as a consequence of restoring the estuary is not available.

Information in the Stakeholder Involvement Report and results from our survey indicate that many people hold values for aspects of the environment that they may not directly use. These attributes fell into the Supportive Functions and Regulating Services **Restoring the estuary would increase the benefits from Supportive Functions and Regulating Services.** In particular, a restored estuary would improve both habitat and biodiversity; however, the magnitude of the benefit is not known. Also, a restored estuary would improve water quality in Budd Inlet, measured in terms of dissolved oxygen levels. The benefit was not quantified due to data limitations..

We found that the **Economic Impacts could be negative overall**. We focused primarily on two categories; 1) boat moorage and 2) tourism. Sedimentation in Budd Inlet impacts not only the recreational marinas but also the Port of Olympia. If a cost-sharing arrangement can not be reached then the Port may likely face increased costs of doing business due to sedimentation deposits. Tourism could either increase or decrease as a result of estuary restoration. Increases could be due to habitat viewing, such as bird watching. Decreases could occur if visitors to such events as Lakefair choose not to attend if it is located beside an estuary. Data on changes in tourist visits were not available so an economic benefit was not assessed.

Table 6
Summary of Results by Deschutes Benefit Category and Economic Impacts

Category of Benefit ^a		Summary of Result	Change in Benefit ^b
4.2 Supportive Functions			
	<i>4.2.1 Biodiversity</i>	A natural estuary would likely improve both habitat and biodiversity, the magnitude of the benefit is not known.	+
	<i>4.2.2 Habitat</i>		+
4.3 Regulating Services			
	<i>4.3.1 Flood protection</i>	The studies to determine the benefit have not yet been completed.	U
	<i>4.3.2 Sea-level rise protection</i>		U
	<i>4.3.3 Water quality</i>	Dissolved oxygen levels are estimated to improve. The benefit was not quantified. An on-going study by Ecology will improve the estimate.	+
4.5 Cultural Services			
	<i>4.5.1 Recreation</i>	Negative impact on boat launches in parks and access to boat moorage at the marinas and Percival Landing due to sedimentation	-
	<i>4.5.2 Ecotourism</i>	A natural estuary is consistent with the concept of ecotourism. An estimate of a change in tourism (i.e. change in the number of tourists) is not known.	+
	<i>4.5.3 Aesthetics</i>	Divergent views based on personal preferences.	+/-
	<i>4.5.4 Cultural Heritage</i>		+/-
	<i>4.5.5 Education</i>	A majority of survey respondents stated that they believed restoring the tidal estuary would provide new educational opportunities.	+
	<i>4.5.6 Spiritual and Inspirational</i>	Divergent views based on personal preferences.	+/-
4.6 Economic Impacts			
	<i>Tourism</i>	Increases or decreases depending on personal preferences	U
	<i>Port,</i>	Potential negative impact on the Port due to sedimentation.	-

^a Note that the number preceding each benefit category listed below is the section number of this report that addresses that category.

^b Key for symbols used in this column: +/- Divergent; - Negative; + Positive; U Unknown

A tabular summary of findings summarized in Table 7, along with information regarding relative certainty of the results, geographic distribution and affected entities. The column headings used in Table 7 are defined in Table 8.

**Table 7
Summary of Conclusions**

Benefit Category*	Direction of Change	Certainty of Estimate		Affected Entities	Geographic Area of Concentration	Comments
		Biological and Physical Effects	Economic and Social Effects			
<i>SUPPORTIVE FUNCTIONS</i>						
Biodiversity	+	Low	Low	Widely varied	Deschutes River basin / Lower Puget Sound	Broad interests, local to national
Habitat	+	Medium	Medium	Widely varied	Deschutes River basin	Broad interests, local to national
<i>REGULATING SERVICES</i>						
Flood Control	U.	Low	High	Property owners near Capitol Lake, Tumwater Historical Park, Old Brewhouse	Lower Deschutes River basin nearshore	Benefits could be high if flood risk is reduced
Climate Change and Sea Level Rise	U	Low	Low	Property owners near Capitol Lake & downtown	Lower Deschutes River basin nearshore	No evidence that estuary improves protection
Water Quality	+	Low	Med. High	Residents, Port, LOTT	Deschutes River Basin / Budd Inlet	Water quality study by Ecology is forthcoming
<i>PROVISIONING SERVICES</i>						
Food	U	Low	Low	Widely varied	Deschutes River basin / Lower Puget Sound	No modeling effort using same modeling techniques

Benefit Category*	Direction of Change	Certainty of Estimate		Affected Entities	Geographic Area of Concentration	Comments
		Biological and Physical Effects	Economic and Social Effects			
<i>CULTURAL SERVICES</i>						
Recreation	-	High	High	Residents, boat owners, recreation businesses	Olympia and Tumwater	Sedimentation affects boaters; others unaffected
Ecotourism	+	Low	Low	Residents, downtown businesses	Olympia and Tumwater	Estimate of new tourism unknown
Aesthetics	+ / -	High	N/A	Local residents and visitors	Olympia / State of Washington	Strong, but divergent views
Cultural Heritage	+/-	High	N/A	Residents (state and local)	Olympia / State of Washington	May affect community pride, but increase local events
Education	+	High	N/A	Residents	Olympia and Tumwater	Positive interest in the community
Spiritual and Inspirational	+ / -	High	N/A	Residents, Squaxin Island Tribe	Olympia / Thurston County	Divergent views
<i>ECONOMIC IMPACTS</i>						
Infrastructure, including Port	-	High	Moderate	Marina tenants, Port of Olympia	Olympia	Sedimentation is forecasted
Tourism	U	Low	High	Local residents, downtown businesses and visitors	Olympia/State of Washington	If the change in the number of visits was known developing an economic impact to quantify the change is straightforward.

*Note: Terms used in column headings for this table are defined in Table 8, below.

The columns in Table 7 are defined as follows:

Table 8
Column Headings Defined for Table 7, Summary of Conclusions

Term	Definition
Benefit Category	The function or service subcategory, or economic impact assessed in the NBA.
Direction of Change	<p>On balance, the net effects are positive (+), negative (-), unknown (U) or highly divergent (+ / -).</p> <p>Unknown means that there is not enough information about future conditions to make a determination of the effect on net benefits.</p> <p>Divergent means that there are strongly held perspectives in the community on whether the change is positive or negative. In addition, there is insufficient information to determine the absolute direction of the net effect.</p>
Certainty of Estimate	<p>Level or degree of certainty with respect to information on the direction of change in (1) physical effects, and (2) economic estimate.</p> <p>Low certainty means that either the physical effects are indeterminate, or there is insufficient information about future conditions.</p> <p>High means that there is information available about the extent and direction of physical effects, or that there is adequate information about the magnitude and direction of the economic estimates.</p> <p>Med. High means that there is some economic information available, but it is not site specific to the Deschutes River basin.</p> <p>N/A means that an “economic estimate” is not applicable (i.e., for some cultural services)</p>
Affected Entities	Identification of the population segment most likely to be affected by the service category.
Geographic Area of Concentration	Geographic region over which the majority of the benefits will accrue

5.2 Summary of Recommendations to Reduce Uncertainty

Table 9 provides a summary of recommendations that were first presented throughout this report. The recommendations are compiled to inform the DEFS team as to how future studies could reduce the level of uncertainty in a NBA.

**Table 9
Summary of Recommendations**

Benefit Category		Recommendations to Reduce Uncertainty
Supportive Functions		
	<i>Biodiversity</i>	<p>The recommendations for this category of benefit speak to an improved understanding of the extent of the biodiversity of Capitol Lake. Specifically:</p> <ul style="list-style-type: none"> • Conduct a comprehensive assessment of existing habitat goods and services provided by Deschutes Basin. • Conduct an environmental valuation study that specifically assesses the change in the value of biodiversity in the Deschutes Basin (or some reference study area) from restoration. • Model the integration of Deschutes Basin ecosystem and economic and social systems. Linked natural and social science models could more accurately supply input to an assessment of social and economic benefits changes resulting from estuary.
	<i>Habitat</i>	<p>The recommendations for this category of benefit speak to an improved understanding of the extent of the quality of the habitat of Capitol Lake. Specifically:</p> <ul style="list-style-type: none"> • Conduct a comprehensive assessment of existing habitat goods and services provided by Deschutes Basin. • Conduct an environmental valuation study that specifically assesses the value of habitat goods and services in the Deschutes Basin (or some reference study area) from restoration. • Model the integration of Deschutes Basin ecosystem and economic and social systems. Linked natural and social science models could more accurately supply input to an assessment of social and economic changes resulting from restoration.
Regulating Services		
	<i>Flood protection</i>	<p>The recommendations for flood control speak to an improved understanding of whether an estuary would provide a flood control benefit. Specifically:</p> <ul style="list-style-type: none"> • Estimate the change in flood elevations under both a lake and estuary context using the same model. These estimates would provide an authoritative determination of whether there is a flood control benefit of a restored estuary. • Consult with FEMA about the possibility of developing a study to examine the impact on the FIRM of GA's recent work to raise the ground elevation of the parks to reduce the risk of flooding around the Capitol Lake.
	<i>Sea-level rise protection</i>	No recommendations are being made about improving the estimation of economic benefits of sea-level rise protection since physical science information particular to the Deschutes Estuary is not yet available.
Regulating Services (contd.)		
	<i>Water quality</i>	The analysis will benefit from the data that will be available from Ecology upon completion of the simulation of the effects of a restored estuary on the water quality in Budd Inlet. In conjunction with those simulation results a dialogue about the impact those results could have on LOTT's existing NPDES Permit could provide insights into the value a restored estuary could have on the future costs of treating wastewater in the

