CAPITOL LAKE

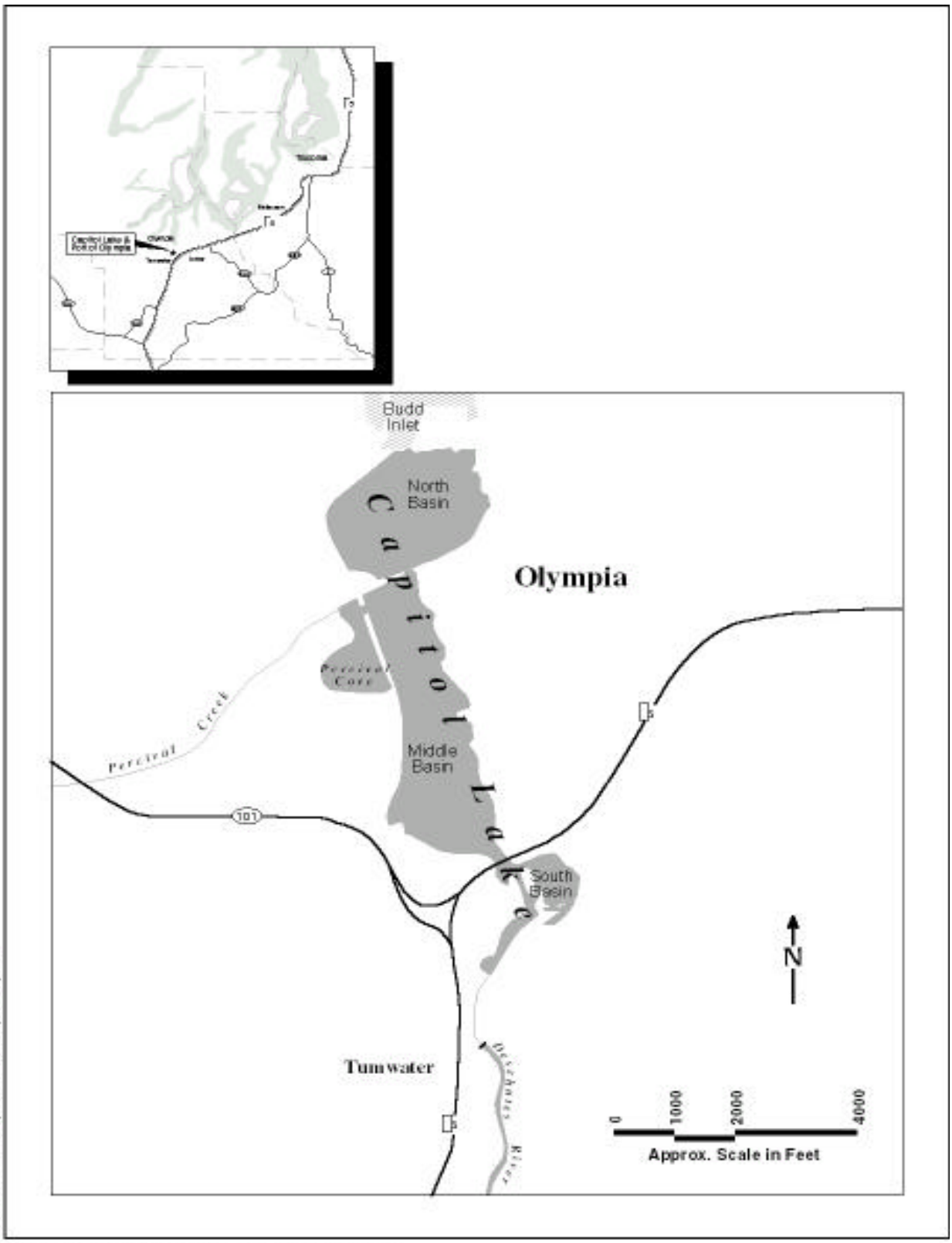
ADAPTIVE MANAGEMENT PLAN 1999 to 2001

CHAPTER 1 INTRODUCTION & PHASE ONE ACTIVITIES

Photo 1-1. Capitol Lake, Interstate 5 and Highway 101 Interchange. c. 1958.
Courtesy of the Susan Parish Collection.

Why Plan?

Since 1951, when the State of Washington created Capitol Lake by damming the head of Budd Inlet, the responsibility for operation and maintenance of the lake has fallen under the jurisdiction of the Washington State Department of General Administration. The lake, which is actually a freshwater reservoir of the Deschutes River, was formed to serve as a reflecting pool for the State Capitol Building as envisioned by architects White and Wilder in the 1911 Capital Campus Plan. The need for a new lake management plan surfaced in 1996, when the State was attempting to gain permits for the construction of Heritage Park on the eastern shore of the North Basin and maintenance dredging the Middle Basin and Percival Cove.



8146 97034-60 Capitol Lake EIS (4/6/98) AGT

BASE SOURCE: USGS MAP TUMWATER, WA, 1994

Figure 1-1

Project Vicinity Map

At that time it became clear that perceptions of effective lake management had changed and that all lake activities needed to be evaluated in a comprehensive fashion. With water flowing in from the Deschutes River and flowing out to Budd Inlet, Capitol Lake is a small part of this watershed. Therefore, solutions for in-lake problems need to be holistic, taking into consideration this larger ecosystem and responding to a broad range of community interests. So in late 1996 and early 1997, General Administration organized a small task force to address this management deadlock. The task force emerged with a "Memorandum of Understanding" which became the template for the management planning process and is included as Appendix A.

Steering Committee Representation

The first meeting of the Capitol Lake Management Plan Steering Committee was held on June 12, 1997, with all seven original members in attendance. This included a mix of state, local and tribal governments. Since that initial meeting the term "Adaptive" has been added to the title of the planning process and two additional jurisdictions were invited to the table. Refer to Table 1-1 for a list of all the jurisdictions and their representative(s).

The Steering Committee is responsible for developing the Capitol Lake Adaptive Management Plan (CLAMP). This adaptive management plan was not intended to be just another planning document, but will present a new way of addressing changing conditions within the lake. The use of adaptive management principles will allow for continued refinement of the Plan. As additional data are collected, the Plan will be modified to reflect the best available information. The list of action items for the next two-year period will be updated as needed. So it is anticipated that various portions or chapters of the CLAMP may be revised every few years.

Steering Committee Ground Rules

The Steering Committee began to address the planning process by establishing some basic Ground Rules. These included the selection of Grant Fredricks (General Administration) as the chair with Chris Parsons (Tumwater) serving as the vice-chair. All Steering Committee meetings were open to the public and the first five minutes of each meeting was reserved for pubic comment. The Steering Committee was staffed by persons from Thurston Regional Planning Council and from the General Administration Division of Capitol Facilities. From time to time a Technical Advisory Committee was formed to deal with specific issues. The results of all such meetings were reported back to the Steering Committee, where any required action was taken.

Table 1-1
Steering Committee Jurisdictions and Representatives

C	WA Department of General Administration	**Grant Fredricks**, Deputy Director
C	WA Department of Ecology	**Sue Mauermann**, Regional Director
C	WA Department of Fish and Wildlife	**Sara LaBorde**, Regional Director
C	WA Department of Natural Resources	**Howard Thronson**, Regional Manager
C	Squaxin Island Tribe	**Jeff Dickison**, Habitat Biologist
C	City of Olympia	**Margaret McPhee**, Councilmember
C	City of Tumwater	**Chris Parsons**, Councilmember
C	Thurston County	**Dick Blinn**, Director of Water and Waste Management Department
C	Port of Olympia	**Andrea Fontenot**, Sr. Land Use Planner

The Ground Rules also contained a section on Committee Process. Modeled after the Timber-Fish-Wildlife agreements, the cornerstone of the Steering Committee process is consensus-based decision making. This requires informed consent and demands much higher commitments from the jurisdictions and their representatives than a majority vote. All parties were required to recognize the legitimacy of others goals and opinions. All issues were required to be addressed by the whole group. And finally, this process required that representatives keep their jurisdictions and constituencies informed of the process. Therefore, this Capitol Lake Adaptive Management Plan was generated by means of these Ground Rules which are included in Appendix B.

Management Plan Goals

To equally address everyone's issues, the Steering Committee established some "Goals" for the planning process in a very deliberative way. Other goals reflect the Steering Committee's actions over the past two years. Table 1-2 lists each Goal with a brief discussion of its content.

Table 1-2
Capitol Lake Management Plan Goals

1. **Complete a Capitol Lake Adaptive Management Plan (CLAMP)**.

   The CLAMP will ensure that operations, maintenance and capital investments are coordinated to insure that limited financial resources are used in an effective and efficient manner. The primary user would be the Department of General Administration, but each of the other planning partners would be helped by the plan.

2. **Complete an Environmental Impact Statement (EIS) on various alternative aquatic environments for the basin**.

   An EIS process was used to explore the implications, benefits and drawbacks of various options for the lake basin. The Draft EIS, issued in October 1998, generated significant public comments and helped to increase public awareness about the lake environment and the CLAMP planning process. The Final EIS will provide the environmental context for future management activities.

3. **The initial CLAMP efforts are designed to achieve measurable improvements in flood control, water quality, salmon enhancement, sediment management and infrastructure improvements.**

   The Steering Committee agrees that many current management practices can be improved and should be the focus for the first two-year phase. Actions that will prevent further adaptive opportunities will be avoided. No specific ultimate fresh or salt-water aquatic environment is preferred at this time.

4. **Selection of a preferred aquatic environment is deferred until essential new data is developed over the next several years.**

   After a very deliberative evaluation of the EIS comments and several technical sub-group meetings, the Steering Committee concluded that it did not have enough information about capital costs or the effects of improved management practices to select a preferred aquatic environment at this time.

5. **Management decisions will be based on the best available legal, environmentally protective, cost effective, science-based information available.**

   This process will a) be consensus based, b) rely on best available science, c) identify areas of incomplete knowledge, d) use experimentation and science-based analyses to gain needed knowledge, e) engage the community at appropriate opportunities, and f) measure success based on the CLAMP management objectives.

6. **Improved coordination among partners resulting in better management of community resources and more naturally performing systems.**

   Continued involvement of the Steering Committee jurisdictions will be required to provide this improved coordination.

Management Objectives & Phase One Activities

At the conclusion of the Steering Committee process, decisions were made about the Management Objectives and the necessary Phase One Activities which would need to be accomplished within the next two years. While the Management Objectives describe HOW things should be managed, the list of Phase One Activities provides a specific list of WHAT will be done in State fiscal years (July 1 - June 30) of 1999 to 2001. Table 1-3 integrates the Management Objectives and Phase One Activities. Due to the State budget cycle, a two-year budget for Capitol Lake activities was prepared in consultation with the Steering Committee, but in advance of their process. Therefore, the budget to the State Legislature is organized by Task and does not have a direct one-to-one relationship to the aforementioned Management Objectives or Phase One Activities. Still, the budget summary contained in Table 1-4 lists many of the specific activities to be accomplished in the first management phase.

Adaptive Management Plan Chapters

Throughout this initial drafting phase, the Steering Committee has identified a series of "key issues," "management themes" or sometimes even referred to as our "bright lights." These were all addressed in the Draft and Final Environmental Impact Statement. However, in this adaptive management plan, these are simply described as *Chapters*.

Each CLAMP *Chapter* was constructed to be an independent part (component) of the entire plan. As an "adaptive" management plan, it is likely that additional data may be generated for one or more *Chapters* over the next two years. This approach will allow the editing and revision of only the affected *Chapter*, and still retain the readability of the remaining document. While the following CLAMP *Chapters* are listed in alphabetical order, no *Chapter* is more important than any other.

Table 1-3
CLAMP Phase One Management Objectives

Campus Planning

1. Strengthen the design and use links between the State Capitol Campus and Capitol Lake.
2. Report to the community on the status of CLAMP implementation.

Deschutes Parkway

1. Recognize the substantial State, private and community investment in infrastructure within the basin, and over time improve current deficiencies. *(Deschutes Parkway, Capitol Lake dam, Heritage Park, mitigation site, 4th and 5th Avenue bridges, BNSF railroad trestle, etc.).*

Fisheries

1. Provide unrestricted fish access into and out of the basin.
2. Maintain or increase the production of Chinook salmon raised within the basin
3. Make the basin function more effectively as fish habitat.

Flooding

1. Reduce flooding and erosion hazards within the basin.

Human Use

1. Maintain and, where feasible, expand public recreation opportunities.
2. Identify shorelines where a park-like setting would be preferred and other shorelines where increased vegetative cover would be appropriate.
3. Increase the value of the basin's urban and natural features as attractive parts of the surrounding Olympia and Tumwater neighborhoods.

Sedimentation

1. Manage sediment within the basin in the most cost effective and environmentally appropriate way.

Water Quality

1. Implement basin management strategies to improve Budd Inlet water quality.
2. Make progress towards removing the basin from the 303d list of impaired water bodies.

Wetland Vegetation

1. Maintain and enhance the function and values of wetlands within the basin.
2. Manage submerged aquatic vegetation without the use of herbicides.

Wildlife

1. Maintain and protect wildlife in their local habitats and utilize the Priority Habitats and Species management guidelines.
2. Reduce the number of resident Canada geese on Capitol Lake.

Table 1-4
CLAMP Phase One Work Program

Task 1	**Year Round Fish Passage**	**$250,000**
Task 2	**Capitol Lake Flood Plan**	**$12,500 (Total @ $75,000)**
Task 3	**Hydrologic Scour Analysis**	**$40,000**
Task 4	**Sediment Samples**	**$50,000**
Task 5	**Budd Inlet Water Quality Model Run**	**$15,000**
Task 6	**Activities and Use Programing**	**$15,000 (HP @$15,000)**
Task 7	**Deschutes Parkway Infrastructure Agreement**	**$50,000**
Task 8	**Lake Water Quality Monitoring**	**$20,000**
Task 9	**Goose Management Strategy**	**$30,000**
Task 10	**Update Controls for Capitol Lake Dam**	**$20,000**
Task 11	**Sediment Management Strategy**	**$100,000 (Option A)** **$250,000 (Option B)**
Task 12	**Phase I - Sediment Removal**	**$881,500 (Option A)** **$731,500 (Option B)**
Task 13	**CLAMP Implementation**	**$115,000**
	TOTAL	**$1,600,000**

NOTE: *The 1999 Legislature provided $1,000,000 less than was requested by the Governor. To accommodate this, approximately $600,000 was removed from Deschutes Parkway for infrastructure improvements and planning, and $400,000 was eliminated from Phase One sediment removal.*

Task 1 Year Round Fish Passage $250,000

This activity will provide unrestricted fish access into and out of the basin which has been a problem during the winter months. This task addresses Fisheries Management Objective #1 and also supports Fisheries Management Objectives #2 & #3.

a.	Advertise for consultant	May 1999
b.	GA hires consultant	Aug 1999
c.	Consultant meets with TAC	Sep 1999
d.	Consultant meets with SC	Sep 1999
e.	Consultant completes designs	Dec 1999
f.	Consultant obtains permits	Feb 2000
g.	Construction begins	Jun 2000
h.	GA supervises consultant	Jun 2000
i.	Construction ends	Aug 2000
j.	Consultant meets with SC	Sep 2000

Task 2 Capitol Lake Flood Plan (Total @ $75,000) $12,500

This activity will accurately identify the hazards of flooding, its impacts and possible mitigations within the basin. It addresses Flooding Management Objective #1, but will also need to be balanced with Deschutes Parkway Management Objective #1; Human Use Management Objective #2; and Fisheries Management Objective #3.