Benefit Category		Recommendations to Reduce Uncertainty
		<p>Cities of Lacey, Olympia, Tumwater, and Thurston County.</p> <p>The future costs of treating wastewater should be compared to the costs of estuary restoration. Both the initial costs of estuary restoration and any annual cost of maintaining an estuary in an urban area should be considered in a net benefits analysis.</p>
Cultural Services		
	<i>Recreation</i>	This analysis would be improved if estimations of whether a restored estuary would increase the number of species and/or the population numbers of those species were available. Such estimations could be used to base an assumption that wildlife viewing would increase and the quality of the activity would also increase. Increases in frequency of both wildlife viewing trips and the quality of the experience would allow us to say definitively that there would be a recreational benefit to a restored estuary.
	<i>Ecotourism</i>	This analysis assumed that the stakeholders' interest in understanding the value that could be contributed under the ecotourism benefit category is addressed under the recreation and education benefits category. This analysis did not attempt to estimate the number of 'tourists' that might travel to Olympia to view a restored estuary
	<i>Aesthetic</i>	This analysis would be enhanced with a more in-depth, statistically significant social survey of the Olympia community to see if the wider values reflect the findings reported here.
	<i>Cultural Heritage</i>	
	<i>Education</i>	
	<i>Spiritual and Inspirational</i>	
Economic Impacts		
	<i>Revenues, jobs, taxes</i>	<p>The analysis would benefit from estimates of the cost of dredging. Two estimates are needed. The first is the on-going maintenance dredging required under the 'no-project' condition. The second estimate is the impact on dredging costs if the estuary is restored. These two estimates could be compared to understand the magnitude of an impact. An analysis such as this would not address who pays for the dredging but serves as a meaningful step in any such dialogue. Furthermore an analysis like this would shed light on the difference between dredging in Capitol Lake and Budd Inlet, where dioxins have been found in the soils.</p> <p>This analysis would benefit from estimates of the change in tourist visitation that could result from a restored estuary. Visitation could increase as a consequence of improved habitat for wildlife, increasing visitation for such things as bird watching. Conversely, existing uses of the Basin, for such events as Lakefair, may suffer reduced visitation if people choose not to attend because they do not enjoy the aesthetic experience of an estuary.</p>

Section 6

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Appendices

Appendix A: Survey Instrument

The following letter and survey were sent by Margen Carlson of the Washington Department of Fish and Wildlife to focus group participants on February 8th, 2007.

Dear Capital Lake Estuary Restoration Survey Participant,

The attached survey questionnaire is being conducted as part of the Deschutes River Estuary Feasibility Study that is called for in the Capitol Lake Adaptive Management Plan. The objective of the estuary feasibility study is to evaluate the possibility of restoring a natural estuary in Olympia, Washington, as an alternative to the continued management necessary to maintain Capitol Lake.

This survey is designed to explore issues raised during previous stakeholder involvement efforts. The results will be included in the Net Social and Economic Benefits Analysis currently being conducted under the management of Margen Carlson of the Washington Department of Fish and Wildlife. The questionnaire was created by Matthew Wilson and Katrin Moffroid at Spatial Informatics Group and Trina Wellman of Northern Economics, Inc.

As you complete the questionnaire, please remember that all your responses will remain anonymous and confidential--we will not identify individuals who participate by name.

When you are finished, please save a copy of your completed survey questionnaire and return it by email to Katrin Moffroid: Katrin@sig-gis.com, no later than February 16th.

If you have any questions, please contact Katrin Moffroid at (703) 472-7440.

Thank you for taking the time to complete the survey, your feedback will provide us with very valuable input.

Sincerely,

Katrin Moffroid
Associate
Spatial Informatics Group
(703) 472-7440
www.sig-gis.com

Capitol Lake Estuary Restoration Survey

Background: Capitol Lake, in Olympia, Washington, was formed in 1951 by building a dam on the Deschutes River. The state created the lake to provide a reflecting surface for the Capitol Building. The Washington Department of General Administration (GA) is responsible for maintaining and operating the lake, the associated dam, and the adjacent Deschutes Parkway. Capitol Lake also provides significant recreational, educational, and cultural opportunities, and influences the economic vitality of downtown Olympia.

By the late 1990s, several characteristics of Capitol Lake made it clear that a limited lake management strategy was no longer feasible:

- Downstream sedimentation is turning the lake into a freshwater marsh.
- The lake is on the state's list of impaired water bodies for fecal coliform bacteria, a human health hazard, and phosphorus, a nutrient that increases algae blooms.
- Capitol Lake is polluted with storm water runoff and noxious weeds, such as Eurasian Watermilfoil and Purple Loosestrife.

In 1997, the Capitol Lake Adaptive Management Plan (CLAMP) Steering Committee was formed to assist GA in making decisions that affect the lake. The CLAMP steering committee prepared a ten-year management plan, which includes exploring options for future management of the lake.

A Restored Estuary: One management possibility is to restore estuary processes to the Deschutes Basin. The Deschutes Estuary Feasibility Study (DEFS) is currently ongoing, *and is the subject of this survey*. A decision has not been made as to whether the dam should be removed and the estuary restored. In general, a restored estuary would have the following attributes:

- Mixing of Deschutes River freshwater with saltwater from Bud Inlet and Puget Sound.
- Influenced by tides, but mostly protected from large waves and intense storms.
- Tidal mud flats occurring during low tides.
- Biologically productive, providing habitat for many species of birds, fish and mammals.
- Provide flood control and filters out pollutants and sediments.
- Could provide educational, spiritual, and other amenities to the local community.

In the Spring of 2006, the CLAMP Steering Committee supported a stakeholder/community involvement process to identify attributes and objectives related to the Deschutes Basin that should be analyzed and suggest ways for the community to be involved in making a final decision about the long-term management of Capitol Lake. The information generated from the stakeholder involvement process has served as the basis of the NBA, which is currently being conducted, and is the final component of the DEFS. The objective of this survey is to expand upon the opinions, perspectives, and benefits or values of the attributes identified by various stakeholders, in order to develop a cohesive understanding of the community's perspectives.

The following survey is designed to solicit your thoughts and feelings on restoring the Deschutes River to an estuary. All your responses will remain confidential and will be combined with others in our final report.

Please answer each question by checking the box you feel is the most appropriate, or providing text where space is given. Remember, there are no right or wrong answers.

Aesthetics. Capitol Lake currently serves several identifiable functions, like providing an entrance to the city, a reflecting pool for the capitol building and green space in the downtown area. A restored estuary may alter the appearance of this area, as the tidal influence will create mud flats at low tide. In the following set of questions please consider the proposed estuary restoration and its possible effect on the sights, sounds or smells of the Capitol Lake area.

Q1. How satisfied are you with the current appearance of the downtown Olympia area around Capitol Lake?

Very Satisfied	Somewhat Satisfied	Neither Satisfied or Unsatisfied	Somewhat Unsatisfied	Very Unsatisfied
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q2. What impact do you think restoring the Deschutes River to an estuary would have on the appearance of the surrounding downtown Olympia area?

Very Positive Effect	Somewhat Positive Effect	Neither Positive or Negative Effect	Somewhat Negative Effect	Very Negative Effect
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q3. Do you think restoring the Deschutes River to an estuary would create more or less open green space?

Much More Green Space	Somewhat More Green Space	Neither More nor Less Green Space	Somewhat Less Green Space	Much less Green Space
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q4. How important is it to you that a restored Deschutes River estuary provides open green space for the community?

Very Important	Somewhat Important	Neither Important or Unimportant	Somewhat Unimportant	Very Unimportant
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q5. How do you think that the presence of tidal mud flats would affect the appearance of the restored Deschutes River estuary?

Very Positive Effect	Somewhat Positive Effect	Neither Positive or Negative Effect	Somewhat Negative Effect	Very Negative Effect
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q6. Are you concerned that restoring the Deschutes River to an estuary by removing the dam would create an unpleasant odor in the downtown Olympia area?

Very Concerned

Somewhat Concerned

Not at all Concerned

Q7. How important to you are the following characteristics of the restored Deschutes River estuary?

Characteristic	Very Important	Somewhat Important	Neither Important or Unimportant	Somewhat Unimportant	Not at all Important
Presence of mud flats	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Presence of Odor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Views of Water	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Views of Mountains	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Reflecting the Capitol	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Natural Space	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Q8. In your own words, describe what you think removing Capitol Lake and restoring the Deschutes River estuary would have on the aesthetics of the area.

Q9. Do you have any additional thoughts or comments on the general sights, sounds, and smells that estuary restoration would affect?

Cultural Heritage. The Capitol Lake area has played a defining role in the history of Olympia, and it was recognized by stakeholders as a source of cultural, civic, and historical pride. In this section, please think of how removing Capitol Lake and restoring the Deschutes River estuary could impact these attributes in downtown Olympia.

Q10. What effect do you think Deschutes River estuary restoration would have on the civic pride generated by downtown Olympia?

Greatly Increase Civic Pride <input type="checkbox"/>	Somewhat Increase Civic Pride <input type="checkbox"/>	No Change in Civic Pride <input type="checkbox"/>	Somewhat Decrease Civic Pride <input type="checkbox"/>	Greatly Decrease Civic Pride <input type="checkbox"/>
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Q11. How do you think Deschutes River estuary restoration would affect the social and economic vitality of downtown Olympia?

Greatly Increase Vitality <input type="checkbox"/>	Somewhat Increase Vitality <input type="checkbox"/>	No Change in Vitality <input type="checkbox"/>	Somewhat Decrease Vitality <input type="checkbox"/>	Greatly Decrease Vitality <input type="checkbox"/>
--	---	--	---	--

Q12. What impact do you think Deschutes River estuary restoration would have on the number of community events that occur in downtown Olympia?

Greatly Increase Events <input type="checkbox"/>	Somewhat Increase Events <input type="checkbox"/>	No Change in Events <input type="checkbox"/>	Somewhat Decrease Events <input type="checkbox"/>	Greatly Decrease Events <input type="checkbox"/>
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Q13. Do you believe the Deschutes River estuary restoration would impact the number of businesses that locate in downtown Olympia?

Greatly Increase Businesses <input type="checkbox"/>	Somewhat Increase Businesses <input type="checkbox"/>	No Change in Businesses <input type="checkbox"/>	Somewhat Decrease Businesses <input type="checkbox"/>	Greatly Decrease Businesses <input type="checkbox"/>
--	---	--	---	--

Q14. If removing Capitol Lake and restoring the Deschutes River estuary involved reducing the reflecting surface for the Capitol building, would you support the project?

Yes <input type="checkbox"/>	No <input type="checkbox"/>	Don't Know <input type="checkbox"/>
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Q15. In your own words, please describe the cultural characteristics that are important to you when considering the possible removal of Capitol Lake and restoration of the Deschutes River estuary.