This task is an essential piece of data which will help the Steering Committee select a preferred aquatic environment for the basin.

a.	Olympia signs FCAAP contract with Ecology	Jul 1999
b.	Locals seek matching funds in 1999/2000 budgets	Sep 1999
c.	Advertise for a consultant	Nov 1999
d.	Consultant hired	Jan 2000
e.	Consultant meets with TAC & Hydrologic Contractor	Feb 2000
f.	Consultant prepares flood map, report & mitigation	May 2000
g.	Consultant meets with SC	June 2000
h.	Consultant prepares Final Report	July 2000

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FCAAP = Flood Control Assistance Account Program
GA = General Administration
SC = Steering Committee
TAC = Technical Advisory Committee

Task 3 Hydrologic Scour Analysis $40,000

This activity will increase our understanding of the hydraulic forces within the basin. It addresses Flooding Management Objective #1 and Deschutes Parkway Management Objective #1, but is also related to Human Use Management Objective #2, Fisheries Management Objective #3; Water Quality Management Objective #1; and Wetland Vegetation Management Objective #2.

This task is an essential piece of data which will help the Steering Committee select a preferred aquatic environment for the basin.

a.	Advertise for consultant	Jul 1999
b.	GA hires consultant	Aug 1999
c.	Consultant meets with TAC & Flood Contractor	Sep 1999
d.	Consultant meets with SC	Oct 1999
e.	Consultant completes designs	Nov 1999
f.	Consultant obtains permits	Jan 2000
g.	Lake drawdown to test modeling	Feb 2000
h.	Consultant prepares report	Mar 2000
i.	Consultant meets with SC	Apr 2000

Task 4 Sediment Samples $50,000

This activity is the first step to develop a sediment management plan for the basin. Previous testing indicated the presence of purple loosestrife and benzoic acid in the sediment. A 1998 sealant spill from Interstate 5 may also be detected. This addresses Sedimentation Management Objective #1 along with Water Quality Management Objectives #1 & #2; and Flooding Management Objective #1.

This task is an essential piece of data which will help the Steering Committee select a preferred aquatic environment for the basin.

a.	Advertise for consultant	Jul 1999
b.	GA hires consultant	Aug 1999
c.	Consultant meets with TAC	Sep 1999
d.	Consultant meets with SC	Oct 1999
e.	Consultant designs sampling protocol	Nov 1999
f.	Consultant obtains permits (if necessary)	Dec 1999
g.	Consultant obtains samples	Jan 2000
h.	Laboratory tests on samples	Feb 2000
i.	Consultant prepares report	Mar 2000
j.	Consultant meets with SC	Apr 2000

Task 5 Budd Inlet Water Quality Model Run $15,000

This activity will provide information about how lower Budd Inlet would function without a summer lake drawdown. It will also identify possible ways of improving lake water quality without the use of herbicides. This task addresses Water Quality Management Objectives #1 & #2; and Fisheries Management Objectives #2 and #3.

This task is an essential piece of data which will help the Steering Committee select a preferred aquatic environment for the basin.

a.	GA contracts with LOTT for Budd Inlet Model Run	Jul 1999
b.	Meet with TAC to review protocol assumptions	Aug 1999
c.	LOTT completes model run	Sep 1999
d.	LOTT prepares report on results	Oct 1999
e.	LOTT meets with SC	Nov 1999
f.	LOTT meets with TAC regarding Lake Drawdown Protocol	Jan 2000
g.	Lake Drawdown Protocol recommended to SC	Mar 2000

Task 6 Activities and Use Programing $15,000

This project will look at the desired activities and human uses of the State managed parks other state owned lands around the lake. As a first step, it will focus on Heritage Park, Marathon Park and lands within the North Basin. It addresses Campus Planning Management Objectives #1 & #2; and Human Use Management Objectives #1, #2 & #3.

a.	GA contracts with TRPC for Heritage Park support	Jul 1999
b.	Stakeholder group established for Heritage Park/North Basin	Aug 1999
c.	Stakeholder group meets to identify activities and locations	Sep 1999
d.	Public hearing scheduled for community input	Oct 1999
e.	Stakeholder group makes Use Programing recommendations	Nov 1999
f.	Use Programing recommendations reviewed by SC	Dec 1999

Task 7 Deschutes Parkway Infrastructure Agreement $50,000

This activity is the first step toward the long term improvement of Deschutes Parkway. It will also ensure that short term construction projects help improve current roadway deficiencies. This task addresses Deschutes Parkway Management Objective #1, but is also Human Use Management Objectives #2 & #3.

a.	GA meets with Olympia and Tumwater managers & staff	May 1999
b.	Parties determine desired level of improvements	Sep 1999
c.	GA prepares Memorandum of Understanding (MOU)	Oct 1999
d.	City Councils for both cities review and act on MOU	Jan 2000
e.	Parties share MOU with SC	Mar 2000
f.	Staff coordinate infrastructure designs by AT&T and LOTT	Mar 2000
g.	Review and approval of AT&T application	Apr 2000
h.	Review and approval of LOTT application	Apr 2000
i.	Supervise construction of projects	Jun 2000

Task 8 Lake Water Quality Monitoring $20,000

This activity will increase knowledge about the current water quality conditions and identify possible lake hot-spots. It will suggest ways to improve lake water quality without the use of herbicides and also how to reduce 303d pollutant sources which are affecting the lake. It addresses Water Quality Management Objectives #1 & #2; but also relates to Wetland Vegetation Management Objective #2, Fisheries Management Objectives #2 & #3; and Human Use Management Objective #1.

a.	Contract with TC Health Department (TCHD)	Jun 1999
b.	GA contract signed	Jun 1999
c.	Review sampling protocol with TAC	Jun 1999
d.	TCHD begins sampling	Jul 1999
e.	TCHD aids TAC on drawdown protocol	Jan 2000
f.	TCHD report on 1st season sampling to SC	Jun 2000
g.	TCHD identify potential corrections	Aug 2000
h.	TCHD report on 2nd season sampling to SC	Jun 2001

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LOTT = Lacey, Olympia, Tumwater, Thurston County Partnership
AT&T = American Telephone and Telegraph, Inc.

Task 9 Goose Management Strategy $30,000

This activity seeks to increase human use of the existing shoreline parks which are currently adversely impacted by resident Canada geese. It addresses Wildlife Management Objective #2 and Human Use Management Objective #1.

a.	GA continues to be involved with the regional effort	On-going
b.	GA identifies parts of regional strategy for the basin	Dec 1999
c.	GA reviews strategy with SC	Jan 2000
d.	GA implements signs, goose feeding areas and service contracts	Feb 2000

Task 10 Update Controls for Capitol Lake Dam $20,000

This activity will improve the "Metasys" computer controls in the Capitol Lake Dam to provide better response time and more protection during flood events. It addresses Deschutes Parkway Management Objective #1 and Flooding Management Objective #1.

a.	Advertise for consultant	Jul 1999
b.	GA hires consultant	Sep 1999
c.	Consultant meets with TAC	Nov 1999
d.	Consultant modifies controls	Dec 1999
e.	Test program for new control	Mar 2000
f.	Consultant meets with SC	Apr 2000

Task 11 Sediment Management Strate **$100,000 (Option A)**
$250,000 (Option B)

This activity is the second step (after Task 4) in developing a sediment management plan for the basin. It addresses Sedimentation Management Objective #1 but will need to be balanced with Fisheries Management Objectives #2 & #3; Water Quality Management Objectives #1, & #2; Flooding Management Objective #1; Deschutes Parkway Management Objective #1; Human Use Management Objective #2; Wildlife Management Objective #1 and Wetland Vegetation Management Objective #1.

a.	Advertise for consultant	Jul 1999
b.	GA hires consultant	Jul 1999
c.	Consultant meets with TAC	Jan 2000
d.	Consultant meets with SC	Jan 2000
e.	Consultant evaluates alternatives	Feb 2000
f.	Consultant prepares draft strategy	Mar 2000
g.	Consultant meets with TAC	Apr 2000
h.	Consultant meets with SC	Apr 2000
i.	SC agrees to draft strategy	Jun 2000
	--- Option A ---	
j.	Consultant prepares Environmental Assessment	Jul 2000
k.	GA circulates a Mitigated DNS	Aug 2000
l.	Public hearing on Sediment Removal Strategy	Sep 2000
m.	Consultant meets with SC	Oct 2000
	--- Option B ---	
j.	Scoping Notice on EIS	Jul 2000
k.	Consultant prepares Supplemental DEIS	Oct 2000
l.	Public hearing on EIS	Nov 2000
m.	SC reviews comments and responses	Dec 2000
n.	Consultant tractor prepares Supplemental FEIS	Jan 2000
o.	Consultant meets with SC	Feb 2000

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DEIS = Draft Environmental Impact Statement
DNS = Determination of Non-Significance
FEIS = Final Environmental Impact Statement

Task 12 Phase I - Sediment Removal — $881,500 (Option A) / $731,500 (Option B)

This activity is the third step (after Tasks 4 & 11) in the sediment management plan for the basin. It addresses Sedimentation Management Objective #1 but will need to be balanced with Fisheries Management Objectives #2 & #3; Water Quality Management Objectives #1 & #2; Flooding Management Objective #1; Deschutes Parkway Management Objective #1; Human Use Management Objective #2; Wildlife Management Objective #1; and Wetland Vegetation Management Objective #1.

a.	Advertise for contractor	--- *Timing Dependent upon Task 11* ---
b.	GA hires contractor	"
c.	Contractor meets with TAC & contractor of sediment strategy	"
d.	Contractor meets with SC	"
e.	Contractor prepares detailed plans	"
f.	Plans reviewed and obtains necessary permits	"
g.	Support site construction begins	"
h.	GA supervises contractor	"
i.	Dredging begins	"
j.	Dredging ends	"
k.	Contractor meets with TAC	"
l.	Contractor meets with SC	"

Task 13 CLAMP Implementation — $115,000

This activity provides continuing planning support and coordination for the various Phase One tasks. It will also produce a Phase One report card to the community on CLAMP implementation. It addresses CLAMP Phase One Goal #6 and Campus Planning Management Objective #2.

a.	GA contracts with TRPC for CLAMP support	Jul 1999
b.	TRPC staffs every month SC meetings and TAC meetings (as necessary)	On-going
c.	TRPC works with GA to coordinate other work tasks	On-going
d.	TRPC updates CLAMP chapters and maps	On-going
e.	TRPC supports local government efforts on lake activities	On-going
f.	TRPC aids in other duties as assigned	On-going
g.	TRPC assists preparing the 2001-2003 biennial budget	Aug 2000
h.	TRPC prepares the CLAMP Phase One report card	Oct 2000

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CHAPTER 2 CAMPUS PLANNING

Photo 2-1. Wilder and White--Washington Capitol Group. c. 1911.
Courtesy of the Washington State Capital Museum.

How Did We Get Here?

The history of the creation of Capitol Lake began in 1855 when the territorial legislature accepted an offer of 12 acres of land by Olympia's founder, Edmund Sylvester, for the site of the capitol. This land was located on a bluff bordered by tidelands. In 1911, the State Capitol Commission conducted a design competition for Washington's capitol building and selected the Wilder and White plan for a grouping of buildings on the bluff overlooking the city and Puget Sound.

Their report discussed access to the capitol group from the north, stating that the city should move toward providing *"...a fine boulevard...connecting the three distinctive ridges contained in the city limits, and giving access to the coast towns. On the axis of the capitol a fine approach from this boulevard to the foot of the steps would be made with a carriage approach on either side, and a boulevard to Tumwater along the water's edge there connecting without the proposed Pacific highway...A tide lock at the Boulevard [to the west] would form a lake and the whole effect would be visible from most parts of the city as well as from the sound."*

The idea of creating a lake received popular support at the time. The area below the Capitol was a tidal estuary. Development along on Water Street was ramshackle and considered unsavory by many at the time. Plans were made for a freshwater lake by constructing an earth dam, concrete spillway and Deschutes Parkway. Permit applications were made, and public hearings were conducted, with the only controversy from the City of Tumwater and barge towing companies who had access to the Old Olympia Brewery. Action to construct the improvements was suspended at the onset of World War II.

Photo 2-2. Capitol Campus and Budd Inlet looking north. c. 1927.
Courtesy of Brubaker Aerial Surveys.

Photo 2-3. Budd Inlet and Capitol Campus looking south. c. 1927.
Courtesy of Brubaker Aerial Surveys.

After the war the vision re-emerged with the State Capitol Commission approving the Deschutes Basin Project. The July 7, 1948 Daily Olympian indicates that "the area [Little Hollywood] has long been considered by Olympians as an eye-sore. *Now it will be replaced with a clear beautiful fresh water lake with mirrored reflections of the Capitol building dome and the spires of the tall stately trees for which the Evergreen State is noted."*

State Authorizes Capitol Lake

On March 18, 1947, the Governor of the State of Washington approved House Bill 236. This authorized the issuance of bonds for the completion of the "Deschutes Basin Project." It also detailed the purposes for the funding, defined the powers of the State Capitol Committee, and declared an emergency to get the project started expeditiously.

Creation of Capitol Lake

1. *The acquisition by purchase or condemnation of necessary lands or easements;*
2. *The construction of a dam or weir along the line of Fifth Avenue in the City of Olympia and a parkway and railroad over the same;*
3. *The construction of a parkway on the west bank of the Deschutes Basin from the Pacific Highway at the Deschutes River to a connection with the Olympic Highway;*
4. *The construction of a parkway from the vicinity of Ninth Avenue and Columbia Street in the City of Olympia around the south side of the north Deschutes Basin, using the existing railroad causeway, to a road along Percival Creek and connecting with the Olympic Highway;*
5. *The preservation of the precipitous banks surrounding the basin by the acquisition of easements or other rights whereby the cutting of trees and the building of structures on the banks can be controlled;*
6. *The construction by dredging of varying level areas at the foot of the bluffs for access to water and to provide for boating and other recreational areas; and*
7. *Such other undertakings as, in the judgment of the Committee, are necessary to the completion of the project. (RCW 79.24.160)*

Photo 2-4. Olympia Brewing Company & Budd Inlet looking south. c. 1920.
Courtesy of the Washington State Capital Museum

Photo 2-5. Wooden bridge linking Olympia and Tumwater, looking south. c. 1920.
Courtesy of the Washington State Capital Museum

On June 1, 1948, an application was made to the U.S. Army Corps of Engineers for approval to construct a 230,000 cubic yard earth dam at the north end of the basin (5th Avenue) with an 80 foot concrete spillway structure. Along with the dam, the request was made to construct an earth fill of 186,500 cubic yards along the westerly shore for Deschutes Parkway and an additional earth fill of 375,000 cubic yards at the northeast end of the basin, where Olympia's Capitol Lake Park is at present. This request was subsequently approved by the Corps on February 4, 1949, and construction was completed on October 10, 1951.

Capitol Lake Restoration Report and Action Plan (1988)

Developing a management plan for Capitol Lake is not a new idea. The Capitol Lake Restoration: Committee Report and Proposed Action Plan was completed in 1988. A summary of this existing plan is provided below to provide historical context to the new Capitol Lake Adaptive Management Planning Process.

The Capitol Lake Restoration Plan was prepared by an intergovernmental staff committee. The committee's goal was to address the water quality degradation in the lake that was adversely affecting recreational activities in the lake and led to the closing of the swimming beach at Capitol Lake Park. The Action Plan contained four goals and 21 action recommendations, aimed at improving the water quality of Capitol Lake. The process predated many other nonpoint pollution rules and planning processes, which occurred in adjacent watersheds and later within the Deschutes River/Capitol Lake watershed.