Q16. Do you have any additional comments on the effects that Deschutes River estuary restoration might have on the community culture or ability to communicate the history of the area?

Education. The proposed Deschutes River estuary restoration may offer residents and visitors to the city opportunities to learn about the natural environment, resource management issues, and local history. In this next set of questions we ask you to consider the changes in educational opportunities that may occur with estuary restoration.

Q17. How important is it to you that the Deschutes River estuary provides a place to teach people about nature?

Very Important Somewhat Important Neither Important or Unimportant Somewhat Unimportant Very Unimportant

Q18. How do you think that restoring the Deschutes River estuary would change the educational opportunities provided?

Greatly Increase Opportunities Somewhat Increase Opportunities Neither Increase nor Decrease Opportunities Somewhat Decrease Opportunities Greatly Decrease Opportunities

Q19. How do you think that restoring the Deschutes River estuary would change the opportunities to demonstrate sustainable environmental practices?

Greatly Increase Opportunities Somewhat Increase Opportunities Neither Increase nor Decrease Opportunities Somewhat Decrease Opportunities Greatly Decrease Opportunities

Q20. In your own words, describe the educational opportunities that you would like to see in a restored Deschutes River estuary area.

Q21. Do you have any additional comments on the impact that restoring the Deschutes River estuary may have on educational opportunities?

Spiritual & Inspirational. People in Olympia have identified the Capitol Lake and proposed Deschutes River restored estuary areas as having unique spiritual and symbolic importance, by providing solace and helping show the connectivity of people with nature. When answering this next set of questions, please consider your feelings about the Capitol Lake area.

Q22. Does the Capitol Lake area of the Deschutes Basin currently have any spiritual significance to you?

Yes No Don't Know

If yes, please explain the spiritual significance in your own words.

Q23. How would the spiritual significance of the area to you be changed by the restoration of the Deschutes River estuary?

Greatly Increase
Significance

Somewhat Increase
Significance

Neither Increase nor
Decrease Significance

Somewhat Decrease
Significance

Greatly Decrease
Significance

Q24. Would a restored Deschutes River estuary create a place for you to seek solace or inspiration?

Yes

No

Don't Know

Q25. What effect do you think the Deschutes River estuary restoration would have on the inspirational qualities of the downtown area?

Greatly Increase
Qualities

Somewhat Increase
Qualities

Neither Increase nor
Decrease Qualities

Somewhat Decrease
Qualities

Greatly Decrease
Qualities

Q26. In your own words, please describe what you think of when you think about the spiritual and inspirational aspects of removing Capitol Lake and restoring the Deschutes River.

Q27. Do you have any additional comments on how the restoration the Deschutes River estuary may affect the spiritual and/or inspirational qualities of the area?

Environmental Health and Recreation. Estuaries provide habitat for fish and wildlife and can support recreational opportunities such as fishing, bird watching, and wildlife viewing. This section of the survey focuses your thoughts on estuary restoration with respect to the general ecosystem health and recreation opportunities.

Q28. Do you believe that restoring the Deschutes River estuary would have any effect on the consequences of global warming such as storm surge and/or flooding?

Yes

No

Don't Know

Q29. Do you believe that restoration of the Deschutes River estuary would increase the biodiversity of the area in terms of plants and animals?

Yes

No

Don't Know

Q30. How important is it to you to know that a restored Deschutes River estuary has high levels of plant and animal diversity?

Very
Important

Somewhat
Important

Neither Important
or Unimportant

Somewhat
Unimportant

Very
Unimportant

Q31. Do you believe that the restoration of the Deschutes River estuary would increase available fish habitat?

Yes

No

Don't Know

Q32. How important is it to you to know that a restored Deschutes River estuary is a productive ecosystem?

Very
Important

Somewhat
Important

Neither Important
or Unimportant

Somewhat
Unimportant

Very
Unimportant

Q33. Do you think that restoring the Deschutes River estuary would enhance recreational opportunities such as wildlife viewing and recreational fishing?

Yes

No

Don't Know

Q34. How important is it to you that recreational opportunities are provided in the restored Deschutes River estuary area?

Very
Important

Somewhat
Important

Neither Important
or Unimportant

Somewhat
Unimportant

Very
Unimportant

Q35. Please list those recreational activities that are most important to you.

Q36. Do you have any additional comments on how restoration of the Deschutes River estuary might impact biodiversity, habitat, and/or the consequences of sea level rise?

Your Information. THE INFORMATION IN THIS SECTION OF THE SURVEY WILL REMAIN CONFIDENTIAL, AND IS BEING COLLECTED ONLY FOR SURVEY ACCOUNTING PURPOSES.

Please enter your name and your affiliation, if any.

May we follow up with a short phone call to discuss your responses to this survey and get additional comments from you?

Yes

No

Don't Know

What is the best phone number to contact you at, and are there particular days or times that work best for you?

Please list any additional people that you feel it is important for us to contact:

Thank you for your participation and input!

When you have completed the survey, please save it and return a copy to **Katrin Moffroid** at katrin@sig-gis.com. You may also contact **Katrin Moffroid** at (703) 472-7440 if you have questions regarding the survey.

Appendix B: Written Responses to Survey Questionnaire

The following tables contain the written responses received to the survey questionnaire. The responses have been included as received. Any spelling or grammatical errors in the original response have not been altered.

Table B-1. Participant Responses to Aesthetics Section

Q8. In your own words, describe what you think removing Capitol Lake and restoring the Deschutes River estuary would have on the aesthetics of the area.	Q9. Do you have any additional thoughts or comments on the general sights, sounds, and smells that estuary restoration would affect?
<p>Reverting back to mud flats would be a disaster for Olympia from both an aesthetic and economic point of view. It would forever mark this community as a dumpy, dirty, unhealthy place because it just looks that way with a lot of dirty mud flats. You see people all the time who walk, run and sit around enjoying the water. I have yet to ever see anyone sitting on a bench and looking at a mud flat. Economically, you would either destroy the Port of Olympia, yacht club, etc. or you would commit the State to a regular program of dredging. Further, you would take a major step in making Olympia a less appealing tourist attraction. Olympia has not made the progress that it should in revitalizing downtown, but the establishment of mud flats would make any chance of revitalizing downtown even more remote and difficult. If you want more housing downtown (as Olympia justifiably does), attracting housing investment is based in part on "views of the water" --- none of us has ever seen housing sold on the basis of "views of the mud flats". Olympia with Capitol Lake is a jewel waiting to be polished. Olympia with the Deschutes Mud Flats would be an ugly duckling that only a biologist could love (and probably not all of them either).</p>	<p>I live on the water and I own the tidelands in front of my house to the low water mark. I see lots of mud flats and it is the least attractive part of my property ---- I can assure you that the water is the attraction for pleasant and peaceful contemplation of our surroundings, not the mud flats. By the way, we grow our oysters in bags to keep them out of the mud flats and clams are up higher where the beach is sandy with lots of gravel.</p>
<p>It would ruin the beautiful Wilder and White plan for the lake reflecting the Capitol Group and it would lessen the amount of open space in the North Capitol Campus.</p>	
<p>The lake was part of the original plan for the Capitol Campus area, including reflection. The current lake is a highly identifiable part of our State Capitol and city, an integral part of our urban living and economy, and a destination for all citizens of the State. All of this would decrement by restoring the lake to an estuary. On a smaller scale, it would be like returning the Potomac Basin to an estuary in Washington, DC. It's a little hard to imagine, isn't it? Returning the lake to an estuary would be the worst possible decision.</p>	<p>An estuary would likely cause: worse odors, much worse mosquitos and possibly disease, DECREASED outdoor activities (I would no longer want to run around a smelly, mosquito infested estuary), loss of economic vitality that would stem from removing a destination highlight of Olympia for all State citizens.</p>

Q8. In your own words, describe what you think removing Capitol Lake and restoring the Deschutes River estuary would have on the aesthetics of the area.

It has the potential of taking a very calming, peaceful gathering area and transforming it into something like the inaccessible (and at times dangerous) mud bay. But Mud Bay has it's own beauty and eventually the NEW estuary could offer it's own unique calm and peaceful appearance. It certainly would change the 'urban' green area appearance into a more rural, untouched, wild space.

I believe the use of the lake area would decrease greatly--it would no longer be a place to enjoy as it is now.

If restoring means mud flats, I think the area would be less aesthetically pleasing than it is today. "Natural space" of an estuarine mud flat is water, then mud. There is no way to bring back the natural forest that once surrounded the area. So we would have grass and pavement around a mud flat. The only wildlife that people would be birds and they might increase in diversity, but their presence would vary with the tide being in or out. East Bay is a good nearby example. It is nothing special when the tide is out.

Might negatively affect the lovely Heritage Park and lake area, all developed with public funds. Would certainly affect the yacht club with a heavy silt load. The boats (particularly the sailboats) are part of the aesthetic appearance of downtown.

I believe it would have a negative effect. Particularly in light of all the work that has occurred to improve Heratige Park.

I believe that the whole character of the downtown waterfront and Percival landing will change. The marinas and public docking areas will not be able to function because of increased sedimentation. All the recreational boats will be gone. Who wants to walk around a tidal mud flat?

Creating a stinky mudflats would be a nightmare to downtown. A major deterrent to development and support of the downtown core.

I think that a reflecting pond in front of the Capitol is aesthetically pleasing and makes the walk around the lower portion of the lake very tranquil and comforting . It provides balance in our busy lives. Having said that I also think that restoring some portion of the lake, not the portion in front of the Capitol, to a more natural habitat would be aesthetically pleasing as well. Perhaps a hybrid of the current pond and a natural tide flat would be the best option. Plus there would not be as high a risk of odor problems. Currently, in the summer, when it's really hot and the Lake has large algae blooms it is not as aestehically pleasing. So it would be good to find a way to restore the water quality to a level where that doesn't happen.

Restoring to the natural estuary would provide openness and health. To me, this is aesthetically pleasing.

Q9. Do you have any additional thoughts or comments on the general sights, sounds, and smells that estuary restoration would affect?

I think I am most concerned with the smells, the bugs (mosquitoes) and the potential to not keep the mud flats free of liter and trash and junk. I am concerned about how we as a populous would treat (respect) this new estuary in general. Nisqually Reach is gorgeous - but it is highly protected, access is very limited and I'm not sure THAT kind of control can be issued within such an 'urban' area.

The sight of a mud flat does not draw me to Mud Bay or East Bay. Neither of them have sounds or smells that are noticeable.

Would the brand new bridge be undermined by a different river flow? Again, much public expense already...Would likely require shoring up differently at the sides.

Capitol Lake is an icon which represents the State of Washington. Visistors to the city of Olympia leave with a vision of the Lake with Olympic Mtns' in the background. With an estuary at low tide they will leave remembering us as just another backwater town.

Maintaining the lake is worth the cost. Grizzly bears once roamed here, yet I would not want to re-introduce them to recreate a "natural" appearance.

Again, I think a partial estuary restoration, if that's possible, would make the most sense.

Q8. In your own words, describe what you think removing Capitol Lake and restoring the Deschutes River estuary would have on the aesthetics of the area.

Q9. Do you have any additional thoughts or comments on the general sights, sounds, and smells that estuary restoration would affect?

It would increase the variability of the landscape, adding valuable depth and dimension to the area. An estuary would be beautiful at all tidal levels - mud flats are inherently beautiful, although in a way very different from impounded water.

Smells that result from estuary restoration are a natural part of living near the marine environment.

It would enhance the aesthetics of the area .

The odors from polluted waters, boat fuel and exhaust are unpleasant and should be avoided.

I've lived near an estuary in an urban setting;jogging,biking and walking quite often along it. The ebb and flow of the water and its attendant life forms afforded such a varied environment . dynamic is a good word to describe, it as opposed to stagnant and you know what body of water that word describes.

I think it would increase the presence of wildlife - particularly birds and fish - which would have a very positive aesthetic value. The tidal changes would also have a positive impact on the aesthetics of the area - with water moving in and out, it gives a real sense of seeing nature at one of its finest moments. Its much more interesting than looking at a pond. In southern Puget Sound we have a great range of tides and this is very beautiful to watch, and would be a real focal point for the public. Shorebirds come in at low tides to feed, and fish and eagles hunting can be seen at the high tides.

It would give the urban environment of Olympia more of a sense of place with Puget Sound, by seeing a natural process of an estuary at work. It would bring more people to the edge of an estuary, which is much needed - residents of Southern Puget Sound do not have much access to the Sound and this would be one that is easily accessible.

A naturally functioning estuary will greatly enhance the natural beauty of downtown Olympia.

The estuary restoration project should include nature trails with educational kiosks , birding and photography stations and other amenities to improve our connection with the natural world.

This urban estuary restoration project serves as a showcase to our region and the nation on how to improve the health and beauty of an ailing waterway.

The smells that come from the seashore bring back good memories for many people who grew up around the sea.

I live on Eld Inlet next to a small estuary. I have kayaked this estuary many times during high tide and walked its mud flats at low tide. This is one of the most enjoyable activities I know.

A healthy estuary smells like the sea. Tidal mud flats represent life and a connection with nature.

Watching shore birds hunt on tidal flats at low tide is like a meditation. Downtown Olympia and our State Capitol Campus will benefit from the opportunity to reconnect with nature.

The estuary is compatible with Heritage Park. Walking/jogging trails will remain and should be enhanced with a 5th Ave. bridge replacing the now dangerous narrow sidewalk along the dam.

The "Capitol Estuary" would rival Kennedy Creek estuary as a dynamic (moving, ever changing) water feature. No fountains, no neon, etc. Birds will work the low tide; water the high tides. The islands will break up the now flat morbid "lake".

It will be ALIVE!

Table B-2. Participant Responses to Cultural Heritage Questions

<p>Q15. In your own words, please describe the cultural characteristics that are important to you when considering the possible removal of Capitol Lake and restoration of the Deschutes River estuary.</p>	<p>Q16. Do you have any additional comments on the effects that Deschutes River estuary restoration might have on the community culture or ability to communicate the history of the area?</p>
<p>To quote a phrase that made Olympia famous, "It's the water".</p>	<p>Restore the estuary to remind us all forever of Little Hollywood (Culture? Or History?)</p>
<p>Removing the dam and Lake would end the salmon run to the hatchery and since salmon are an important symbol of Northwest culture, it would be a loss to the community.</p>	
<p>I think I said it all above.</p>	<p>I really don't understand the "communicate the history" point. The current Lake IS our history, and it is the history for our children. If you mean a history that preceded the lake, in the late 18th or early 19th century, then put up historical signs.</p>
<p>I love Olympia - and I am a runner who bases many, many, many of my runs around the lake. I love the activity of the area, the sense of pride, the "State" Capital, the mental reflections available from the varied water scenes around the lake - I can't even imagine how it would feel if this was gone. I guess I really am not one who can answer this question without prejudice!</p>	
<p>Many of the events held at the lake would no longer want to be around the mud flat.</p>	
<p>As it is, people can get the same impact any time of day. Restoration would probably cause people to visit more frequently when the tide was in. Some would use the park regardless of the tidal situation. There would be a net loss of use.</p>	<p>I think there would be little impact. There might be some ways to highlight the history of the area, but not to a great extent.</p>
<p>Yacht club members and visitors have easy access to downtown amenities and events at their current location. The estuary alternative threatens the downtown location of the club, and will likely affect easy access to downtown amenities.</p>	<p>What do you mean by community culture? Festivals? Daily life? Highbrow events? Long term, there's also the question of the port, and the effect of an estuary on it. Deep-draft shipping may become a thing of the past. Can it be replaced with marine-oriented moorage, boat repair and other businesses that would make use of prime waterfront on the port peninsula? Turning downtown into tall buildings is not an approach I favor.</p>
<p>Many events are held in that area of downtown. I believe returning the lake to an estuary would discourage those evnets from taking place.</p>	
<p>In addition to the disappearance of lower Budd Inlet as a moorage area for small boats, I will miss the many water-oriented activities that have occurred on the Lake and around, Percival Landing, i.e., Lakefair, the speedboat races on the lake, the Wooden Boat Festival, and Harbor Days. I am getting on in years, but two of my fondest memories are of watching City Parks teaching youngsters how to sail and my children swimming off the dock and float in the Lake.</p>	<p>I don't see how creating an estuary would help communicate the history of the area.</p>

Q15. In your own words, please describe the cultural characteristics that are important to you when considering the possible removal of Capitol Lake and restoration of the Deschutes River estuary.

Q16. Do you have any additional comments on the effects that Deschutes River estuary restoration might have on the community culture or ability to communicate the history of the area?

The lake is integral to downtown pride. It is a place for people to jog/walk, for families to congregate, and for community events such as lake fair. A mudflats may meet the esoteric personal needs of a few "back to nature" self-serving "purists", but so would tearing down all the buildings in the city so that the trees can grow back. It is not in the best interest of the community.

The answers I provided above were based on a total estuary restoration option. If the reflecting surface of the lake in front of the Capitol was maintained and other portions were restored to a more natural state and the water quality improved then I think Civic pride would increase, recreational and other businesses would increase, the entire area would be more accessible providing more public use. It would be a wonderful place to learn the history of the area...about state government...about how our community developed along the water front...about the history of Olympia Beer and the Old Brewhouse. There could be a walkway and waterway with interpretive signs all the way from West Bay to the Old Brewhouse even continuing in some way to the Falls Park and Pioneer park. It's a really great way to connect our community's past and present. Safe access to the Old Brewhouse even if it's like a roman ruin would be quite wonderful.

If the restoration of Capitol Lake is a balanced project which maintains the character of the community, provides opportunities to tell the community's evolution and history, enhances access and recreational uses, as well as restoring natural habitat...it will be a huge success! Olympia and Tumwater will attract many a visitor.

I don't believe the restoration would impact my cultural experience of Olympia.

It's neat to think about the water commerce that occurred between Budd Inlet and Tumwater before the dam was created. The restoration would provide an opportunity to talk about that history.

A restored estuary would enhance olympia's tie to the natural world that surrounds it. This would only enhance any cultural characteristics that I feel are important when tying them to olympia.

Olympia's history, by far, is situated in a pre-capitol lake environment.

The restoration of the estuary would bring us closer to our earlier cultural history - with a larger oyster industry and closer link to our past of having a "harvest" industry - of timber and oyster and shellfish. The shellfish industry is still important here - but its in Totten and Eld Inlets where most residents don't see it. Freshwater exchange is important to shellfish and just seeing that (along with some explanatory educational signs) would help residents connect with this aspect of our local natural heritage.I do not have a historical cultural sentiment in having a lake where the estuary used to be.

Restoration would be an environmental success story that could remind us that we can correct what we have done wrong or carelessly in the past. It could be a model for other areas and communities that also need large scale restoration.

Q15. In your own words, please describe the cultural characteristics that are important to you when considering the possible removal of Capitol Lake and restoration of the Deschutes River estuary.

There will be an adjustment period after Deschutes Estuary restoration but people will realize that events around Deschutes Basin are what people make them.

A restored Deschutes estuary increases the opportunity for cultural events that tie in to original historic Native American heritage of the waterway. The historic brewery become more accessible to kayakers and small boats. "Bathtub" races like in Arcata CA will be possible. Events that take advantage of the restored access of the Deschutes River up to the historic brewery and out to Budd Inlet can occur. More recent traditions like "Lakefair" will continue if the local residents want them to continue. Olympia can tag onto National Estuary Day adding more festivals that increase local business activity.

A nature center tied to a small scale marine museum could highlight the urban estuary restoration project with educational stations set up to teach local students about Puget Sound marine ecology.

Studies demonstrate the water will cover the tidal saltmarshes over 70% of the time. The Capitol Dome will reflect off the saltwater most of the time, as long as the sun is out. The community has a project to restore the historic brewery which could house a small scale nature center. Kayak rentals could launch from the historic Tumwater Park and paddle all the way out to Budd Inlet with the tides.

- observe marine cycles (salmon, tides, grasses/rushes)
- classroom projects (education, SPSCC projects, etc.)
- the calming rhythm of tides
- humans and nature example (+ and -); impact'

Q16. Do you have any additional comments on the effects that Deschutes River estuary restoration might have on the community culture or ability to communicate the history of the area?