There was little incentive for the state departments or local jurisdictions, which helped prepare the 1988 Action Plan, to actually adopt it as a decision-making document. Therefore, any implementation of its recommendations has been an indirect result of other ongoing water quality activities or projects. For example, the Budd Inlet - Deschutes River Watershed Action Plan responded to the need for a watershed planning process (Rec. 21). Therefore, the creation of the CLAMP Steering Committee could be considered the interjurisdictional guidance body suggested in this recommendation.

Regarding water quality, monitoring has been done on a limited basis within the watershed (Rec. 5), stormwater outlets to Capitol Lake have been sampled in several intensive monitoring operations by the Thurston County Health Department (Rec. 12), and the NPDES permit for the Olympia Brewery was updated (Rec. 10). A stormwater basin plan for Percival Creek has been prepared (Rec. 19) along with an evaluation of Black Lake water quality (Rec. 18). Implementation of these basin plans have resulted in the construction of a new stormwater treatment facility at Mottman Road.

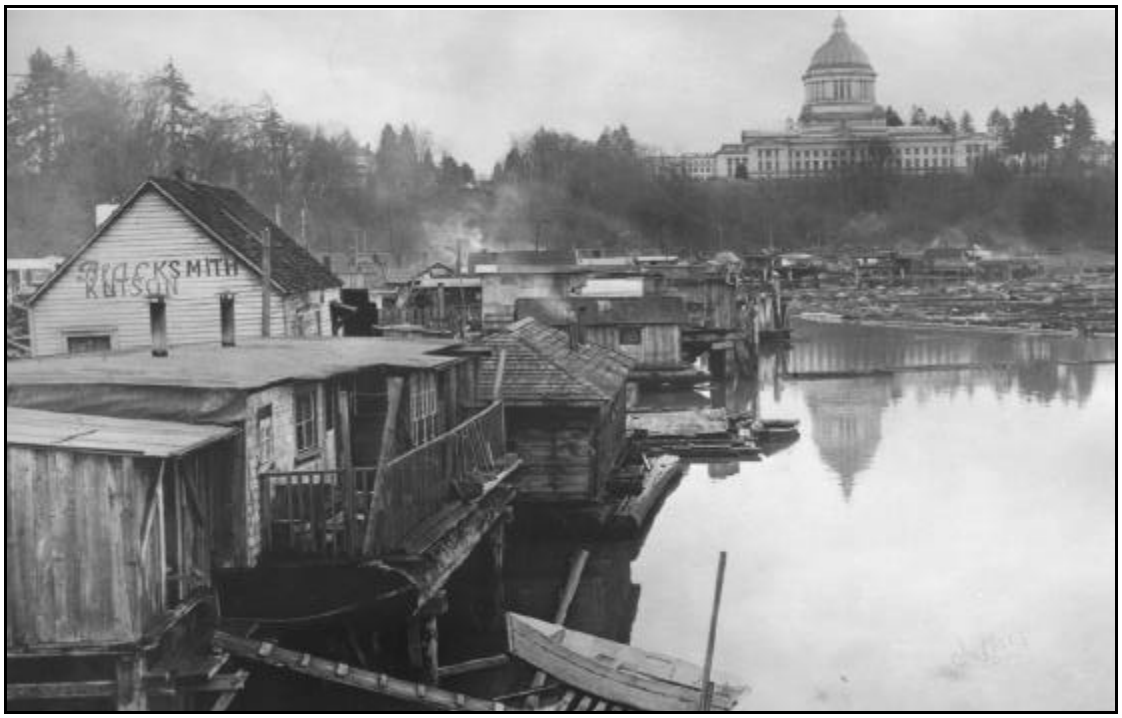


Photo 2-6. "Little Hollywood." c. 1938. Courtesy of the Susan Parish Collection.

Photo 2-7. Outline of "Little Hollywood" urban blight which was eliminated by the Deschutes Basin Project. c. 1948. Courtesy of the Washington State Capital Museum.

New stormwater facilities are now required to meet new treatment standards (Rec. 6 & 7) and the Thurston County Conservation District has targeted the Deschutes River as a priority area for new farm plans (Rec. 15 & 16). The Budd-Deschutes Plan and Long-Term Forestry zoning have identified the extent of forestry in the watershed (Rec. 14), and the Timber-Fish and Wildlife process has been adopted into the Forest Practices Act (Rec. 13). Wetlands throughout the watershed were mapped in 1995 (Rec. 20); an evaluation of creating a wetland in the middle basin was completed (Entranco 1990a) and is being re-evaluated under the current planning process (Rec. 22).

Even though a majority of the recommendations have been addressed, there are still unresolved issues. The first is the lack of "maintenance dredging on a planned and regular basis" (Rec. 3); this is one reason for the current planning process. The County and State have adopted a number of new water quality regulations, but providing adequate staffing levels and enforcement of those regulations is still difficult (Rec. 8). Ineffective enforcement may also lower voluntary compliance for actions such as implementing farm plans (Rec. 15 & 16). It is unknown if nutrient loading from the Percival Cove fisheries operation has been monitored or reduced (Rec. 11), and correcting erosion problems along the Deschutes River is and will continue to be a long-term water quality issue (Rec. 17).

Watershed Erosion Control Planning & Activities

Recognizing that the rate of sediment delivery to Capitol Lake is partially determined by land and water use management activities in the watershed, the Department of General Administration contracted work to identify and mitigate erosion in the watershed. Timber practices historically involved clear-cutting and construction of erosion-prone logging roads. These practices were believed to have a significant influence on erosion and changing hydrology in the watershed. Other sources of erosion/sedimentation were livestock trampling of river/stream banks and clearing and grading activities associated with urban development.

A recent investigation of erosion/sedimentation concerns in the Deschutes River was completed by Collins in 1994 on behalf of the Squaxin Island Tribe and the Thurston Conservation District. This report evaluated river bank erosion and feeder bluffs which served as the major and moderate sediment supply sources along the river. Aerial photographs were used to determine the rate of erosion and bed load conditions. The report has the following conclusion regarding reductions in sediment loading to Capitol Lake:

> "While it is worth reducing land-use sources of erosion as a means to reducing sedimentation to the lake (and for meeting other objectives such as improving aquatic habitat by improving riparian conditions), it may be more sound for the watershed's overall habitat to emphasize dredging rather than a widespread program of bank protection, and the tradeoffs between the two need to be evaluated." (Page 96)

Photo 2-8. Old Crosby Mill in Tumwater looking north with wooden bridge to Old Oregon Trail Road. c. 1909. Courtesy of the Washington State Capital Museum.

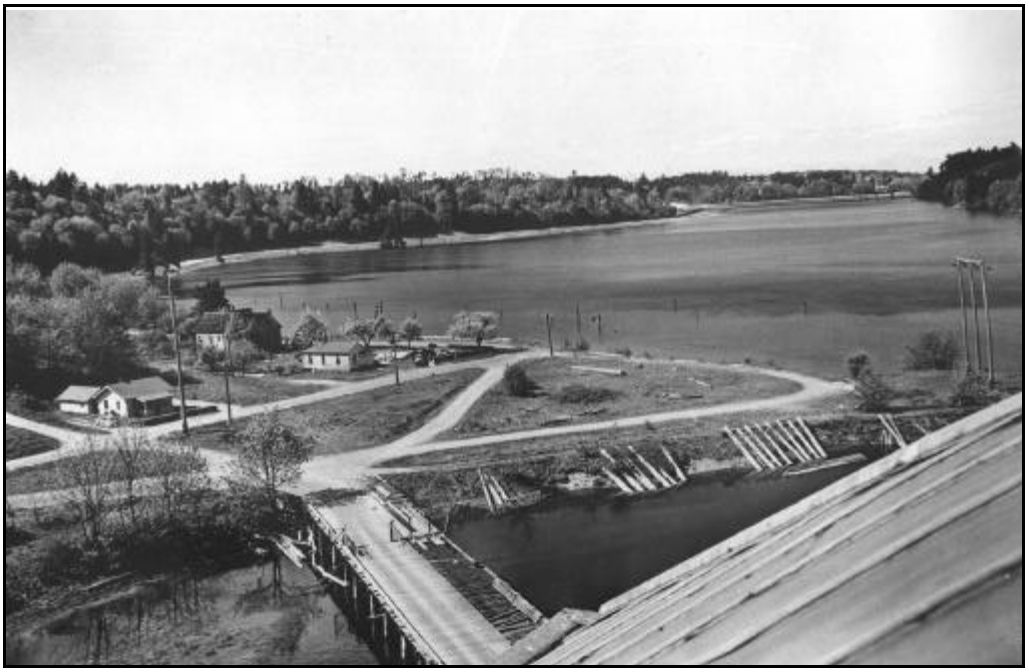


Photo 2-9. Deschutes Parkway along the western shore of Budd Inlet. From the Olympia Brewery looking northwest. c. 1951. Courtesy of the Susan Parish Collection.

This comment was supported by an assessment of the relative contributions of natural and man-induced erosion/sedimentation problems in the watershed. The Collins report also concluded that natural sources of erosion/sedimentation were considered greater than those due to man-related activities such as forestry and agriculture.

The Department of General Administration was also involved with the departments of Ecology, Fish and Wildlife, and other organizations such as the Thurston Conservation District, to install bioengineering improvements for river bank stabilization. These efforts involved vegetation plantings and related work on a total of seven upstream reaches of the Deschutes River. Three bioengineering projects were installed in 1993 and four were installed in 1994. These sites are being monitored by the Conservation District and valuable local experience was gained. Several farm management plans were also developed and implemented as a part of an overall sediment reduction effort.

More stringent development and forestry regulations along with the efforts of state, federal, local, and tribal interests are expected to reduce Capitol Lake's sedimentation rate in the years ahead. The amount of sediment load reduction expected from these efforts is uncertain. However, it is clear that some degree of erosion and sedimentation will continue, primarily due to natural causes, despite the benefits of improved control efforts in the watershed. The Collins report concludes that the maintenance sediment removal of Capitol Lake is expected to be a long-term, ongoing need, even with the best watershed management practices in place.

New Market Historic District Master Plan (1993)

Tumwater's New Market Historic District borders most of the South Basin of Capitol Lake. The master plan for this district was adopted by the City of Tumwater in 1993. It describes future land uses, shoreline improvements, and cultural and recreational facilities planned for the district. Key components of the master plan include expansion of the City's Historical Park to include a trail system around the south basin (including pedestrian bridges over the Deschutes River and Capitol Lake near the Interstate 5 bridge), and rehabilitation of the Old Olympia Brewery buildings for beneficial use to the public. Other existing and future cultural and archaeological resources of the district also are identified in the master plan.

Budd Inlet - Deschutes River Watershed Action Plan (1995)

A long-term Watershed Action Plan for the Budd Inlet & Deschutes River watershed was completed by Thurston County in 1995. The Budd Inlet-Deschutes River Watershed Action Plan addressed the problem of erosion/sedimentation in the Deschutes River and the associated filling of Capitol Lake. Response to these concerns were included in the Flooding, Sedimentation and Bank Erosion chapter where 18 action recommendations suggest ways to

improve the instream conditions. General Administration did not have a representative on the watershed action plan committee, so there are few recommendations which directly deal with the Capitol Lake basin.

Since the adoption of the Watershed Action Plan, moderate progress has been made to address this topic. By the year 2000, Thurston County will have concluded a "reach scale analysis" of the river habitat Flooding, Sedimentation and Bank Erosion Chapter - Action Recommendation #4 (a.k.a. SED 4). One recommendation would inventory areas of existing off channel rearing habitat and erosion concerns (SED 11) and this has been incorporated into data already collected by the Squaxin Island Tribe on the distribution of large woody debris along the mainstem of the river.

Funding for suggested restoration projects has been less available. Currently unfunded projects are the Conservation District riparian revegetation program (SED 3), bioengineering projects (SED 6), new farm plans (also include revegetation) (SED 8), and the City of Tumwater riparian vegetation restoration project along the Tumwater Valley Golf Course (SED 10). Four different projects have been constructed on the golf course with the help of volunteers. The regional Stream Team effort has been active along the river and helped to replant streamside vegetation in Tumwater's Pioneer Park. The Capitol Land Trust has set aside funds for protecting riparian vegetation on a few properties along the river (SED 7) and for a small property in the South Basin of Capitol Lake. The Weyerhaeuser Corporation and the Washington State Department of Natural Resources (DNR) have not yet begun a Watershed Analysis process in the upper watershed (SED 1). Also, the entire forest practices industry, including DNR, is re-evaluating streambank stability with respect to salmon habitat (SED 16).

As indicated by these action recommendations, the intent is to minimize erosion and sedimentation in the Deschutes River watershed to the extent feasible using available local, state, tribal, and federal resources. Depending on the degree of success, and the funding availability for implementation, these actions are expected to result in some reduction in sediment loading to Capitol Lake over time.

The Watershed Action Plan also includes recommendations on agricultural practices, wastewater management and stormwater quality which, if implemented, would result in improved water quality in the Deschutes River and Capitol Lake over time. 20:lb

CHAPTER 3 DESCHUTES PARKWAY

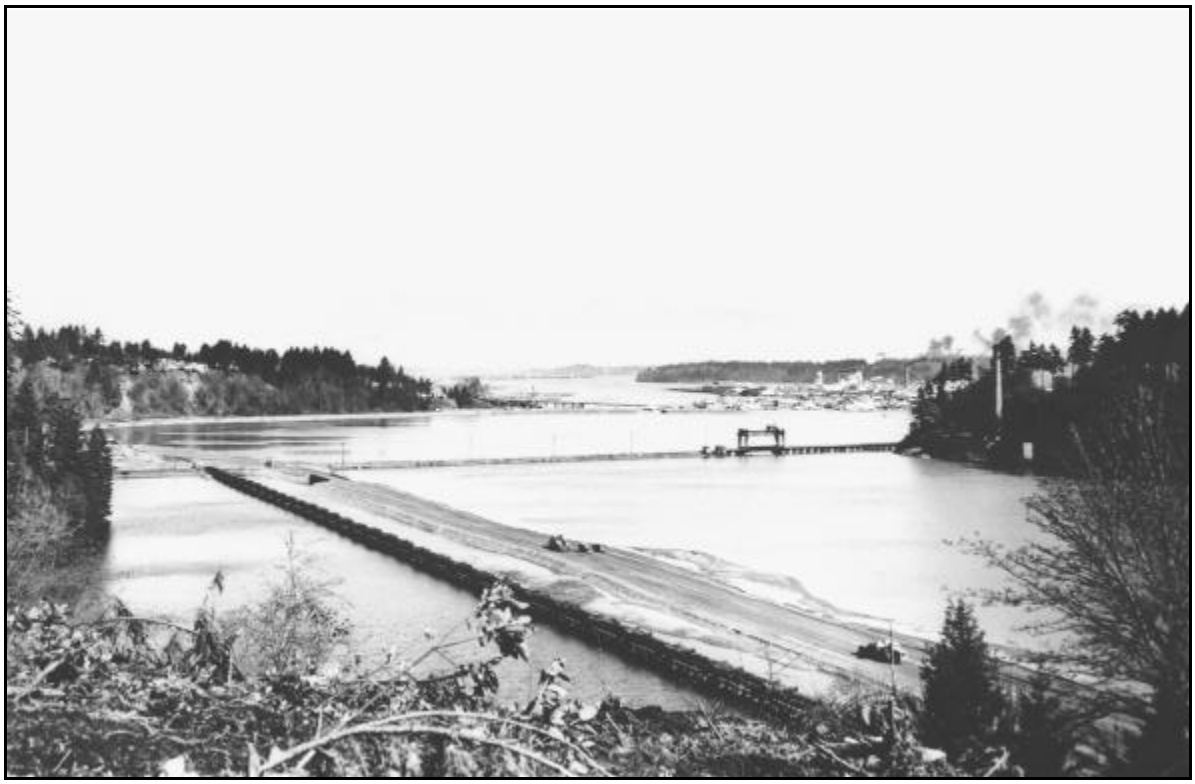


Photo 3-1. Construction of "The Causeway" which created Percival Cove, looking from the Courthouse Hill. c. 1950. Courtesy of the Susan Parish Collection.