Our community's connection with the true history of this area should improve with the estuary restoration. I would encourage the local tribes to contribute historical artifacts and educational information to a small scale nature center and marine museum serving the local area.

Early business like the Historic Tumwater Brewery relied on Deschutes River navigation to bring in supplies and deliver products. This history could be acknowledged in the same center.

Full restored (out to Priest Point Park -- see low tide photos) the entire estuary will reflect not a building, but a community that knows where to build, divert, ship stuff, drain, etc. "Remember when the port and tin boat houses used to be there!"

Lacey = no waterfront! only boxes

Table B-3. Participant Responses to Education Questions

Q20. In your own words, describe the educational opportunities that you would like to see in a restored Deschutes River estuary area.	Q21. Do you have any additional comments on the impact that restoring the Deschutes River estuary may have on educational opportunities?
<p>You already have mud flats such as Mud Bay but you are doing little or nothing with them from an educational point of view. If that are any educational values to mud flats, then demonstrate them at Mud Bay or elsewhere and see whether there is any viable and sustainable demand. Why build some new mud flats - and justify them on an educational basis - when you are not taking "advantage" of the mud flats that you have. Indeed, it is interesting to note that in your efforts to sell the Deschutes Mud Flats proposal, you have made no effort to conduct educational and other types of visits to the existing mud flats around here to demonstrate their supposed benefits and justify why such action should be taken at Caitol Lake.</p>	<p>See above - you have failed to take advantage of whatever educational value there is in the mud flats we have - why would be think for a moment that Deschutes would be any different?</p>
<p>The North Capitol Campus should continue to tell the story of Washington with the Arc of Statehood from the Western Washington Inlet to the Eastern Washington Butte.</p>	
<p>If you really need an estuary to teach something that is not available for a lake, go a few miles north to the Nisqually River area. THAT area was preserved by our forbears (Flo Brodie, etc) to do this kind of teaching. Or go to the wonderful area near South Bend or Raymond. These are very special areas, and they are not urban.</p>	
<p>If the a new estuary is formed I certainly would support rigorous sustainable actions, information paths and signs, educatinal activities based on exploration and sharing of information, salmon and other species enviroment attention.</p>	<p>As a negative comment - Tioday in Thurstan County there are many, many of these areas now available for educational opportunities - Deschutes River is currently one as is Nisqually Reach, Fifth Ave Bridge, McClane. I agree heavily that we do need to find many imaginative ways to keep all of us in touch with the 'outdoors' - this is the only way we learn to care about and protect it - but those opportunities exist in many ways already in Thurstaon County..</p>
<p>There is little in the way of education based on estuarine information at this time. The possibility of creating an oyster farm would be an example of something that could attract people. However, reading signs about how a mud flat is a working ecosystem is not going to be an attraction.</p>	
<p>A marine oriented educational center would be wonderful...and is viable without the estuary alternative. Certainly it would be appropriate to include study and observation of altered environments. The mere presence of humans changes a natural environment, to say nothing of the impact of cars, sewage, air pollution and the like.</p>	
<p>I think we have great opportunities now, particularly in the southern part. We are not taking advantage of the areas we have now, such as Priest Point Park and Burfoot Park.</p>	
<p>People can learn about swamp life and mosquito breeding habits.</p>	<p>Perhaps if the project proceeded other communities would have the opportunity to learn from our mistake.</p>

Q20. In your own words, describe the educational opportunities that you would like to see in a restored Deschutes River estuary area.

Q21. Do you have any additional comments on the impact that restoring the Deschutes River estuary may have on educational opportunities?

As mentioned the area could have interpretive signs and displays about our government, the natural surroundings, the history and geography of the area as well as the flora and fauna. Talk about a hands on museum!

In this day and age, I think it's very important for people to see the big picture- the whole system and how our actions in one area of the system affect other areas of the system. Estuaries are good metaphors for explaining this concept.

It's important to have places to go- to see, to touch, to smell- to understand how healthy systems require health and balance in its smaller components.

Local students invoved in monitoring the change in usage by wildlife. I would like the entire community to understand the importance of natural areas, the value of restorion and the degree to which we can undo mistakes made in the past.

It would provide an ideal place for local and regional students to study an urban estuary restoration. It would provide an important model for other areas considering similar issues. It would provide an ideal

Just as the estuary at priest point allows for many educational opportunities, so would a restored deschutes estuary.

First, there would need to be some kind of trail system around the estuary so people could have access - varying from inland paths to the waters and mudflats edge.

Field trips to the estuary by all grade levels.

Opportunities for the general public to learn about an estuary - for example, with a regular guide program every month or so and on the weekend for families, and with good signposting of what is to be seen and understood, at different parts of the trail for self guiding.

Local colleges could use it as an excellent field case study. Also at the high school level it could provide a good focus for a long term practical case study by a biology class over time. Ornithological courses could use the area for study of the increased habitat on bird populations. For example, Mud Bay in Eld Inlet (which is similar to what the restored Deschutes Estuary would be like) is among the most important inland sites in the Pacific Northwest for the Greater Yellowlegs shorebird. Mud Bay supports significant concentrations of wintering waterfowl. An increase in habitat for these species with the deschutes estuary restoration would have an effect on these bird species and there would be much interest in the scientific community and local birding community for study.

The estuary restoration project is the perfect opportunity to teach people in this region about wetland habitat restoration. This area needs a small scale marine science educational center.

There is now a group of community leaders proposing such a marine science center in Olympia.

Wetland restoration and protection is vital if we are to have a healthy Puget Sound waterway.

An urban restoration project such as this provides a real-time model of estuary restoration that can be scientifically studied and used as a template for estuary restoration in other parts of our nation and the world.

My children attend Capitol High School in Olympia. One of the problems discussed this year in their biology class is the lack of educational opportunities to study marine sciences in our area.

Estuary restoration will provide a hands-on opportunity for our local schools at all levels to teach their students about marine sciences and wetland restoration.

Deschutes Estuary restoration will have a positive impact on educational opportunities at all academic levels.

Q20. In your own words, describe the educational opportunities that you would like to see in a restored Deschutes River estuary area.

Q21. Do you have any additional comments on the impact that restoring the Deschutes River estuary may have on educational opportunities?

- "Olympian" series
- classrooms
- state tideland stewardship (no OYC in the middle -- would they move to the Nisqually Delta? No.)
- observation points

Table B-4. Participant Responses to Spiritual/Inspirational Questions

Q22. Does the Capitol Lake area of the Deschutes Basin currently have any spiritual significance to you? If yes, please explain the spiritual significance in your own words.

Q26. In your own words, please describe what you think of when you think about the spiritual and inspirational aspects of removing Capitol Lake and restoring the Deschutes River.

Q27. Do you have any additional comments on how the restoration the Deschutes River estuary may affect the spiritual and/or inspirational qualities of the area?

Water is symbolic of "parting of the seas". No one ever heard of "parting of the mud flats."

As stated above, people sit and watch the existence, movement and reflections from water for spiritual and inspiration reasons. We place park benches to accommodate them in this pursuit, both in this community and in others. In fact, it is a fairly universal practice. However, I have never seen a park bench placed for people to observe mud because the dirty truth is that mud does not have much inspirational value.

It provides the ability to reflect the beautiful buildings on the West Capitol Campus.

It would take away the ability to reflect the beautiful Capitol Group of buildings.

Since my first visit to Olympia to consider moving here, in 1987, I stayed at the Westwater Inn up the hill and ran around the lake. Before coming here, and never having been here before, I had a dream about the view from the Capitol, up the lake and the bay, to the Olympic mountains. It is exactly as I had dreamed.

Again, greatly reduced spiritual prospects here, when there are similarly imagined spiritual prospects just up the road.

offers a connection outside myself - to something stronger, bigger and more lasting than anything I can be

It is used as a quick retreat for many people during the day.

<p>Q22. Does the Capitol Lake area of the Deschutes Basin currently have any spiritual significance to you? If yes, please explain the spiritual significance in your own words.</p>	<p>Q26. In your own words, please describe what you think of when you think about the spiritual and inspirational aspects of removing Capitol Lake and restoring the Deschutes River.</p>	<p>Q27. Do you have any additional comments on how the restoration the Deschutes River estuary may affect the spiritual and/or inspirational qualities of the area?</p>
<p>Spirituality in terms of the environment is a value laden concept to me. I love Capitol Lake and will love it as a mud flat which it is trying to be. However, going beyond that is nothing but putting one persons values in front of another.</p>	<p>I am at a loss when I hear of someone gaining inspiration from having a mud flat which is natural and losing inspiration from a reflecting basin that is a human construct. As a rule, I would potentially distrust their other decisions.</p>	
<p>Calm expanse of water, birds, wind and sounds that bring a new dimension to our urban setting.</p>	<p>I think that time and money should be spent on protecting estuaries of greater significance than the Deschutes, preferably in areas not already substantially altered by human activity.</p> <p>In our region, the Nisqually restoration has been a superb effort, well worth it.</p>	
	<p>Nothing positive comes to mind.</p>	
<p>The peaceful water provides a wonderful solace for spiritual reflection.</p>	<p>I don't find a mosquito infested stinky mud flat spiritually inspiring. If I did, I would spend my day wading in the mud around Mud Bay.</p>	<p>I'd want to move away.</p>
<p>It provides peace and tranquility in our busy lives whether driving, walking, running, around the lake. The reflection pond provides a sense of calm. It also reflects back a building of beauty that represents our democratic ideals.</p>	<p>While a natural mudflat and habitat can provide a peaceful setting, it does not compare to the tranquility of a water body that reflects it's historical and natural surroundings at a glance. When the water is still, a simple glance at Capitol Lake is as soothing as a cool drink of water on a hot day. And it only takes a second, or a minute and it provides that sense of well-being. All is calm.</p>	
<p>To me nature = spirituality. Nature is a place to access my spirit and how I am one piece of the whole- just like the community of ducks on Capitol Lake are one piece of the same whole. Connecting with my spirituality helps me to stay in balance and right relationship to this larger whole.</p>	<p>This system as we have it now, is not how nature designed. It has artificial blocks. My spiritual practice is about trying to be aware of my artificial blocks. I think that if we allow the system to flow again, it will positively effect our ability to flow (see things for how they really are, let go, accept change...)</p>	
	<p>I think the restoration of the estuary would represent a significant move forward in recognizing and accepting our responsibility to share the land with other organisms.</p>	
<p>Capitol Lake sybolizes that trying to contain the spirits true expression can only result in stagnation.</p>	<p>A return to a natural estuary would be an ever present reminder of natures flux and beauty.</p>	

Q22. Does the Capitol Lake area of the Deschutes Basin currently have any spiritual significance to you? If yes, please explain the spiritual significance in your own words.

Q26. In your own words, please describe what you think of when you think about the spiritual and inspirational aspects of removing Capitol Lake and restoring the Deschutes River.

Q27. Do you have any additional comments on how the restoration the Deschutes River estuary may affect the spiritual and/or inspirational qualities of the area?

It's the end of Bud Bay and the beginning of the tributary to it and would provide a haven for wildlife if it was in its natural condition. Its also a grand open space - just outside of town and is a grand site when you are entering Olympia from the westside, over the bridge. You see the sound on one side and the continuation of water and open space on the other.

The presence of trees would be important for inspiration in this value. Trees and water are traditional elements of what gives the Northwest its spiritual splendor - and where humans find renewal.

I do not call it spiritual, but I am drawn to water. I think the water body at the foot of our Capitol is significant to our area.

I do not seek spiritual rejuvenation at the Capitol Lake reservoir, because I see the dam as harmful to a natural habitat. The thought of lost natural habitat in view of all the problems faced by Puget Sound because of lost wetlands bothers me.

Capitol Lake is not a place I go to reconnect with nature.

a constant presence, (friend) always there, soothing, doesn't hassle me, tides will always be back to see me

- a rhythm like the seasons

I recharge in nature. People need to re-connect with nature to restore themselves. As cities increase in size, natural habitat loss occurs. People become disconnected from the natural world. An urban estuary with walking paths, park benches, and educational kiosks provides a way for people to understand and appreciate the importance of the natural world.

Walking along tidal salt marshes, listening to the sounds of shorebirds, watching a heron hunt in the tidal flats all provide spiritual grounding for me.

good-bye weedy, shallow, drainage, store-the-mud-for-the-port "lake" and hello living estuary that will get better, not worse

A natural estuary would improve the spiritual and inspirational connection with nature that recharges many people.

Kayaking silently in a few inches of water, closely observing and appreciating that natural world that surrounds you, is spiritual.

Appendix C: Socioeconomic Profile of Olympia and Thurston County

Introduction

It is often useful to describe the socioeconomic setting of the affected area, in order to provide context for the nature and relative significance of the anticipated changes. Who is affected, how they will be affected, and what is the relationship of changes to the economic environment, may be relevant to decision makers. This section also contains an economic profile of Olympia and Thurston County.

Population (Age, Ethnicity, Recent and Projected Growth Rates)

The 2006 population of Thurston County is estimated at 231,100, ranking sixth in size among counties in Washington State. Thurston County has been one of the fastest growing counties in the state since the 1960s, with growth rates consistently greater than that of the state. Since 2000, the county's population is estimated to have grown by about 11.5 percent, compared to the state's population increase of 8.2 percent for the same period.¹² From 2000 to 2006, the average annual growth rate for Thurston County was 1.8 percent, down from the 2.5 percent annual average growth rate that the county experienced from 1990 to 2000.

Historic population trends for Thurston County and the City of Olympia are shown in Table C-1. The City of Olympia is both the state capitol and the county seat, and was first incorporated in 1859. The 2006 population of Olympia is estimated at 43,740, and the city ranks 21st among Washington cities and towns in terms of population size. In recent years, the city has grown at a lesser rate than that of the county and state; from 2000 to 2006, Olympia's population increased by about 2.9 percent, or an average annual growth rate of 0.5 percent. In the 1990s, however, Olympia's growth rate was similar to that of the county, averaging 2.3 percent annually.

¹² State of Washington, Office of Financial Management, Forecasting Division, September 2006, *2006 Population Trends*, p. 9.

Table C-1. Historic Population Trends, Thurston County and City of Olympia, 1960-2006

Area	1960	1970	1980	1990	2000	2006
Thurston County	55,049	76,890	124,264	161,238	207,355	231,100
City of Olympia	18,273	23,296	27,447	33,729	42,514	43,740

Source: Thurston Regional Planning Council, October 2006, *The Profile*, p. II-11; and State of Washington, Office of Financial Management, Forecasting Division, September 2006, *2006 Population Trends*, p.17.

Olympia is the largest city in Thurston County, followed by Lacey and Tumwater (see Table C-2). A large portion of the county's population, 57 percent, lives within the unincorporated areas of the county. Two Indian reservations have lands within Thurston County. The majority of the Chehalis Indian Reservation population resides within Grays Harbor County, with just 35 residents estimated to live within the Thurston County portion of the reservation in 2006. All residents of the Nisqually Indian Reservation live within Thurston County and are estimated to number 600 in 2006.¹³

Table C-2. Populations of Cities and Towns in Thurston County, 2006 Estimate

Municipality	Population	Percentage of County
Bucoda	650	0.3%
Lacey	34,060	14.7%
Olympia	43,740	18.9%
Rainier	1,665	0.7%
Tenino	1,515	0.7%
Tumwater	13,100	5.7%
Yelm	4,565	2.0%
<i>Incorporated</i>	<i>99,295</i>	<i>43.0%</i>
<i>Unincorporated</i>	<i>131,805</i>	<i>57.0%</i>
Total County	231,100	100.0%

Source: State of Washington, Office of Financial Management, Forecasting Division, September 2006, *2006 Population Trends*, p. 17.

Table C-3 shows the age distribution of Thurston County's population in 2006. Nearly one-quarter of the county's population consists of children under the age of 18 years. The median age of county residents has increased steadily in recent years, from 34 years in 1990 to 37 and 38

¹³ Thurston Regional Planning Council, October 2006, *The Profile*, pp. II-2-II-3.

years in 2000 and 2006, respectively.¹⁴ The median age of Olympia residents was 36 years in 2000, the oldest among cities/towns in Thurston County.¹⁵

Table C-3. Thurston County Population Age Structure, 2006

Age (years)	Persons	Percentage
17 and under	55,184	23.9%
18-24	22,800	9.9%
25-34	27,905	12.1%
35-44	33,513	14.5%
45-54	38,310	16.6%
55-64	26,773	11.6%
65 and over	26,615	11.5%
Total	231,100	100.0%

Source: Washington Office of Financial Management, Forecasting Division, January 18, 2007, *2006 Total Population Estimates by Age, Gender, and Race: Washington and Its Counties*, available at <http://www.ofm.wa.gov/pop/race/2006estimates.asp> (accessed March 10, 2007).

The 2000 Census, upon which the 2006 population estimates are based, allowed respondents to choose one or more races to define their racial background. Table C-4 shows the 2006 estimated population of Thurston County by race and ethnicity. Over 86 percent of county residents identify themselves as white only, compared to 85 percent of state residents.¹⁶ The Asian/Native Hawaiian and Pacific Islander population of the county is slightly over six percent, compared to seven percent of state residents.¹⁷

The category of “Hispanic” is used to describe people of Hispanic origin, and they may be of any race. Nearly 12,000 people, or five percent of the county’s population, are of Hispanic origin, compared to nine percent of the state’s population.¹⁸

¹⁴ Thurston Regional Planning Council, October 2006, *The Profile*, p. II-6.

¹⁵ Thurston Regional Planning Council, October 2006, *The Profile*, p. II-7.

¹⁶ Washington Office of Financial Management, Forecasting Division, January 18, 2007, *2006 Total Population Estimates by Age, Gender, and Race: Washington and Its Counties*, available at <http://www.ofm.wa.gov/pop/race/2006estimates.asp> (accessed March 10, 2007).

¹⁷ Washington Office of Financial Management, Forecasting Division, January 18, 2007, *2006 Total Population Estimates by Age, Gender, and Race: Washington and Its Counties*, available at <http://www.ofm.wa.gov/pop/race/2006estimates.asp> (accessed March 10, 2007).

¹⁸ Washington Office of Financial Management, Forecasting Division, January 18, 2007, *2006 Total Population Estimates by Age, Gender, and Race: Washington and Its Counties*, available at <http://www.ofm.wa.gov/pop/race/2006estimates.asp> (accessed March 10, 2007).

Table C-4. Thurston County Population Race and Ethnicity, 2006

Race / Ethnicity	Persons	Percentage
White	199,044	86.1%
Black/African American	6,122	2.6%
American Indian and Alaska Native	3,734	1.6%
Asian/Native Hawaiian and Pacific Islander	14,115	6.1%
Two or More Races	8,085	3.5%
Total	231,100	100.0%
Hispanic*	11,857	5.1%

*A person of Hispanic origin can be of any race.

Source: Washington Office of Financial Management, Forecasting Division, January 18, 2007, *2006 Total Population Estimates by Age, Gender, and Race: Washington and Its Counties*, available at <http://www.ofm.wa.gov/pop/race/2006estimates.asp> (accessed March 10, 2007).

The most recent age distribution, race, and ethnicity data for Olympia are from the 2000 Census. Children (17 years and younger) made up a slightly smaller portion of the Olympia population, about 21 percent compared to 25 percent of the 2000 county population. Those 65 years and older made up about 13 percent of Olympia’s population in 2000, compared to 11 percent of Thurston County residents. About 85 percent of Olympia’s 2000 population reported their race as white alone, and about six percent selected Asian/Native Hawaiian and Pacific Islander alone. Just over four percent of Olympia residents were of Hispanic origin, according to 2000 Census data.¹⁹

The Thurston Regional Planning Council (TRPC) develops population forecasts every three to five years for use in local government and business planning. The latest forecast, developed in 2004, projects population growth out to 2030, and are shown in Table C-5. The TRPC projections for Thurston County remain within the low-to-high range of Growth Management projections developed by the Washington Office of Financial Management in 2002.

The population of Thurston County is forecast to grow at a slightly greater rate than that of Olympia through 2030. The forecast also shows a slackening off of growth as annual average growth rates for both Thurston County and Olympia are significantly lower in later years of the forecasted period. TRPC projects that the population of Thurston County will reach 373,000 in 2030, which represents an increase of over 60 percent from the estimated 2006 county population of 231,100. Olympia’s population is forecast to reach 61,850 in 2030, increasing over 40 percent from the estimated 2006 population of 43,740.