The Dream

Present day Deschutes Parkway was created as a part of the "Deschutes Basin Project." This was no small project and took several years to construct (1949-1951). A decade before I-5 or other arterial improvements, access between Tumwater and Olympia was limited. Therefore, the creation of a second motor link between the cities was seen as a substantial community benefit. The creation of the roadway, a bridge across Percival Creek and a dam across the Deschutes River resulted in a fresh water lake we now call Capitol Lake. Reclaiming part of the "stinking tideflats" of Budd Inlet was also a popular community goal as neither city, at that time, had a sewage treatment facility.

As constructed, Deschutes Parkway extended from the Crosby House in Tumwater to the intersection of Water and 5th Avenue in Olympia. It paralleled the 4th Avenue bridge across Budd Inlet and extended a distance of 13,000 feet or 2.45 miles. Today, the portion of the roadway from Water Street to the 5th Avenue "Y" is maintained by the City of Olympia. In Tumwater, the route terminates about 400 feet south of the I-5 overpass. The remaining 2.15 mile portion of Deschutes Parkway from I-5 to 5th Avenue continues to be owned and maintained by the State of Washington.

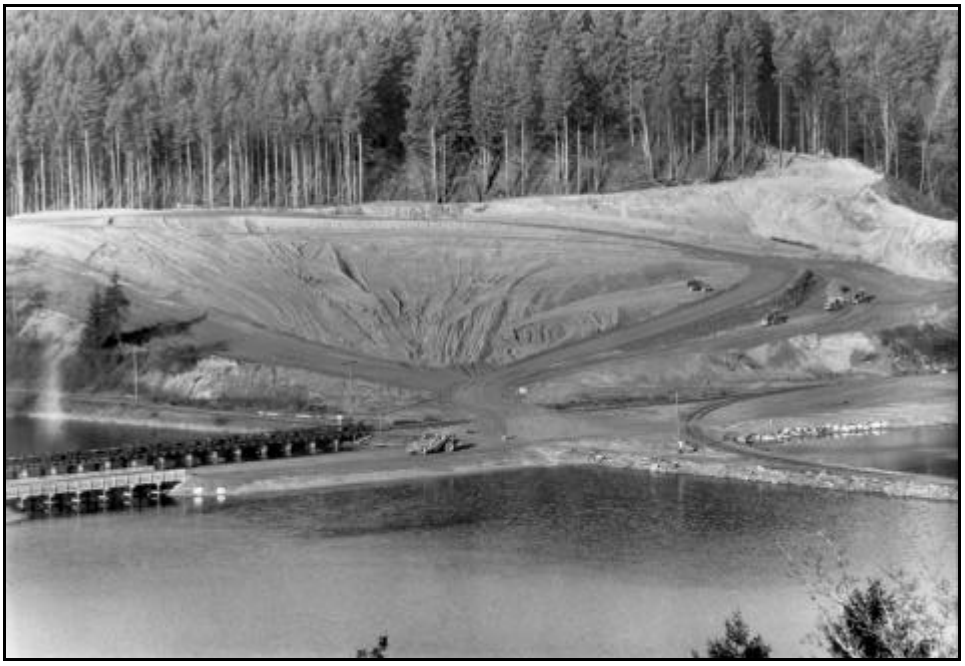


Photo 3-2. Burrow pit for Deschutes Parkway now located west of Marathon Park.
c. 1951. Courtesy of the Susan Parish Collection.

Photo 3-3. Construction of Deschutes Parkway and the North Basin.
c. 1951. Courtesy of the Susan Parish Collection.

Deschutes Basin Project

Before Deschutes Parkway there were few crossings of Budd Inlet. Olympia had the 4th Avenue bridge which was part of US 101 route to Shelton. There was also the train trestle which ran from the Percival Creek canyon and followed along the shoreline north of the State Capitol Campus. This crossing is the location of the present railroad trestle which separates the north and middle basins of Capitol Lake.

A narrow gauge railroad line also ran along the west side of Budd Inlet. Its location was midway up the hillside, south of current Lakeshore Drive and extended to the north on a timber pile trestle to lumber mills on the west side of the inlet. This line was reportedly abandoned about 1940. For the most part, the railroad alignment established the present day alignment of Deschutes Parkway from the north end of Percival Cove south. The northerly portion of the roadway generally follows the original western shoreline of Budd Inlet. The railroad right-of-way was acquired by the State of Washington. Along what is the now north basin, the roadway was constructed on a portion of the former railroad bed.

Construction records for the Deschutes Basin Project are limited but the following photographs outline what is known. From Percival Landing (Water and 5th Avenue) to the vicinity of Marathon Park, Deschutes Parkway was constructed as a ballast haul road using a point of land to the west of the present park location as the source of the fill material. The Percival Cove crossing (now called "The Causeway") was constructed along the side of the railroad trestle by dumping fill along the east side of the trestle. After the roadway was complete, the trestle was abandoned and dismantled. (Refer to Figure MP-7 in the Map Packet.)

Private land for the roadway was acquired by and remains in the ownership of General Administration. However, construction constraints resulted in portions of the actual roadway being constructed outside of General Administration ownership, in Class A Tide Lands. Hence, the ownership of the land beneath these portions of the roadway is held by the Washington State Department of Natural Resources (WDNR). (Refer to Figure MP-8 in the Map Packet.)

1965 Earthquake

On April 13, 1949, the Olympia area experienced one of the largest earthquakes of record in the Puget Sound. The estimated magnitude of this earthquake was 7.0 with an epicenter located near the Nisqually Delta. Historical reports of this earthquake recount mainly building damage with a total of $15,000,000 (1949 dollars) in cumulative property damage in the area, but since Deschutes Parkway was not yet constructed, this facility was not affected. However, a second relatively large earthquake impacted the Olympia area on April 29, 1965. The magnitude of this earthquake was recorded by instrumentation to be 6.5. This event caused significant damage along Deschutes Parkway.

Photo 3-4. Earthquake damage to Deschutes Parkway. c. 1965.
Courtesy of Washington Department of Natural Resources.

Earthquake damage repair drawings were prepared and recorded failure areas showed six slide areas and one settlement area. Slide areas # 1 through 5 (Interpretative Center Area) were located along the southerly lake shore, moderate in size and characterized by steep/high bank upland slope areas and lake bottom mud waves. The slide area located north of Marathon Park was large, extending about 1,400 feet and extended to the Causeway area and fronting Percival Cove. This was the most severe damage to roadway pavement. Considering the type of soil in the failure areas, the probable method of construction and relatively low vertical height of the roadway section, the recorded failures were most likely the result of subgrade liquefaction.

Geotechnical Investigations

Available geotechnical data confirms the filling process. The fill material used for the roadway generally consisted of uncompacted gravelly fine to course sand, which readily segregates as it settles to the bottom of the inlet. Geotechnical borings indicate fill thicknesses of up to 25 feet in depth with most fill in the 16 feet range. Beneath the fill is naturally loose clayey silt and loose lake (inlet) bottom sediments, which range from a few feet to over 20 feet in thickness. Data gathered on the Causeway in 1996 indicates artesian groundwater with static levels above the ground surface. This suggests that there could be buried springs under this portion of the roadway and that vertical seepage pressure will act to reduce the stability of this embankment. Further, slight slumping to the west of the Causeway may indicate a rising bottom toward the west in Percival Cove. This may indicate a mud wave formation and a deep rotational subgrade failure.

Other areas of the roadway show surface cracking and settlement. The western shore of the north basin has shown signs of shorefront slope erosion and instability. The rip rap shore protection installed along this shoreline was placed to reduce slope and upland soil loss resulting from lake wave action and/or the erosional forces of the summer lake draw down. These conditions indicate that the bearing capacity of the native soils beneath the rip rap shore protection is poor due to the relatively fine grained nature of these soils and seepage through and beneath the roadway fill.

A 1997 report on Deschutes Parkway by Jerome W. Morrissette and Associates, indicates that comprehensive improvements to the facility may cost upwards of $9.9 million. Although the roadway is classified by the 1998 Regional Transportation Plan Update, Deschutes Parkway is not listed as a state or local facility which is to be constructed, expanded or rebuilt within the next 20 years. The projected cost of Road Related Expenditures from the Regional Transportation Plan is projected to be $1,084 million, not including Deschutes Parkway. The roadway is on the Federal Arterial Board map, so some Federal aid may be available. Also, all previous Capitol Lake expenditures were funded with direct appropriations from the legislature as a part of the State Capital Budget.

Driving Surface

Deschutes Parkway is designated as a "Major Arterial" by the City of Olympia and the 1998 Regional Transportation Plan Update. The current requirements of such a facility are a 48 foot roadway cross section. This curb to curb dimension includes two 11 foot driving lanes, with a 5 foot Class II bicycle lane on both sides adjacent to the driving lanes, and then an 8 foot parking lane next to the curb. There are additional landscaping and sidewalk requirements for a Major Arterial which are discussed in the following section.

The current dimension of Deschutes Parkway is 40 feet curb to curb. A curb is present along both sides of the street with the exception of the western side of the Causeway adjacent to Percival Cove. Also, that portion of the Parkway adjacent to the Interpretive Site has parking cut outs and additional street trees, which narrows the pavement width. Prior to February 1998, parking along Deschutes Parkway generally occurred along the eastern (north bound) side of the street which is closest to the sidewalk and the bus shelters. Parking also occurs on the western side of the Causeway. An estimate of the number of parking spaces along Deschutes Parkway is approximately 345 spaces. During the legislative session, freeway signs direct visitors to park along Deschutes Parkway and then ride the free legislative shuttle to the Capitol Campus. The shuttle service is every 15 minutes from 7:30 a.m. to 5:30 p.m. and Intercity Transit provides the shuttles on contract with General Administration.

Photo 3-5. Construction of Deschutes Parkway in the Middle Basin.
c. 1951. Courtesy of the Susan Parish Collection.

Photo 3-6. Deschutes Parkway along the Middle Basin.
c. 1951. Courtesy of the Susan Parish Collection.

In March 1998, parts of Deschutes Parkway were restriped and designated as assigned State parking. This occurred north of Marathon Park and specifically in the most northerly 1/3 mile closest to the 5th Avenue "Y." In this area the State Department of Corrections is assigned 86 parking spaces, with 45 spaces on the east and 41 spaces on the west (or railroad) side of the street. This linear parking facility is mitigation for the existing leased parking spaces at the 5th Avenue and Simmons Street lot, which was eliminated due to the expansion of Heritage Park. With this parking configuration, all of the width of Deschutes Parkway is used in two 12 foot driving lanes with 8 foot parking lanes on both sides.

Such a parking arrangement is not unique within the capital city. Washington Street, between Sylvester Park and the Old State Capitol, is an example of another State owned property which just happens to be a street with reserved parking spaces. Designation of leased or reserved parking on a City owned right-of-way would not be possible. With on-street parking needed for Heritage Park, it will not be possible to accommodate the Class II bike lanes with this new parking configuration. However, two bike lanes could be accommodated if parking was restricted to only one side of Deschutes Parkway.

Landscaping and Sidewalks

There are requirements for landscaping and sidewalks on both sides of a "Major Arterial." An 8 foot landscaping strip is required between the curb and a 6 foot sidewalk. Deschutes Parkway provides basically the same amenities, just in a different order and only on the eastern (lake) side of the street. Adjacent to the curb is a 6 foot soft surface, jogging or walking trail. Next comes a 4 foot sidewalk. Adjacent to the sidewalk is a 10-12 foot landscape strip of grass, Karabonsii cherry trees, and some low hedges adjacent to the North Basin. The shuttle bus shelters and the occasional park bench are also located in this landscaping area. No sidewalk exists on the west side of the Parkway given the street's orientation to the lake. Now that assigned parking exists on both sides of the Parkway, a new sidewalk on the west side is a consideration.

The dominant appearance of Deschutes Parkway adjacent to Capitol Lake is a formal park- like setting of green lawns and ornamental trees. This "Theme" is an extension of the State Capitol Campus. This type of landscaping does require a high level of maintenance, use of fertilizers and herbicides and supplemental water during the summer. A sprinkler system was installed along the Parkway after the 1965 earthquake.

In addition to planted materials, other trees have taken root on the slopes leading from the Parkway to the lake. Alders and cedars dominate these volunteers, which are infrequently spaced. While the hedges in the north basin are regularly maintained, it is unlikely that the slope areas or the volunteer trees have been completely cleaned out since the Women's Olympic Marathon Trials in 1984.

Photo 3-7. Construction of the Capitol Lake Dam.
c. 1951. Courtesy of the Susan Parish Collection.

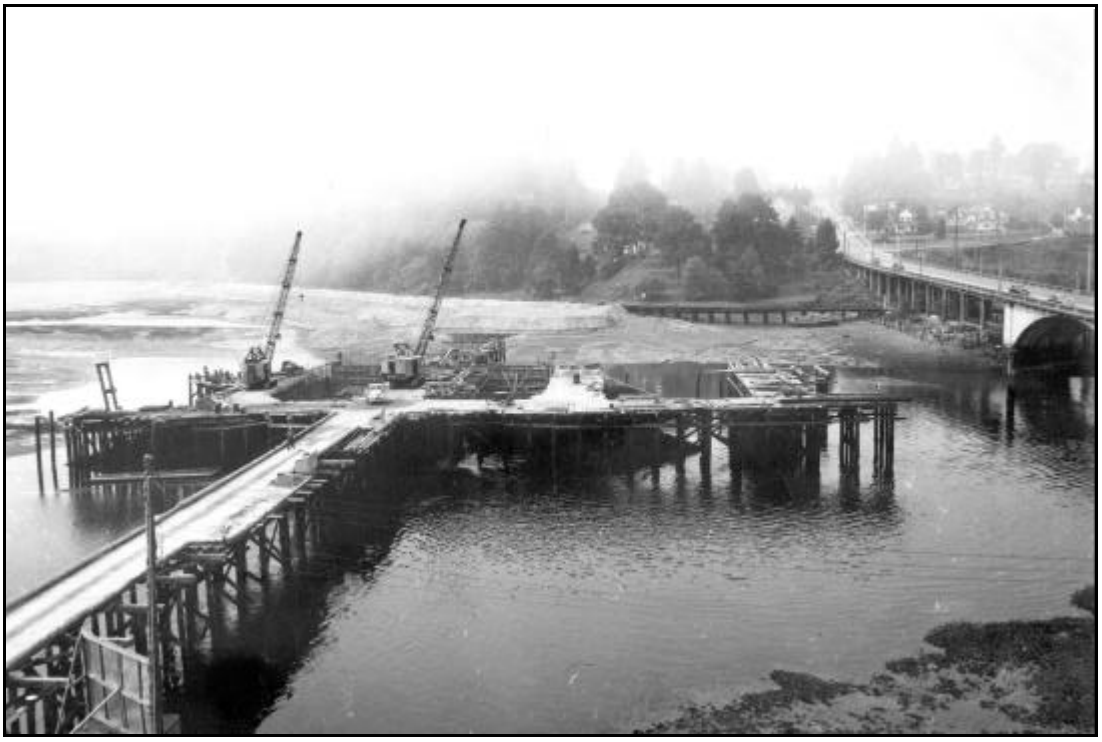


Photo 3-8. Construction platform for the Capitol Lake Dam. c. 1951.
Courtesy of the Susan Parish Collection.

In general terms, the North Basin has the most ornamental landscaping, least slope vegetation and as a result the most extensive views from the Parkway. The Middle Basin is more open from Lakeshore Drive to Marathon Park, with the southern portion of the basin having the most shoreline trees along the Parkway. The vegetation along the Percival Cove provides an interesting contrast between planted and native species. European birch trees were planted in the grassy areas on the western side of the Causeway and now require trunk protection due to occasional beaver activity. The volunteer alders and blackberries just south of the Department of Fish and Wildlife net pens, require no maintenance but are a visual screen. However, such natural habitat is less desirable for geese and so the use of native vegetation can be an effective element of a goose management program.

Designers of parks and green spaces have recognized the need to create "defensible spaces." If people do not feel safe in a public space it will not be used. Therefore, to provide "natural surveillance" of a park or linear greenway, landscaping is often minimized, thinned, limbed up or removed altogether. The current "look" of Deschutes Parkway and its parks is a good example of these design principles. Given the large number of single women and mothers with children who use the sidewalk and trails along Deschutes Parkway, there seems to be an adequate degree of visual security, with the only possible improvement being better lighting. However, such visual access comes at a price.

A number of landscaped areas and edges along the Interpretative Center/Mitigation Site have been significantly trimmed between the ground and 10 feet. This delimbing allows for visual access, but at the same time, also eliminates fish or wildlife habitat. Therefore, as mentioned above, there will continue to be tradeoffs between views and habitat along the Deschutes Parkway corridor.

Deschutes Parkway as a Utility Corridor

Currently, the only utility corridor along Deschutes Parkway is the pressurized sewer line from the Westside Lift Station to the Lacey-Olympia-Tumwater-Thurston County partnership (LOTT) Treatment Plant in downtown Olympia. There are future plans for a fiber optic cable to parallel the roadway. The Westside Lift Station is located west of Marathon Park and serves the sanitary sewer needs of a large portion of West Olympia. This facility is currently rated at 6 Million Gallons Per Day (MGD) and needs to be upgraded to 12 MGD. In a related sewerage improvement, the Washington State Department of Ecology has notified LOTT that the emergency repairs to the Southside (Tumwater) Interceptor, currently on the hillside of the South Basin, will not be an adequate long-term solution. Therefore, LOTT is seeking an alternative route to the treatment plant.

The most appropriate route appears to extend along Deschutes Parkway from Tumwater to the Westside Lift Station. (Refer to Figure MP-5 in the Map Packet.) Such a proposal would require an additional upgrading of the Westside Lift Station from 12 to 24 MGD and adding a new, parallel pressure line from the lift station to the general area of the Olympia Center where it flows by gravity to the treatment facility. Plans for these facility improvements have

not been finalized, but preliminary discussions indicate that this construction would require the temporary closure of the western 20 feet of Deschutes Parkway. Also, any utilities constructed within Deschutes Parkway would need to be constructed to withstand future seismic events. Therefore, these lines would have to be supported from both vertical and lateral failures by some sort of piling or foundation.

Photo 3-9. Aerial view of the 4th and 5th Avenue Corridor and Capitol Lake Dam. c. 1992.
Courtesy of the Washington Department of Ecology.

CHAPTER 4 FISHERIES

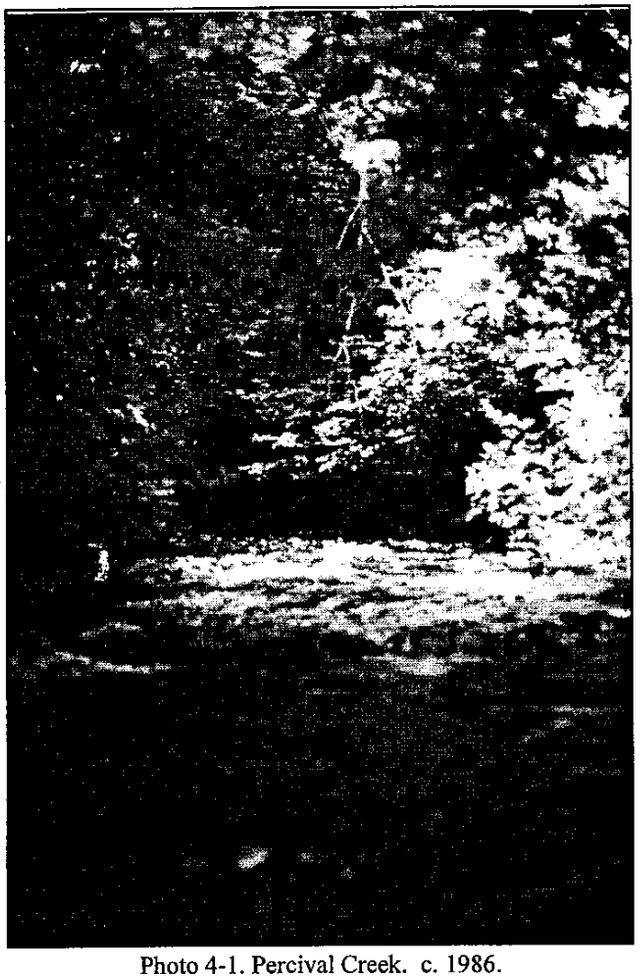
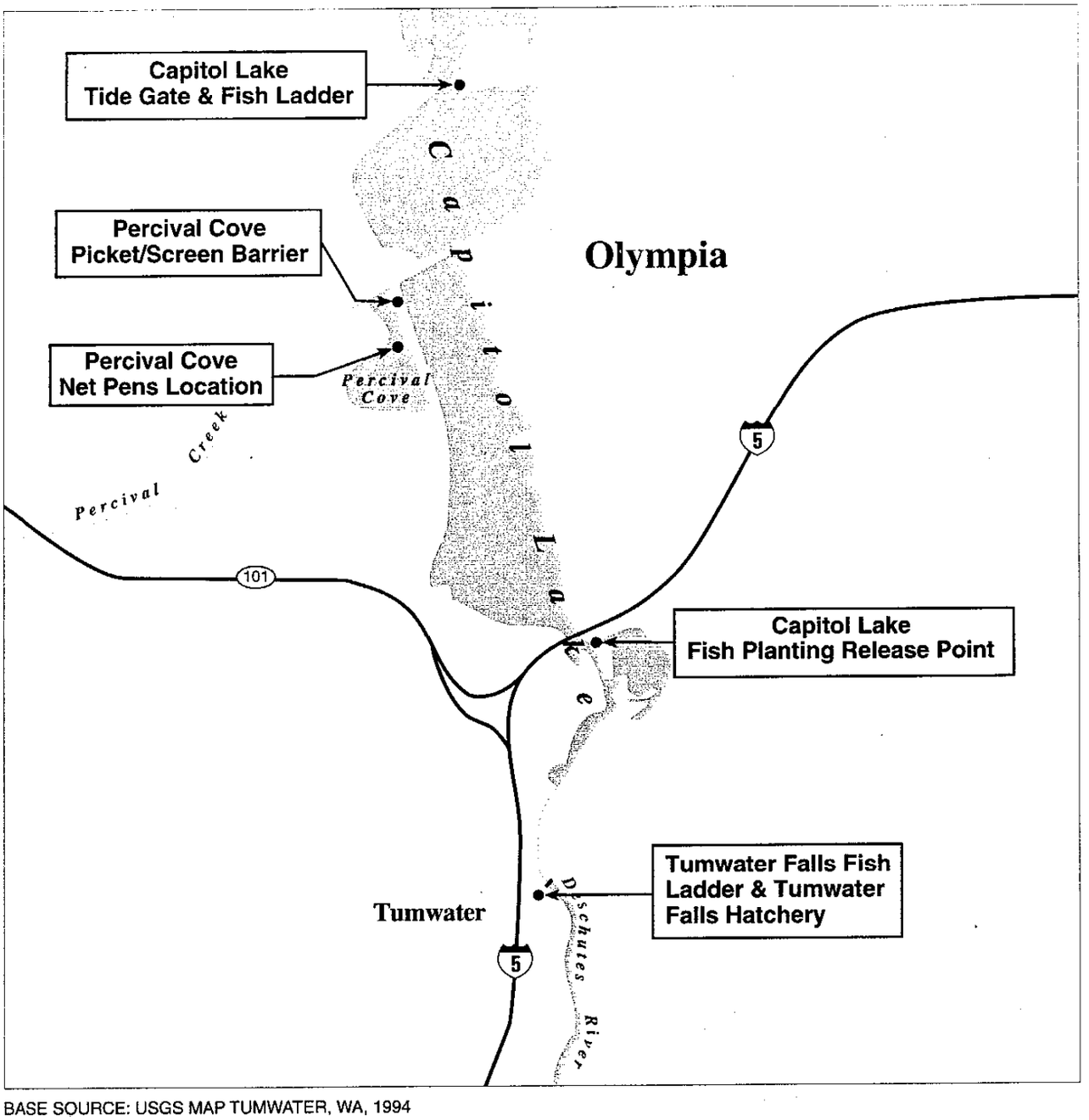


Photo 4-1. Percival Creek. c. 1986.
Courtesy of Thurston Regional Planning Council.

Capitol Lake Fisheries

Numerous fish species inhabit Capitol Lake and the Deschutes River. Table 4-1 provides a list of fish species observed since 1975. Fish use of these waters includes habitat for rearing and reproduction, a migration corridor both upstream and downstream to Budd Inlet, and the collection and rearing facilities in Capitol Lake itself and at the Washington State Department of Fish and Wildlife (WDFW) facility adjacent to Tumwater Falls. Other fisheries related facilities include a fish ladder at the tide gate that allows upstream and downstream migration by anadromous salmonids into and out of Capitol Lake. Another fish ladder is located at Tumwater Falls which allows upstream migration of adult salmonids into the Deschutes River watershed. A fish trap is used at the Tumwater Falls Collection Facility to gather adult chinook and steelhead trout to provide an egg supply for the production program. A recreational fishery also is associated with many of the fish populations both in Capitol Lake and the upper Deschutes River. The following discussion provides an overview of the status of fish populations and their habitat for the species of greatest interest in Capitol Lake.

The Pacific salmon inhabiting Capitol Lake and the Deschutes River include chinook salmon *(Oncorhynchus tshawytscha)*, coho salmon *(O. kisutch)*, chum salmon *(O. keta)*, and, in very small numbers, sockeye salmon *(O. nerka)* and pink salmon *(O. gorbuscha)*. Resident and anadromous trout include coastal cutthroat trout *(O. clarki clarki)* and resident rainbow and anadromous steelhead trout *(O. mykiss)*. In the past, coho, cutthroat and steelhead from other hatchery facilities were planted into the upper Deschutes Watershed but this practice has been discontinued. In 1997 only chinook salmon and winter-run steelhead were cultured at the Tumwater Falls facilities and/or planted in the lake.



BASE SOURCE: USGS MAP TUMWATER, WA, 1994

B146 97034-60 Capitol Lake EIS (9/21/98) CDF

Figure 4-1

Fish Culture and Passage Facilities

Table 4-1
Fish Observed in Capitol Lake and the Deschutes River

Fish Type	Common Name	Scientific Name	Prevalence	Literature Sources
Salmon	Pink salmon	Oncorhynchus	Uncommon	WDFW Hatcheries program 1997
	Chum salmon	Oncorhynchus keta	Uncommon	WSU 1975, Williams et al., 1975, CH2M Hill 1977, Entranco 1983 and 1990a
	Coho salmon	Oncorhynchus kisutch	Common	WSU 1975, Williams et al., CH2M Hill 1977, Entranco 1983 and 1990a
	Sockeye salmon	Oncorhynchus nerka	Uncommon	Entranco 1990a, Uehara 1995 personal communication
	Chinook salmon	Oncorhynchus tshawytscha	Abundant	WSU 1975, Williams et al., CH2M Hill 1977, Entranco 1983 and 1990a
Trout	Sea-run cutthroat trout	Oncorhynchus clarki clarki	Common	WSU 1975, CH2M 1977, Entranco 1983 and 1990a
	Coastal cutthroat trout	Oncorhynchus clarki	Common	Entranco 1997
	Resident rainbow trout	Oncorhynchus mykiss	Common	WSU 1975, CH2M 1977, Entranco 1983 and 1990a
	Steelhead trout	Oncorhynchus mykiss	Common	WSU 1975, CH2M 1977, Entranco 1983 and 1990a
Spiny rays	Large-scale sucker	Catostomus macrocheilus	Common	WSU 1975, CH2M 1977
	Prickly sculpin	Cottus asper	Common	WSU 1975, CH2M 1977
	Reticulate sculpin	Cottus aleuticus	Common	Entranco 1997
	Coastrange sculpin	Cottus aleuticus	Common	Entranco 1997
	Riffle sculpin	Cottus gulosus	Common	Entranco 1997
	Carp	Cyprinus carpio	Common	WSU 1975, CH2M 1977, Entranco 1990a
	Three-spine stickleback	Gasterosteus aculeatus	Common	WSU 1975, CH2M 1977, Entranco 1990a
	Bullhead catfish	Ictalurus nebulosus	Uncommon	WSU 1975, CH2M Hill 1977
	Western brook lamprey	Lampetra richardsoni	Common	Entranco 1997
	Pumpkinseed sunfish	Lepomis gibbosus	UnCommon	DGA 1977
	Smallmouth bass	Micropterus salmoindes	Common	Entranco 1997
	Largemouth bass	Mylocheilus caurinus	Common	WSU 1975, DGA 1977, Entranco 1990a
	Peamouth	Novumbra hubbsi	Uncommon	Entranco 1997
	Olympic mudminnow	Perca flavescens	Common	Entranco 1997
	Yellow perch	Platichthys stellatus	Uncommon	WSU 1975, DGA 1977
	Starry flounder	Pomoxis nigromaculatus	Common	DGA 1977
	Black crappie	Richardsonius balteatus	Common	WSU 1975
	Red-sided shiner	Rhinichthys osculus	Common	WSU 1975, DGA 1977
	Speckled dace	Rhinichthys osculus	Common	Entranco 1997

Chinook Salmon

Because Tumwater Falls presented a barrier to anadromous migration near the upstream end of present-day Capitol Lake, no historic chinook runs existed on the Deschutes River. Percival Creek below the SR-101 bridge may have supported an historic chinook run. With the initiation of chinook juvenile plantings in the 1950s and construction of the fish ladder in 1954, upstream migration around Tumwater Falls became possible for returning adults.

Since there was no native chinook stock, transfers were made from at least 16 different hatcheries which span in geography from the Skagit River in north Puget Sound, to Hood Canal and the Columbia River. Most of the initial stock came from the Soos Creek hatchery in the Green River watershed. In 1962, a fish trap was constructed to capture returning adults for the production program, but some chinook adults were allowed to pass upstream into the watershed. There has been no concerted effort to establish a naturally spawning population above the falls.

Over the years the chinook hatchery stock has been supported through a combination of: incubation of eggs in Percival Creek, and spring and fall release of fish less than one year old and yearlings (fish over one year old) into Capitol Lake. The Deschutes/Percival Cove chinook culture program is one of the most successful in the Puget Sound and is an important contributor of chinook to the state non-Native American and Native American commercial and sports fisheries.

Estuaries provide an important nursery habitat and many, if not most, juvenile fry in natural populations will rear in downstream estuaries and in a wide range of salinities. Stream-type chinook juveniles (which rear in freshwater for up to a year) use low velocity waters along stream margins and behind instream structures, but will tend to move to higher velocity waters before either coho or steelhead juveniles. This behavior appears to provide habitat segregation between these potentially competing species in waters they cohabit. Freshwater rearing chinook are not known to prefer lake rearing during their freshwater residence, although net pen rearing and feeding has proven to be highly successful in producing returning adults for fisheries.