¹⁹ Thurston Regional Planning Council, October 2006, *The Profile*, pp. II-27-II-28.

Table C-5. TRPC Population Forecast for Thurston County and Olympia, 2010-2030

	2010	2015	2020	2025	2030
Thurston County	255,000	285,000	319,000	348,000	373,000
<i>Ave. Annual Growth Rate (previous 5 year period)</i>	<i>2.6%</i>	<i>2.2%</i>	<i>2.3%</i>	<i>1.8%</i>	<i>1.4%</i>
City of Olympia	47,900	51,990	55,910	59,120	61,850
<i>Ave. Annual Growth Rate (previous 5 year period)</i>	<i>1.8%</i>	<i>1.7%</i>	<i>1.5%</i>	<i>1.1%</i>	<i>0.9%</i>

Source: Thurston Regional Planning Council, Population and Employment Forecast Work Program, 2004-2005, available at www.trpc.org (accessed March 12, 2007).

Employment

Total full- and part-time employment in Thurston County was 120,592 jobs in 2004, as shown in Table C-6. About 30 percent of jobs in Thurston County are in the government sector, making it the largest sector in the county in terms of employment. State government, with offices in the state capitol of Olympia and elsewhere in Thurston County, is the single largest employer, accounting for nearly one-fifth of total county employment. The next largest employment sectors are retail trade, with nearly 12 percent of total employment, and health care and social assistance, with just over 10 percent.

Table C-6. Total Full-Time and Part-Time Employment by Sector, Thurston County, 2004

Industry Sector	Number of Jobs	Percentage of Total
Farm, Forestry, Fishing, and Related Activities	3,172	2.6%
Mining	158	0.1%
Utilities	192	0.2%
Construction	6,655	5.5%
Manufacturing	3,338	2.8%
Wholesale Trade	2,605	2.2%
Retail Trade	14,087	11.7%
Transportation and Warehousing	2,132	1.8%
Information	1,243	1.0%
Finance and Insurance	3,839	3.2%
Real Estate and Rental and Leasing	4,220	3.5%
Professional and Technical Services	5,868	4.9%
Management of Companies and Enterprises	482	0.4%
Administrative and Waste Services	5,536	4.6%
Educational Services	2,382	2.0%
Health Care and Social Assistance	12,290	10.2%
Arts, Entertainment, and Recreation	2,228	1.8%
Accommodation and Food Services	6,864	5.7%
Other Services, except Public Administration	7,093	5.9%
Government and Government Enterprises	36,208	30.0%
Federal Government, Civilian	964	0.8%
Federal Government, Military	816	0.7%
State Government	23,548	19.5%
Local Government	10,880	9.0%
Total employment	120,592	100.0%

Source: U.S. Bureau of Economic Analysis, April 2006, *Regional Economic Information System 1969-2004*.

The top ten employers in Thurston County are shown in Table C-7. As mentioned previously, state government is the single largest employer in the county, with over 23,000 employees. This is followed by local government, with nearly 11,000 jobs, including those within local school districts. Several health care providers are in the top ten, including Providence St. Peter Hospital, Group HeaMth Cooperative, and Columbia Capitol Medical Center.

Tribal government is the fourth largest employer in Thurston County. Chehalis tribal enterprises, which include the Lucky Eagle Casino, Chehalis Tribal Construction, and Eagle's Landing Hotel, account for 574 jobs, while tribal government and community services employ another 149 people. The Nisqually Tribe employs a total of 650, which includes about 175 jobs in tribal government and community services and the remainder with the Red Wind Casino.²⁰

Two of the larger retailers in the area are also found among the top ten employers. Wal-Mart currently has one store in the county, in Lacey, and Costco has stores located in Lacey and Tumwater. Both retailers account for between 100 and 500 jobs each. Saint Martin's College, located in Lacey, is also one of the top ten employers in Thurston County.

Table C-7. Top Ten Employers in Thurston County, 2004

Employer	Employees
State Government, including Education	20,000-25,000
Local Government, including Education	10,000-15,000
Providence St. Peter Hospital	1,000-5,000
Tribal Government	1,000-5,000
Federal Government	500-1,000
Group Health Cooperative	500-1,000
Columbia Capitol Medical Center	100-500
Wal-mart	100-500
Saint Martin's College	100-500
Costco Wholesale Corporation	100-500

Source: Thurston Regional Planning Council, October 2006, The Profile, p. IV-18.

Small businesses play an important role in Thurston County, as can be seen in Table C-8. Over 60 percent of firms in the county employ less than five workers each. Nearly one-quarter of jobs are with firms employing less than 20 workers; these firms make up nearly 89 percent of the county's total firms. Just 11 firms (including departments of state government) employ more than 1,000 workers each, accounting for about 18 percent of total jobs.

²⁰ Thurston Regional Planning Council, October 2006, The Profile, p. IV-3.

Table C-8. Thurston County Employment by Size of Firm, First Quarter 2005

Number of Employees	Number of Firms	Percentage of Total Firms	Employment	Percentage of Total Employment
0-4	3,706	60.4%	6,016	6.5%
5-9	1,027	16.7%	6,819	7.4%
10-19	703	11.5%	9,454	10.2%
20-49	435	7.1%	13,298	14.4%
50-99	123	2.0%	8,377	9.0%
100-249	90	1.5%	13,456	14.5%
250-499	18	0.3%	5,787	6.3%
500-999	19	0.3%	12,519	13.5%
>1,000*	11	0.2%	16,842	18.2%
Total	6,132	100.0%	92,568	100.0%

- Includes individual departments of state government.

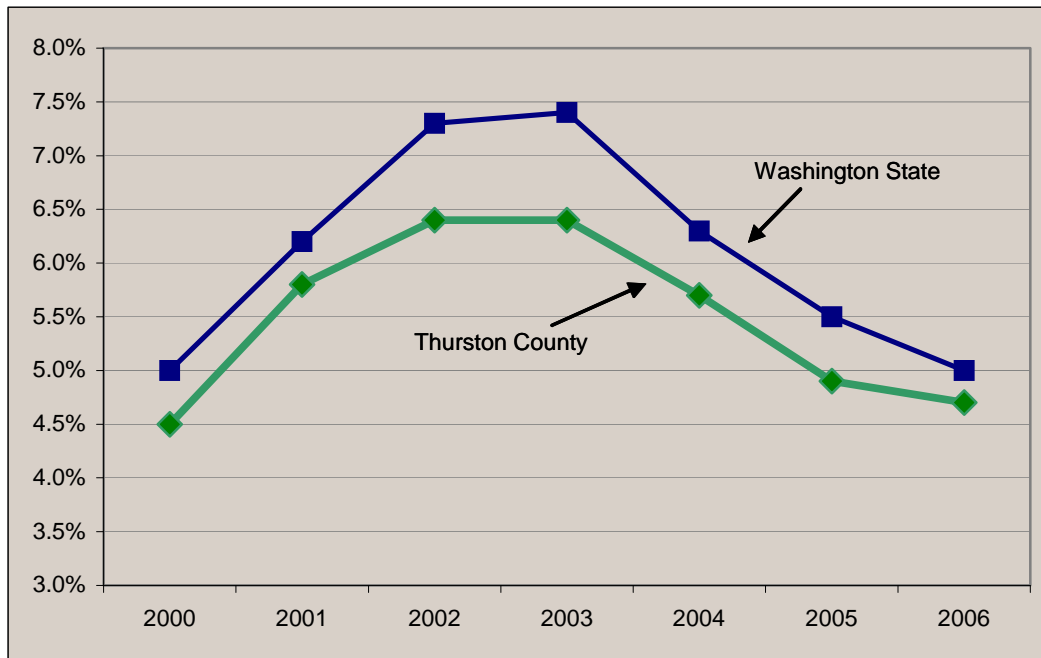
Note: Size of firm distribution includes all ownerships, including multiple establishments. Employment figures in this table include only those jobs covered under unemployment insurance, and do not include self-employed workers, proprietors, CEOs, military, and other non-insured workers. Therefore, these figures will differ from the total employment numbers discussed elsewhere.

Source: Thurston Regional Planning Council, October 2006, *The Profile*, p. IV-19.

The labor force (also referred to as the civilian labor force, to exclude those in the military) is made up of all persons 16 years of age or older within a specific geographic area who are either working or actively looking for work. The unemployment rate is the percentage of people within this labor force who are not employed, but still actively seeking work. Unemployment rates at the county level are determined based on the state's portion of a national survey of households, integrated with other information, such as unemployment insurance claims and business surveys.

Unemployment rates in Thurston County have closely followed state trends in recent years, as shown in Figure C-1. The county unemployment rate, 4.7 percent in 2006, has been consistently lower than that of the state since 2000. The 2001 recession pushed unemployment rates up for both the state and county during the next two years, but since 2003, unemployment rates have been on the decrease, reflecting the improving economy.