Coho Salmon

Coho salmon did not exist in the upper Deschutes River above Tumwater Falls, however it is possible that a historic coho run may have existed in Percival Creek. Unlike chinook salmon, coho are passed through the Deschutes River fish trap and allowed to reproduce naturally within the watershed. A naturally spawning population also inhabits the headwaters of Percival Creek. It is reported that a small plant of coho occurred within the Deschutes watershed in 1986 and 1990, but was discontinued as it is part of the south Puget Sound natural coho spawning study.

Coho juveniles have a year of freshwater residence where they typically inhabit their natal streams. However, coho do rear in lakes for this first year of residence, and their growth and survival can be equally good or better than stream rearing.

Chum Salmon

Chum salmon also historically spawned in Percival Creek and continue to do so. Chum salmon do not readily ascend the fish ladder above Tumwater Falls so the development of a self sustaining population in the upper watershed has been limited.

Sockeye and Pink Salmon

While sockeye and pink salmon have been observed at the Tumwater Falls hatchery trap, these fish are thought to be members of extremely small populations, and do not constitute a population that is of management interest in the basin.

Searun Cutthroat Trout and Steelhead Trout

These anadromous trout also use the Capitol Lake tide gate fish ladder to enter Capitol Lake. They also use the Tumwater Falls fish ladder to extend their access into the upper Deschutes watershed. Winter-run steelhead are supplemented from the Tumwater Falls hatchery by trapping adults at the hatchery, hatching the eggs at other WDFW hatcheries, and raising the subyearling juveniles at the hatchery holding ponds from January through April so that they acclimate to and imprint on the Deschutes River waters. These yearling fish are then released to Capitol Lake.

Both cutthroat and steelhead trout will reside for at least two years in freshwater before migrating to coastal and offshore waters. These fish are multiparous (can spawn more than once in a lifetime) and so adult fish can be two to five years of age. Spawning and rearing of these fish mostly occur upstream of Tumwater Falls in the Deschutes watershed.

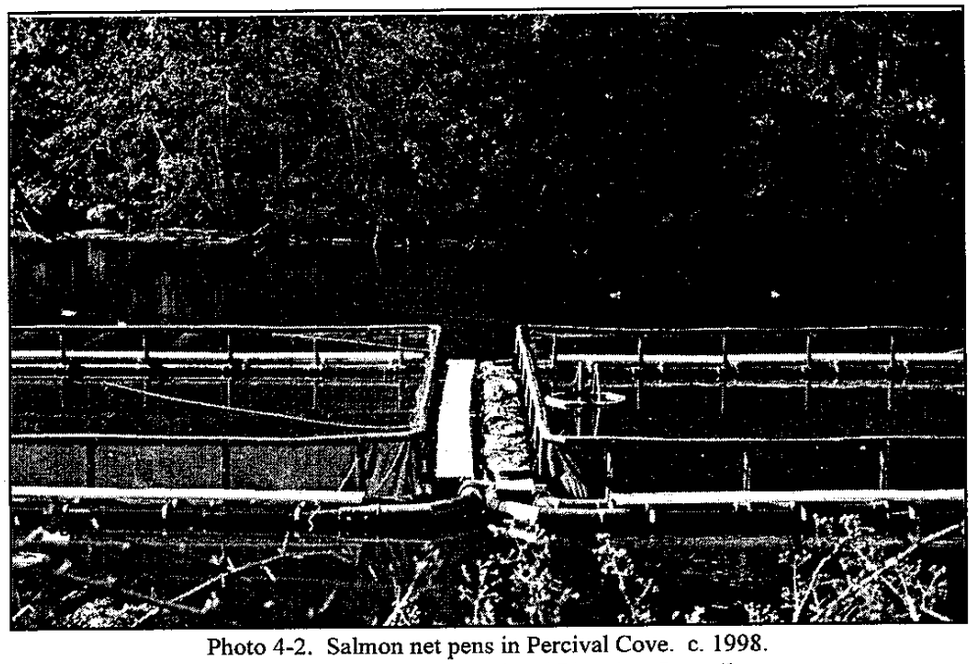


Photo 4-2. Salmon net pens in Percival Cove. c. 1998.
Courtesy of Thurston Regional Planning Council.

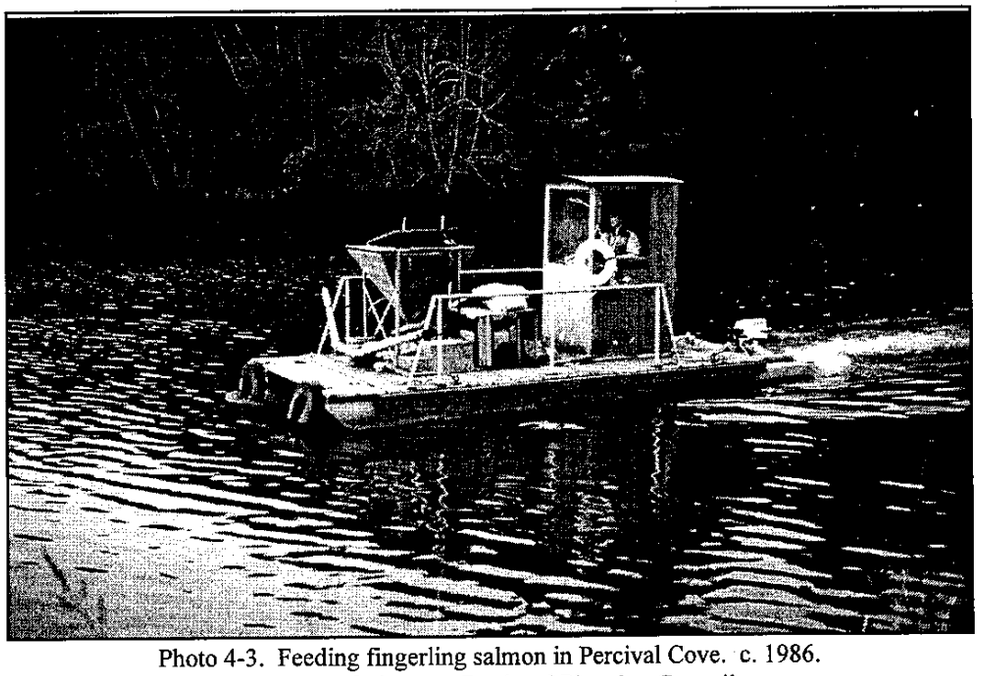


Photo 4-3. Feeding fingerling salmon in Percival Cove. c. 1986.
Courtesy of Thurston Regional Planning Council.

Other Freshwater Fish

Numerous other freshwater fish inhabit Capitol Lake. Virtually all of these fish prefer lake or shallow, low velocity environments. None have been identified as significant to fish population management in Capitol Lake with the exception of the Olympic mudminnow.

The only aquatic species of special concern that has been identified in the Capitol Lake basin is the Olympic mudminnow. The Olympic mudminnow (*Novumbra hubsi*) is presently under review as a Washington State candidate species by the WDFW Fish Management Program as a state sensitive species. Washington State sensitive species are used as an indicator of degrading habitat condition.

The Olympic mudminnow prefers habitat that is well shaded by vegetation with muddy substrate and very low (less than 0.1 feet per second) water velocities. The fish has good tolerance for low dissolved oxygen levels or high temperatures, but not for any measurable salinity or stream flow velocities. They can be found in lake shallows but also small stream tributaries, and often in association with coho salmon juveniles. Often underground springs are numerous where mudminnows collect.

Endangered Species Act

In March 1999, the National Marine Fisheries Service (NMFS) listed chinook salmon stocks in Puget Sound as "Threatened" under the Federal Endangered Species Act. The listing in the Federal Register indicates that the Deschutes River is a part of the Puget Sound Evolutionarily Significant Unit, but the run is designated by NMFS as "not essential for recovery." It is not known what provisions might be required for Capitol Lake or its tributaries as a result of this listing. It is likely that communication will continue between the affected parties, being NMFS, WDFW and the Squaxin Island Tribe, and that additional information will be brought to the CLAMP Steering Committee as needed.

Fish Culture Program and Fish Passage Structures

The Tumwater Falls hatchery and Percival Cove rearing pens are part of the WDFW "South Sound Complex." The fish culture and passage facilities at Capitol Lake include (going from downstream to upstream) the Capitol Lake tide gate fish ladder, the Percival Cove net pens and open-cove rearing facility, a fish release point at the I-5 boat ramp in Capitol Lake operated by WDFW, Tumwater Falls hatchery, holding ponds, and the Tumwater Falls fish ladder. (Refer to Figure 4-1 on page 4-2.) While adult chinook and steelhead trout are trapped at the hatchery for eggs and milt (sperm), the eggs are raised at other hatcheries and returned to either Capitol Lake directly or Percival Cove for continued rearing (for chinook), or to the hatchery rearing ponds (for steelhead).

Both chinook fingerlings (2 million) and yearlings (200,000) are fed and reared in Percival Cove. These fish supplement the chinook salmon return, which supports the recreational chinook fishery in Capitol Lake and Budd Inlet. Net pens are presently operating in Percival Cove to rear yearling chinook between November and April each year, and fingerlings are raised (free-swimming) in the cove from the time of planting to late May or early June. Pickets are placed at the mouth of Percival Cove during the chinook run to capture adult fish for egg supply, and a limited number of surplus fish are lifted over the pickets and allowed to migrate to Percival Creek.

Fish passage conditions at the tide gate may present difficulty to steelhead migration during winter. The entrance to the fish ladder at the tide gate is relatively high, and during winter, the lake level is often maintained at a level where flow does not occur through the ladder. Although adult salmonids are able to pass through the tide gate when it is open at low tidal elevations, fish are likely delayed in their upstream migration when the tide gate is closed and there is no flow through the ladder. This delay may result in predation by marine mammals and overall delayed spawning.

Existing Lake Habitat

The existing habitat in Capitol Lake can be characterized as a shallow lake environment with low to moderate densities of aquatic macrophytes covering most of the lake shoreline. The Deschutes River stream current also produces downstream currents and circulation patterns that are more pronounced than for rivers of similar size and volume.

During summer months warm temperatures and low dissolved oxygen concentrations can increase respiratory stress on various fish populations. Low dissolved oxygen conditions can be even lower within macrophyte beds. While these conditions are less than optimal for salmonid fish, the macrophyte beds still provide good refuge habitat for small prey fish such as crappie or pumpkin seed. While much of the shoreline has some macrophyte and/or riparian cover, some areas are lined by riprap and are largely devoid of either aquatic or terrestial vegetation.

Between 1971 and 1995 Capitol Lake was completely drained (during low tide) and allowed to backfill with saltwater to control macrophytes, aid in juvenile salmonid out-migration which was discontinued in the mid-1980s, and facilitate maintenance activities in the lake. This procedure was implemented one to three times per year. In 1996 and 1997, the drawdown procedure was modified to only partially drain the lake and limit the amount of saltwater backfill. Modified drawdown was implemented to minimize adverse impacts on freshwater aquatic and wetland plant communities established as mitigation for the Heritage Park project.

While the intent of modified drawdown was to produce lake water quality benefits, it was determined that it had the adverse side effect of causing fish stranding and mortality due to predation and exposure from heat or stranding out-of-water. A wide variety of fish were observed either stranded in isolated pools or dead on mudflats. Many hundreds of fish were killed or temporarily stranded by the drawdown of 1997.

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CHAPTER 5 FLOODING

Photo 5-1. Flooding on Columbia Street at Legion Way. c. 1975. Courtesy of Gant Eichrodt Collection.

Capitol Lake Dam

When the Washington State legislature approved the Deschutes Basin Project in 1948, it recognized a dam would be needed as the cornerstone of this construction project. It would cross the Deschutes River where the river flows into Budd Inlet at low tide. In fact, construction of the dam was second in priority on the list of seven actions contained in that State law;

> *"2. The construction of a dam or weir along the line of Fifth Avenue in the City of Olympia and a parkway and railroad over the same."* (RCW 79.24.160)

The Capitol Lake dam serves as both a tidal lock to keep saltwater out of the lake, as well as a fresh water impoundment of the Deschutes River to create the lake. The dam is operated by the Washington State Department of General Administration to maintain a constant water level in Capitol Lake. There are two radial tide gates which are operated by electric motors and cables connected to automatic sensors. The east gate is 24 feet wide, whereas the west gate is larger at 36 feet in width. A 5 foot wide fish ladder is located along the eastern wall of the dam. Refer to Photos 3-8 and 3-9 which show the dam under construction.

The sensors in the dam discern differential pressure of the tide level relative to the lake level. An automated system called "Metasys" controls the dam by spilling water or raising the tide gates. The gates rotate up to discharge lake water to Budd Inlet. This control system can be programmed for a variety of variables. These may include the time of year, the predicted tidal elevations, and anticipated flows from the Deschutes River.

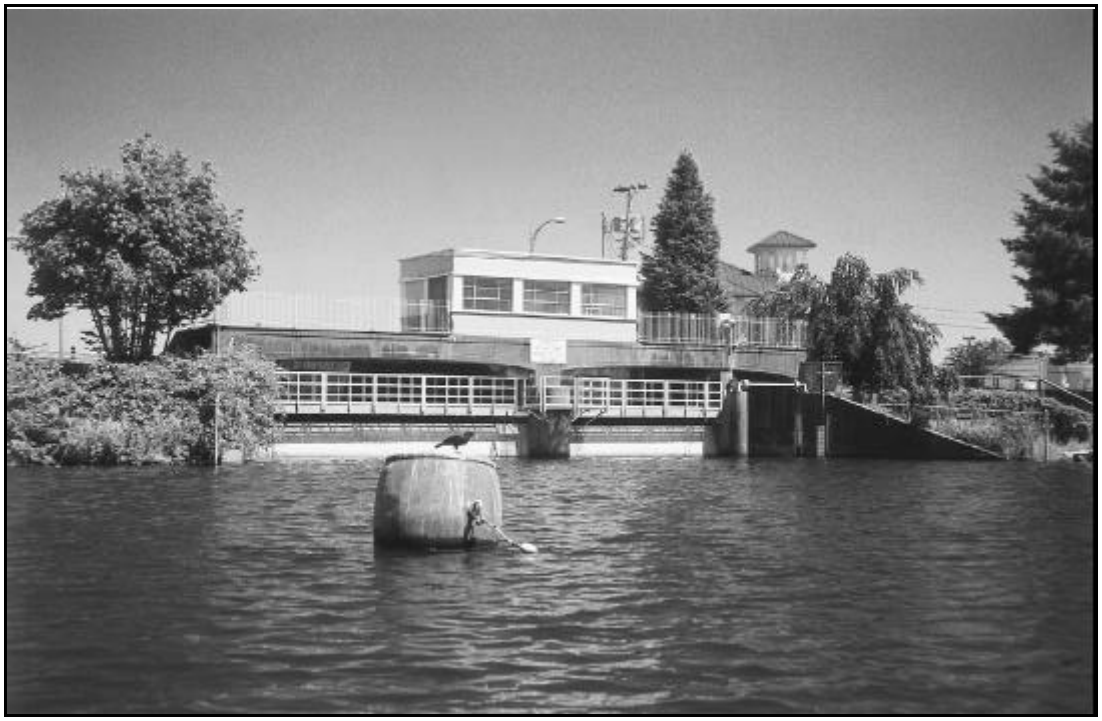

Photo 5-2. Capitol Lake dam from the lake side. c. 1998.
Courtesy of General Administration.