Figure C-1. Thurston County and Washington State Unemployment Rates, 2000-2006



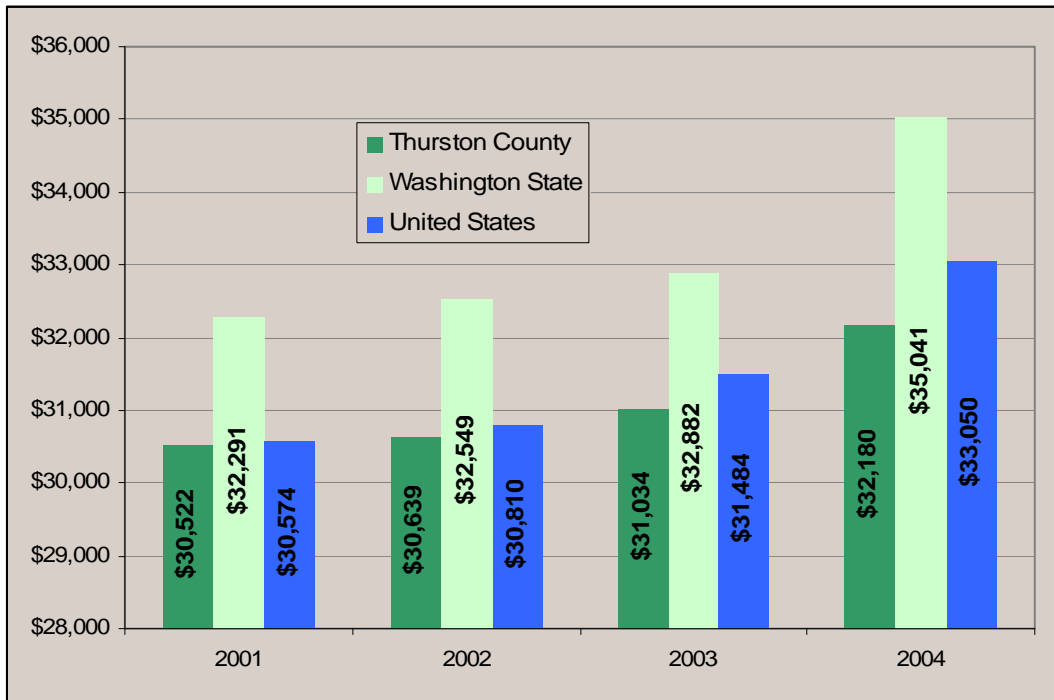
Source: Washington State Employment Security Department, Labor Market and Economic Analysis Branch, available at www.workforceexplorer.com, accessed March 12, 2007.

Per Capita Income

Per capita income is calculated by dividing the total personal income by the total population for a particular area. This figure can be used to compare regions or time periods, and is a useful indicator of the character of consumer markets and the overall economic “well-being” of area residents. Per capita income provides a good measure of how personal income is growing relative to a population, but does not necessarily indicate how that income is distributed among the population.

As can be seen in Figure C-2, per capita income in Thurston County in recent years has lagged slightly behind that of the total United States, and been significantly less than that of Washington State. Growth in per capita income within Thurston County has also lagged behind that of the state and nation. In 2001, Thurston County’s per capita income of \$30,522 was nearly equal to that of the United States, and the equivalent of about 95 percent of the state per capita income. In 2004, the county’s per capita income of \$32,180 was the equivalent of about 97 and 92 percent of the nation’s and state’s respective per capita income.

Figure C-2. Thurston County, Washington State, and U.S. Per Capita Income, 2001-2004



Source: U.S. Bureau of Economic Analysis, April 2006, *Regional Economic Information System 1969-2004*.

Poverty

Another measure used to indicate economic well-being in a region is the percentage of people who are estimated to live below the poverty level. These data are based on national levels set for minimum income requirements for various different sizes of households. There is no correction for the variation in costs of living among areas. For example, if housing prices and food prices in a county were lower than national levels, then a family in that county with an income at the national poverty level might be better off than a family with the same income living elsewhere in the nation. However, poverty figures can be useful to permit comparison between geographic areas and time periods.

The most recent available poverty data are from the 2000 Census, and are based on income levels reported for 1999. According to the Census data, about 8.8 percent of individuals living in Thurston County had income below the poverty level, compared to 10.6 percent of Washington State residents. Olympia had the highest rate of poverty among Thurston County cities (12.1 percent), in part due to the concentration of social services in urban areas that are unavailable in rural areas.²¹

²¹ Thurston Regional Planning Council, October 2006, *The Profile*, pp. V-4 and V-20.

Olympia Economic Base²²

Early development of the city of Olympia was based on its port facilities and lumber-based industries, and later oyster farming and dairying. The timber industry exerted a large influence on the city's economy following World War II, when Olympia served as a major service center for lumber communities west of Thurston County and the Port of Olympia provided a transportation center for shipping logs and finished lumber. During the mid-twentieth century, however, the local timber industry declined and many of the local associated milling and secondary operations were lost.

The area's modest farm sector was further diminished by housing development as Olympia expanded as a center of offices and homes for state employees, military personnel, and families during the 1970s. Farming continued to a lesser extent in the south county, and consisted mostly of dairy and truck (primarily berry crops) farming, as well as small hobby farms.

The education sector grew with the construction and operation of the Evergreen State College, a four-year public institution founded in 1967. The campus is located about five miles northwest of Olympia and encompasses about 1,000 acres. The approximately 4,500 students, 225 faculty members, and additional staff people contribute to the local housing and retail sectors.

In the late 1980s, the Olympia waterfront and downtown areas underwent a revitalization, and since that time, efforts have been made to draw new businesses to that area.

In recent years, the manufacturing sector has continued to be a major economic segment as plastics, industrial supplies, and machinery have grown, while the wood and food processing segments have stagnated. The Miller Brewing plant closed in 2003, causing a decline in local manufacturing jobs which is expected to rebound in the future. Local manufacturing companies that are experiencing growth include Dart Containers, Inc., Albany International Corp., Big Toys, Inc., and Amtech Corp.

The presence of state government offices in Olympia serves as a stabilizing factor for the local economy, and also supports the economy as a tourist attraction. Tourism spending in 2003 was estimated at \$209.7 million; much of the tourist season revolves around the annual sessions of the state legislature, which occur in the winter and spring and mark the start of the first tourist season of the year. Other attractions include the Olympia waterfront area and tribal casinos that offer gambling in the local area.

Only a small number of technology companies are located in Olympia or Thurston County, especially relative to other regions of Washington State. Local economic development programs are working to attract more of these companies, promoting the area's telecommunication infrastructure, low property price, and educated workforce. Univera, Inc., a biotechnology firm, relocated to Thurston County from Colorado in 2004. Reach One, an internet service provider, and Fast Transact, a processor of credit card transactions, are also new additions to the local area.

With two hospitals, Olympia functions as the regional medical center for the five surrounding counties. Providence St. Peter Hospital is the largest hospital in the region, with 390 beds and

²² "Olympia: Economy," 2006, Cities of the United States website, available at <http://www.city-data.com/us-cities/The-West/Olympia-Economy.html>, accessed March 12, 2007.

offering a full spectrum of specialized and general health care. A \$27.5 million emergency center and clinical laboratory was opened at Providence St. Peter in 2003. The other full service hospital, Capitol Medical Center, has 119 beds and 238 physicians.

Port of Olympia

The Port of Olympia is one of 76 public ports in Washington State, and is organized as a special purpose district that can build and operate marinas, airports, railroads, industrial sites, recreational facilities, and marine shipping terminals. The port essentially operates as one business with four divisions: the Marine Terminal, the Olympia Regional Airport, Swantown Marina and Boatworks, and the Property Development Division. The Port also administers economic development tools for use by private business, such as Industrial Development Revenue Bonds and a four-county Foreign-Trade Zone.

The Marine Terminal was recently renovated and consists of three deepwater berths, a U.S. Customs bonded warehouse, activated Foreign-Trade zone, and a cargo yard. The Olympia Regional Airport is located in Tumwater, and operates as a general and corporate aviation-transport facility. The Swantown Marina and Boatworks, located in the East Bay waterfront area, operates a variety of boating services ranging from those supporting day visits, to permanent moorage, to vessel haulout.

The Port is also a major owner of real estate in areas of the region with significant commercial and industrial development activity. The Port of Olympia owns the Port Peninsula on Olympia's waterfront, and is a major land-owner in the Tumwater Town Center and the NewMarket Industrial Campus, adjacent to the Olympia Regional Airport in Tumwater.

The Port of Olympia and tenants operating on Port of Olympia property generate extensive economic activity in Thurston County, as well as throughout the State of Washington. According to a recent economic impact study conducted for the Port of Olympia, the Port and Port tenants generated \$429.7 million in direct business revenue. A large portion of this revenue (\$363.1 million) is generated by tenants at properties owned by the Port of Olympia (see Table C-9). The Swantown Marina and Boatworks is responsible for another \$28.5 million in revenue, followed by the Marine Terminal, with \$19.6 million in revenue.

Table C-9. Direct Business Revenues from the Port of Olympia and Tenants, 2004

Port Division or Tenant	Direct Business Revenue
Tenants at Port-Owned Properties	\$363,052,000
Swantown Marina and Boatworks	\$28,505,000
Port of Olympia Marine Terminal	\$19,612,000
Olympia Regional Airport	\$9,222,000
Capital Projects (Undertaken in 2004)	\$4,901,000
Unallocated Administrative Activities	\$4,451,000
Total Revenues	\$429,743,000

Source: BST Associates, July 15, 2005, Port of Olympia: *2004 Economic Impact Study Final Report*.

According to the study, the Port and Port tenants also paid approximately \$14.8 million in state and local taxes in 2004. Included in this estimate are payments of approximately \$500,000 to each of Olympia and Tumwater from leasehold, business and occupation, and sales and use taxes.²³

More than 2,600 jobs are directly related to the Port of Olympia, either through its lines of business or tenants. Many of these jobs are relatively high paying, with wages averaging \$35,000 annually (over \$17 per hour), with some as high as \$59,000 annually (\$29 per hour).²⁴ Employment by line of business or activity center is shown in Table C-10.

Table C-10. Direct Employment by Port of Olympia and Tenants, 2004

Port Division or Tenant	Direct Employment (jobs)
Olympia Regional Airport	166
Swantown Marina and Boatworks	131
Port of Olympia Marine Terminal	131
Properties at NewMarket Industrial Campus and Budd Inlet Peninsula	2,164
Capital Projects (Undertaken in 2004)	36
Unallocated Administrative Activities	50
Total Employment	2,678

Source: BST Associates, July 15, 2005, Port of Olympia: *2004 Economic Impact Study Final Report*.

In 2004, about \$145 thousand metric tons of foreign waterborne trade goods were imported and exported through the Port of Olympia, valued at about \$163.6 million. This represents a decrease in the quantity (by weight) of goods compared to 2003, but a substantial increase from the \$106.2 million value of those goods in 2003. Among Washington ports, the Port of Olympia ranked 10th in terms of total weight of foreign waterborne trade, and 8th in terms of value, according to 2004 figures.²⁵

²³ BST Associates, July 15, 2005, Port of Olympia: *2004 Economic Impact Study Final Report*.

²⁴ BST Associates, July 15, 2005, Port of Olympia: *2004 Economic Impact Study Final Report*.

²⁵ Thurston Regional Planning Council, October 2006, *The Profile*, p. V-36.