Southern Puget Sound experiences diurnal tides (two highs and two lows per day), with a tidal change every 12 hours. Tidal elevations, or the saltwater side of the dam, is measured on a Mean Lower Low Water (MLLW) datum. Tide levels vary daily, from the extremes of -3.0 feet MLLW to a high of 17.0 feet MLLW, although the average range is from a low tide of 4.0 feet MLLW to a high of 12.0 feet MLLW. Mean High Water in Budd Inlet is elevation 13.50 MLLW.

The elevation of Capitol Lake was constructed using the City of Olympia datum, but since then all elevations on the lake side of the dam have been converted to a Mean Sea Level (MSL) datum. Normal summer lake level (March 16 - October 14) is 6.45 feet above Mean Sea Level (MSL). The winter lake level (October 15 - March 15) is 5.45 feet above MSL.

DATUM POINTS

Elevations in Mean Sea Level (MSL) can be converted to tidal datum by adding 7.73 feet.

Tidal elevations described as Mean Lower Low Water (MLLW) can be converted to MSL by subtracting 7.73 feet.

Therefore:

- A summer lake level of 6.45 MSL = a tidal elevation of 14.18 MLLW tidal elevation.
- With a conversion of the winter lake level of 5.45 MSL = to a tidal elevation of 13.18 MLLW.

Tide Gate Operation

The tide gates can only be raised to let lake water into the Budd Inlet when the tide is lower than the lake level. Under normal tidewater operation, the east gate begins to open slowly when the tide level is 6 inches lower than the lake level until the desired lake level is achieved; then the gates are closed. A large tidal range will cause the lake level to drop more quickly and the gates will correspondingly close quicker. The automatic system can be manually over-ridden in anticipation of high winter flows to drop the winter lake level an additional 1 to 2 feet to keep the lake water from rising and flooding downtown Olympia.

Fish Ladder

Fish passage through the dam is accomplished with a six step 5 foot wide fish ladder located on the eastern side of the dam. A metal gate is lowered to allow flow of water over the top of a concrete sill. Returning salmon or smolts moving from the lake into saltwater, need a minimum water depth over the sill of 0.5 feet to be operational. Therefore, the ladder requires a lake elevation above 5.5 feet MSL. During tides higher than the top of the fish ladder (12.73 feet MLLW), saltwater can flow from Budd Inlet into Capitol Lake. Currently, the fish ladder is only operational during spring months for smolts to migrate to saltwater and during the fall for salmon to return to Capitol Lake. The volume of water flowing across the top of the fish ladder sill is a negligible percentage of the lake volume.

The Washington State Department of Fish and Wildlife (WDFW) is interested in a "fully functioning fish ladder" at the Capitol Lake Dam, which would provide year-round fish access to the lake. WDFW is interested in introducing a winter run of steelhead salmon into the Deschutes River system. Since these fish would return to the lake during the lower, winter lake level the current fish ladder would have to be modified or the salmon would become prey for the local harbor seals. A less desirable option would be to keep the lake at a higher level which would seriously increase the threat of flooding parts of downtown Olympia.

Creation of Downtown Olympia

In many ways downtown Olympia was a creation of its geography, being at the southern tip of Puget Sound. First settled in the 1850's Olympia's shoreline evolved through a series of dredge and fill projects. For example, between 1909 and 1911, two million cubic yards of material dredged from Budd Inlet created about 30 new, downtown city blocks. Over the years industrial sites along West Bay Drive were filled and the most recent expansion of the Port of Olympia peninsula was completed in 1982. So it is into this context that the Deschutes Basin Project, with the creation of Capitol Lake, Deschutes Parkway, 5th Avenue, and Capitol Lake Park was embraced by the capitol community. Figure MP-7 in the Map Packet shows the historical shoreline of Budd Inlet and Capitol Lake prior to any filling.

Photo 5-3. Flooding at corner of 7th Avenue and Columbia Street (June 1951).
Courtesy of Susan Parish Collection.

Photo 5-4. Flooding at corner of 7th Avenue and Columbia Street (December 1975).
Courtesy of Susan Parish Collection.

Flooding Adjacent to Capitol Lake

Figures MP-3, 4 and 5 in the Map Packet indicate the chronic flooding problems faced by some downtown businesses adjacent to Capitol Lake and in the vicinity of Water and Columbia Streets. The earliest flood (June of 1951- Photo 5-3) was shortly after the creation of Capitol Lake and local folk lore credits this event to General Administration's first trial and error with operating the new dam. However, the other major flooding events have been during winter months where the combination of high tide and peak river flows cause concerns for downtown flooding. General Administration maintains a normal winter lake elevation one foot lower than the summer lake elevation, which provides approximately 270 acre feet of additional in-lake flood storage.

Using only flood elevations, it would appear that the Heritage Park Arc of Statehood bulkhead being constructed to a finished elevation of 10.0 feet MSL, would provide adequate flood protection for the properties along Water and Columbia Streets. The most consistent flooding problem along Capitol Lake had been the "sandbag parking lot" just south of 7th Avenue and west of Water Street. After inundation in the 1980s, sandbags were added along the shoreline to provide flood protection. However, this was not a complete solution. As the lake level begins to rise, water is forced up into the parking lot catchbasins from two storm outfalls, an 8 inch outfall in the south and a 6 inch line to the north. Until Heritage Park construction, the parking lot currently served as the City's downtown flood threat barometer.

However, these are minor sources when compared to the discharge and flood threat associated with the 7th Avenue storm sewer which also discharges to Capitol Lake. This storm line drains an area of approximately 16 city blocks. The drainage extends south of 7th Avenue to 10th Avenue and easterly to Adams Street. It even includes the General Administration building on the State Capitol Campus. Street drains along 7th Avenue also flow into this line. Since most all the drainage is at significantly higher elevation than the properties at Water and Columbia Streets, there can be a great hydraulic head in this line which can cause manhole covers to be blow off and water to flow out of street gutters. The lowest elevation in this vicinity is at the corner of 7th Avenue and Columbia Street (Olympia Supply Building). The street gutter at the corner is at an elevation of 8.8 feet MSL and a sidewalk near it is at 9.2 feet MSL. Most photos in this chapter document the problems faced at this location.

Flooding of such low lying areas can also be caused by high tides even with a normal lake level. Many of these properties would be inundated by tides in excess of 17.23 feet MLLW (sidewalk elevation near Olympia Supply Building) without the dam. Water and Columbia Streets also have storm drains which flow to the north and discharge directly into Budd Inlet near the Percival Landing. So in addition to the 7th Avenue line, these properties have a threat of salt water inundation from these north/south storm sewer lines.

Photo 5-5. Flooding at corner of 7th Avenue and Columbia Street (February 1987).
Courtesy of Susan Parish Collection.

Photo 5-6. Deschutes River flooding. c. December, 1975.
Courtesy of General Administration.

Recently, the 7th Avenue storm sewer line to Capitol Lake was refitted with a "sea gate." These are normally a concrete cap at the end of the pipe with a heavy steel door which is hinged at the top. On the 7th Avenue line, this valve was located in a manhole for better access and is maintained by the city. During normal rainfall the water pressure within the storm line pushes the gate open and water flows out. If a high tide or lake level occurs, then the hydraulic pressure from the other side would seal the gate, and thereby preventing flooding. However, flooding of these low lying areas would still occur when heavy local rainfall coincides with a high lake level or a high tide. (Refer to Figure MP-7 in the Map Packet.)

The City of Olympia responds to a flood event in this area by providing 2-3,000 sand bags to property owners. These are used to create dams across doorways and other openings to the street. Sand bags are also used to cover the street catchbasins so that water is not forced up into the street. Distribution of the sand bags may only take a day when done by 4-6 maintenance personnel with the assistance of up to 20 personnel from the Fire Department. However, clean up duty can take several days. The year 1997 only saw one call for sandbags, with two such events in 1996. The current City of Olympia Capital Facilities Plan contains no funds in either the 6 or 20 year time periods to address the problems associated with the 7th Avenue storm line or flooding of these low lying properties.

Flood Elevations

The Federal Emergency Management Agency (FEMA) prepared a report on the flood risks within the City of Olympia. The initial mapping for this study was completed in May 1976 with the aforementioned report issued in August 1981. The effective date of the City of Olympia FEMA Flood Insurance Rate Map (FIRM) was February 17, 1982.

FEMA determined that an elevation of 11.0 feet MSL represented the 100-year flood elevation for Capitol Lake. The same report also indicated that the 100-year flood elevation in Budd Inlet would be 0.4 feet below that of Capitol Lake, or at 10.6 feet MSL (or a tidal elevation of 18.33 feet MLLW). Table 5-1 indicates the flows associated with various flood events. Table 5-2 compares the elevations of various flood stages for Capitol Lake and Budd Inlet with some historical events and local landmarks.

Table 5-1
Predicted Flood Flows for the Deschutes River

Recurrence Interval in Years	**Flow** (cubic feet per second)
1	1,878
2	3,803
5	4,926
10	5,644
25	6,529
100	7,813
Maximum discharge of record	9,600

Source: USGS 1985 and USGS personal communication.

The official City of Olympia Flood Insurance Rate Map (FIRM) panel 4 indicates the extent of flooding mapped by May of 1976. The area mapped as 100-year floodplain stops at the westerly side of Columbia Street and extends northward to the edge of 5th Avenue. All of the previous flooding photographs show an extent greater than this. Shortly thereafter, in December of 1977, the City experienced the record high tide. No revisions were made to the preliminary FEMA boundary after that event and the same map was adopted in February of 1982.

The following year, the City undertook a program to create detailed topography maps. The aerial photographs used for this were from April of 1983 and MSL was used as the vertical datum. The City recently updated this mapping with a flight from March of 1996. General Administration (GA) prepared a topographic survey of Heritage Park and its immediate surroundings. This map covers the low lying properties in the vicinity of Water and Columbia Streets. The GA map contains thousands of spot elevations and has an 11.0 feet MSL contour line, but does not have any coverage north of 5th Avenue. Based upon GA's new topographic data, it appears that a significantly larger area would be subject to a 100-year flood than is currently mapped on the FIRM. The CLAMP Environmental Impact Statement used the flood of record and determined that this would result in waters reaching 12.4 feet MSL. (Refer to Table 5-2.)

Table 5-2
Comparison of Flood Elevations

FEMA Flood Event	Tidal Elevation - MLLW (in feet)	Lake Elevation - MSL (in feet)	Historical Events & Local Landmarks
		12.40	**CLAMP EIS Prediction of Existing Conditions**
500-YEAR*		11.20	
100-YEAR*		**11.00**	**Center of Intersection 5th Avenue & Water Street**
50-YEAR*		10.80	
	(18.40)	**10.67**	**Top of Tide Gates**
	(18.33)	*10.60**	*100-Year High Tide in Budd Inlet*
10-YEAR*	(18.23)	10.50	
	18.20	*(10.47)*	*Record High Tide --December 15, 1977--*
	17.80	*(10.07)*	*Previous Record High Tide --January 18, 1914--*
	(17.73)	**10.00**	**Heritage Park Bulkhead with Capstone (Phase II)**
	(17.52)	9.79	Heritage Park Bulkhead
	(16.93-17.23)	9.20-9.50	Sidewalks in Vicinity of 7th Avenue & Columbia Street
	(16.61)	8.88	Street Gutter at 7th Avenue & Columbia Street
	(14.86)	7.13	South Catchbasin at Sandbag Lot
	(14.18)	**6.45**	**Normal Summer Lake Level (Mar 16 - Oct 14)**
	13.50	*(5.77)*	*Mean High Tide*
	(13.23)	**5.50**	**Fish Ladder Operational**
	(13.16)	**5.43**	**Normal Winter Lake Level (Oct 15 - Mar 15)**
	(12.23)	4.50	Pre-Winter Storm Drawdown
	(0.26)	-7.07	Tide Gate Sill (Bottom of Dam)

* = FEMA, Flood Insurance Rate Study; City of Olympia Washington. (1981)
(###) elevations converted using 7.73 feet difference between MSL & MLLW
@ = CLAMP EIS predictions using flood of record (Jan 1990)

Sea Level Rise

A more recent report on possible downtown flooding, Preliminary Assessment of Sea Level Rise in Olympia, Washington: Technical and Policy Implications (1993), mapped a "Base Flood" for this same vicinity. The mapped coverage of this base flood was somewhat less than the FIRM map, as the contour line of 18.0 feet MLLW was used around both Budd Inlet and Capitol Lake. This was the closest contour interval to the 100-year flood elevation for Budd Inlet of 18.33 feet MLLW and close to the record high tide of 18.2 feet MLLW in December 1977, but this report did not take into account the FEMA Flood Insurance Study which indicated a 0.4 foot reduction in the 100-year flood elevations between Capitol Lake to Budd Inlet. Therefore, based upon the available topographic and elevation datum, neither the FEMA map nor the Preliminary Assessment map provides an accurate delineation of those portions of Downtown Olympia which would be affected by a 100-year flood event.

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CHAPTER 6 HUMAN USE

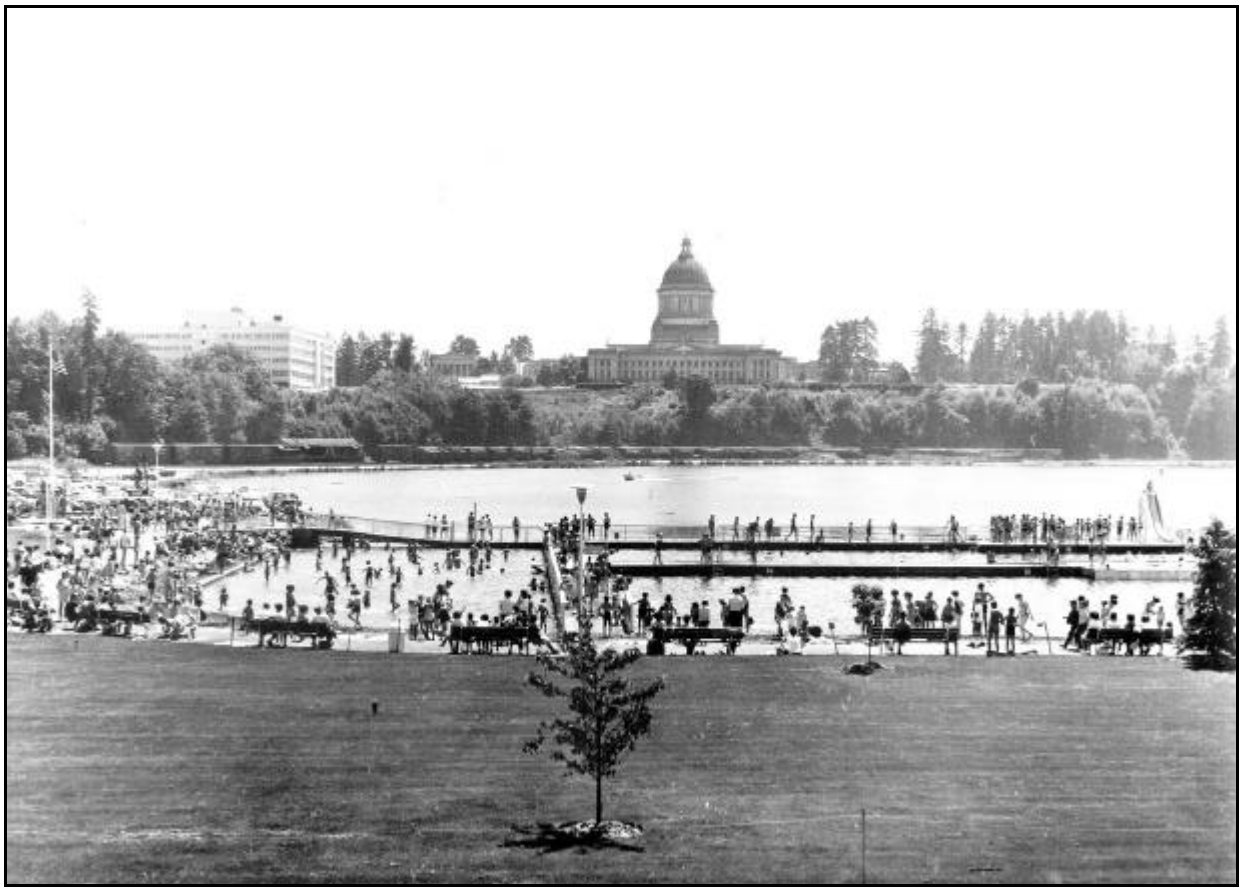

Photo 6-1. Capitol Lake Park swimming area. c. 1964. Courtesy of the Susan Parish Collection.

Use of Capitol Lake

The immediate Capitol Lake shoreline is primarily open space, trails, and park lands. Heritage Park (formerly Capitol Lake Park), is located on the shores of the eastern half of the North Basin; Marathon Park is on the southwest shore of the North Basin; the Capitol Lake Interpretive Center is in the Middle Basin's southwest corner; and Tumwater Historical Park is on the western shore of the South Basin. (See Figure MP-4 in the Map Packet.) Recreational fishing occurs throughout the lake. Other recreational uses include jogging, walking, or bicycling along the lake shore; sight-seeing (including open-water vistas); bird-watching; boating; canoeing; fish-watching (at the fish ladders and traps constructed around the Tumwater Falls); and Lakefair (an annual, week-long, community event). From 1965 to 1985, Capitol Lake Park maintained a swimming beach in the summer.

All the parks around the lake are operated and maintained by General Administration with the exception of Tumwater Historical Park. Marathon Park has picnic areas, water fountains, restrooms, and jogging trails. The Capitol Lake Interpretive Center has two fishing/observation piers, and fishing also is possible from the footbridge that crosses the constriction between the North and Middle Basins near Marathon Park.

Photo 6-2. South and Middle Basins prior to Tumwater Historical Park; I-5 and SR 101 interchange. c. 1958. Courtesy of the Susan Parish Collection.

Photo 6-3. Lakefair celebration. c. 1998. Courtesy of General Administration.

Tumwater Historical Park is partly on state land leased to the City of Tumwater and partly on property donated to the City by the Olympia Brewery. There is a boat launch for fishing boats at the north end of Tumwater Historical Park near the I-5 freeway. In addition, there are trails through the wetlands, picnic areas, a playground, a large play area, and restrooms. The North Basin of Capitol Lake, most of the Middle Basin (the portion north of the Capitol Lake Interpretive Center), and the eastern half of the lake's South Basin are within the City of Olympia, while the remainder of the Middle and South Basins are within the City of Tumwater.

Another trail project which may occur in the South Basin vicinity, is the Olympia Woodland Trail. This urban trail would extend the existing bikeway along I-5 from Tumwater Historical Park to the Chehalis Western trail head near Lacey. A new pedestrian bridge would need to be constructed across Capitol Lake, just south of the I-5 bridge. Once completed, the trail would be 3.8 miles long. Timing is subject to funding availability.

Tumwater's New Market Historic District borders most of the South Basin of Capitol Lake. A master plan for this district was adopted by the City of Tumwater in 1993. It describes future land uses, shoreline improvements, and cultural, and recreational facilities planned for the district. Key components of the master plan include expansion of the City's Historical Park to include a trail system around the south basin (including pedestrian bridges over the Deschutes River and Capitol Lake near the I-5 bridge), and rehabilitation of the old Olympia Brewery buildings for beneficial use to the public. Other existing and future cultural and archaeological resources of the district also are identified in the master plan.

Existing trails follow the entire length of the lake's west side, running from Tumwater Historical Park to the Capitol Lake Interpretive Center, then north along Deschutes Parkway, on to Marathon Park, and around the lake's north end. The City of Olympia's Comprehensive Plan designates a Class II bicycle path along this route. This new path would connect to other east-west bicycle routes along 4th and 5th avenues. A system of sidewalks and trails also bounds the entire North Basin of Capitol Lake and loops back across the lake adjacent to the railroad right-of-way (the railroad track forms the constriction separating the lake's North and Middle basins), to Marathon Park. The existing rail corridors in the lake's vicinity are identified by the City of Olympia as future urban trails.

Steep, wooded slopes are located along the entire west side of Percival Cove, as well as the southeast portion of the North Basin, and the eastern margins of the Middle and South Basins. Developed lands around the North Basin are primarily commercial on the east side, with a mixture residential on the west side. Existing land uses up-slope of the Middle Basin include the State Capitol Campus and residential uses on the east. To the west are the Thurston County courthouse complex, motel, office, and residential uses. In the South Basin, existing land uses include residential and commercial on the east and residential and park use on the west.

Just north of Capitol Lake, along the shores of Budd Inlet, there are a mix of various land uses. Land uses on the east side of the inlet include Percival Landing (a waterfront park), commercial and office buildings, a marina (Olympia Yacht Club), and industrial uses

associated with the Port of Olympia (northern half of the eastern shore). Land uses to the west are primarily residential, but also include office, commercial, and industrial.

Heritage Park

Heritage Park construction began with the construction of the hillside trail to connect the Capitol Campus. This work was completed in 1997 with the kickoff for the park in the summer of 1998. Phase I of Heritage Park is scheduled for completion by the spring of 1999. There are several subsequent phases planned that will each add landscaping material or design elements. Depending upon funding by the State Legislature, construction of the park is scheduled to be complete by the year 2008. (Refer to Figure MP-6 in the Map Packet.)

Heritage Park encompasses 46 acres located directly north of the historic Capitol Campus, including 22 acres of lake surface (only a portion of the eastern side of the North Basin). The park is the final part of the original 1911 plan for the State Capitol Campus. The park, which has as its theme, Washington State's heritage, includes walking trails, paths along the lake, civic space for events and public gatherings, an amphitheater, and areas for state landmarks and commemorations. The symbolic centerpiece of the park plan is the Arc of Statehood, a wide semicircular tree-lined walkway defining the lakeshore between the overlooks of the lake. This feature requires 3 acres of fill within the lake and a replacement wetland of 9 acres in the Middle Basin. The other major park features include a trail meandering through a heather-planted slope, extensive native landscaping, enhancement of the shoreline with public access, and outdoor gathering spaces.

Historically, the most intensive use of Capitol Lake has been the annual Capital Lakefair celebration. Lakefair was started 40 years ago as a fund raiser for nonprofit organizations. The six-day fair, preceded by two days of related events, is held in July and typically is attended by 60,000 to 100,000 people. Additional activities that occur in conjunction with Lakefair include a parade, fireworks across Capitol Lake, a golf island, stage entertainment, fair royalty coronation, and a carnival. The carnival is held on the shores of Capitol Lake just south of the existing park, extending to the end of Water Street.

View Analysis Methodology

When assessing an area for visual quality (aesthetics) and its potential for impacts from proposed changes, both the perspective of the viewer and the characteristics of the site are considered. The following criteria for the viewer's perspective were used to assess the existing visual character of the site and the potential for impact:

- ***Viewer Distance***. The distance at which an area is viewed influences the amount of objects that can be seen and the panoramic quality of the view. Views can be divided into foreground, middleground, and background. These ranges are established by using distinguishable details in the landscape. Foreground views are between 0 and 500 feet, with clearly distinguishable features in landscape elements. Impacts to the foreground view would have greater impact than changes to the background view. Middleground views are from 500 feet to one-half mile, with broadly distinguishable features. Background views are one-half mile and beyond, with no individually distinguishable features.

- ***Viewer Activity***. The viewer's activity often determines the sensitivity of the viewer to the surrounding views. For example, a person using a park is usually more sensitive to visual degradation than a person within an industrial setting. Therefore, the sensitivity of a viewer can often be inferred from the land use. For Capitol Lake, the major land uses seen by the viewer include recreational, commercial, residential and transportation corridors.

- ***Duration of View***. This criterion refers to the length of time that the area is viewed. For example, motorists using I-5 would view the area for a relatively short time, when compared with nearby residents, and therefore the potential for significant impacts is less.

- ***Viewer Position***. The viewer's relative position above or below the area. For example, is the viewer on a hill overlooking Capitol Lake, or is the viewer at the shoreline?

- ***Number of Viewers***. The relative number of viewers is an important consideration in evaluating the area's visual quality.

Five key viewpoints were selected around the basin to assess the existing visual conditions. Figure MP-10 in the Map Packet shows the viewpoint locations and view directions used in this section. The viewpoints were selected by the CLAMP Steering Committee.

Table 6-1
Viewshed Analysis of Capitol Lake

View Point	Location	Direction of View	Characteristics	Purpose
1	North Basin - On south side of 5th Avenue at Simmons Street	South	Has views through Heritage Park of the North Basin and the Capitol Campus Building.	Assess change in views of the North Basin for people in the downtown area on the north side of the lake.
2	North Basin - Along sidewalk adjacent to Deschutes Parkway	Southeast	Has the widest expanse of open views toward the Capitol Building and the reflecting pool aspects of the North Basin.	Assess change in views of the North Basin for people along Deschutes Parkway.
3	Sidewalk - adjacent to the Lakeridge Drive/Deschutes Parkway intersection	East	Has the closest view of Capitol Building and includes motorists' views at the Lakeridge Drive/Deschutes Parkway intersection and pedestrian views from the west shore sidewalk.	Assess change in views of the Middle Basin for motorists and recreational users along Deschutes Parkway.
4	Capitol Lake Interpretive Center	North	Has extended views of the Middle Basin.	Assess changes within the Middle Basin
5	Tumwater Historical Park	Southeast	Has views from Tumwater Historical Park across the south Basin and Deschutes River toward the historic Olympia Brewery. The location is near the point where the River enters the South Basin.	Assess change in views from Tumwater Historical Park.

In addition to the viewer's perspective, the following characteristics of the site were considered to determine the site's vulnerability to visual impacts:

- Encroachment by manmade structures, such as utility poles or railroad tracks.
- The presence of distinctive landscape features, for example, open water, steep slopes, or tall buildings.
- Contrasting elements, such as differences in color, line, or shape, which create a more memorable landscape. Ordinary landscapes lack these distinguishing elements.
- The presence of historic or culturally significant resources.

Refer to Figure MP-10 in the Map Packet for the location of these view points.

Viewpoint 1:
Views of the North Basin at Simmons Street

View from May, 1999.

The existing view from 5th Avenue next to the Corrections Building includes the eastern half of the North Basin, generally unobstructed views of the north side of the Capitol Campus and General Administration buildings, and the forested hillside. In addition, a large portion of the open-water area in the middle ground has been filled to construct the park.

The area is within the Heritage Park construction phase one; so the view has been altered since the inventory was prepared in 1997. Future views from this location will change as Heritage Park is constructed and will likely consist of a formal stand of trees as shown by the proposed design of Heritage Park (Refer to Figure MP-6 in the Map Packet). In addition, a large portion of the open-water area will be filled to construct the park.

Viewpoint 2:
Views of the North Basin from Deschutes Parkway

View from May, 1999.

Views from the northwestern shore of the North Basin include the north side of the Capitol Building, which lies on the eastern plateau above the lake, Heritage Park, and a partial view of the downtown commercial/retail core toward the east and north. On calm days, the Capitol Building is reflected in the lake. The downtown section is relatively flat when compared with the land surrounding the rest of the North and Middle basins. From Viewpoint 2, the North Basin appears as a wide, circular body of water. From this location, views of the Middle Basin are blocked by the dike and railroad trestle separating the basins. This area is viewed by a large number of pedestrians and motorists along Deschutes Parkway.

There are unobstructed scenic views of open water and the Capitol Building with its tree-filled hillside. However, other dominant buildings of contrasting architectural styles within the downtown core toward the east and the north and within the Capitol Campus detract from the scenic views. The principal land use activity that can be seen from Viewpoint 2 is commercial development in the downtown core; a rail line at the south end of the North Basin; recreation, such as Marathon and Heritage parks; and forested hillsides toward the west. In the background to the south, are views of I-5 and homes along the hillsides.

Viewpoint 3:
Views of the Middle Basin at Lakeridge Drive Intersection

View from May, 1999.

Views along the Deschutes Parkway from the northern half of the Middle Basin provide the closest and most complete views of the Capitol Building from Capitol Lake. As viewed from the sidewalk adjacent to the Deschutes Parkway/Lakeridge Drive intersection, the Capitol Building is framed on both sides by evergreen and deciduous trees. The Capitol Building and trees are reflected in the water in a relatively narrow section of the Middle Basin.

The steep hillside along the eastern shore of the Middle Basin is densely wooded with red alder, big leaf maple, and Douglas fir. The hillside rises to a plateau about 100 feet from the lake shore elevation. The plateau is occupied by the Capitol Building and residential development to the south.
From Viewpoint 3, homes on the edge of the plateau are generally screened by trees, but can be seen partially in winter. The eastern shoreline of the Middle Basin usually has overhanging vegetation, and has a more natural appearance than the shoreline of the North Basin. Views of the North Basin are restricted by the shoreline and the railroad trestle dividing the two basins.

Homes along the bluff in the South Capitol Neighborhood of the Middle Basin have views of the lake that generally are partially or completely blocked by vegetation. In contrast, views from buildings along the lake's western bluff, such as portions of the Thurston County Courthouse and the homes above Percival Cove, have mostly unobstructed views of the lake and the Capitol Building.

Viewpoint 4:
Views of the Middle Basin at Capitol Lake Interpretive Center

View from May, 1999.

Views at this site are northeast from the dock of the Capitol Lake Interpretative Center toward the eastern forested hillside of the Middle Basin. There is also a large section of open water of the Middle Basin that can be seen in the foreground and the dome of the Capitol Building can be seen in the background. The lower portions of the Capitol Building are blocked by vegetation. Homes along the edge of the eastern plateau, particularly along the basin's southern end, can be seen partially from Viewpoint 4. Trees on either shore are reflected in the Middle Basin of the lake.

The uniform (without distracting elements) forested eastern and western shores and the dome of the Capitol Building provide a scenic background for the open waters of the Middle Basin. The Capitol Building is less dominant from Viewpoint 4 than from Viewpoint 3, and the homes along the bluff in the South Capitol Neighborhood are generally screened by vegetation.

Viewpoint 5:
View of the South Basin at Tumwater Historical Park

View from May, 1999.

In the South Basin there are no views of the Capitol Dome. The most dominant structure from Tumwater Historical Park is southeast toward the historic Olympia Brewery and Tumwater Falls. Formal park landscaping is in the foreground, including a sidewalk, park bench, and handrail. The open water of the Deschutes River is visible in the middleground. This viewpoint is where the river enters the South Basin. Along the eastern edge of the river is a stand of mature cattails. Beyond the brewery, the view encompasses a mixed forest of deciduous (mostly red alder and big leaf maple) and conifer trees (Douglas fir, cedar, etc.). Further to the south lies Tumwater Falls, which is the terminus of the Deschutes River.

The park landscaping, the water element, the uniform (without distracting elements) forested background and the small size of the viewshed make the view of the old Olympia Brewery very scenic. Only the presence of Interstate 5 and the newer, more industrial character of some of brewery buildings detract from the quality of this view.

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CHAPTER 7 SEDIMENTATION

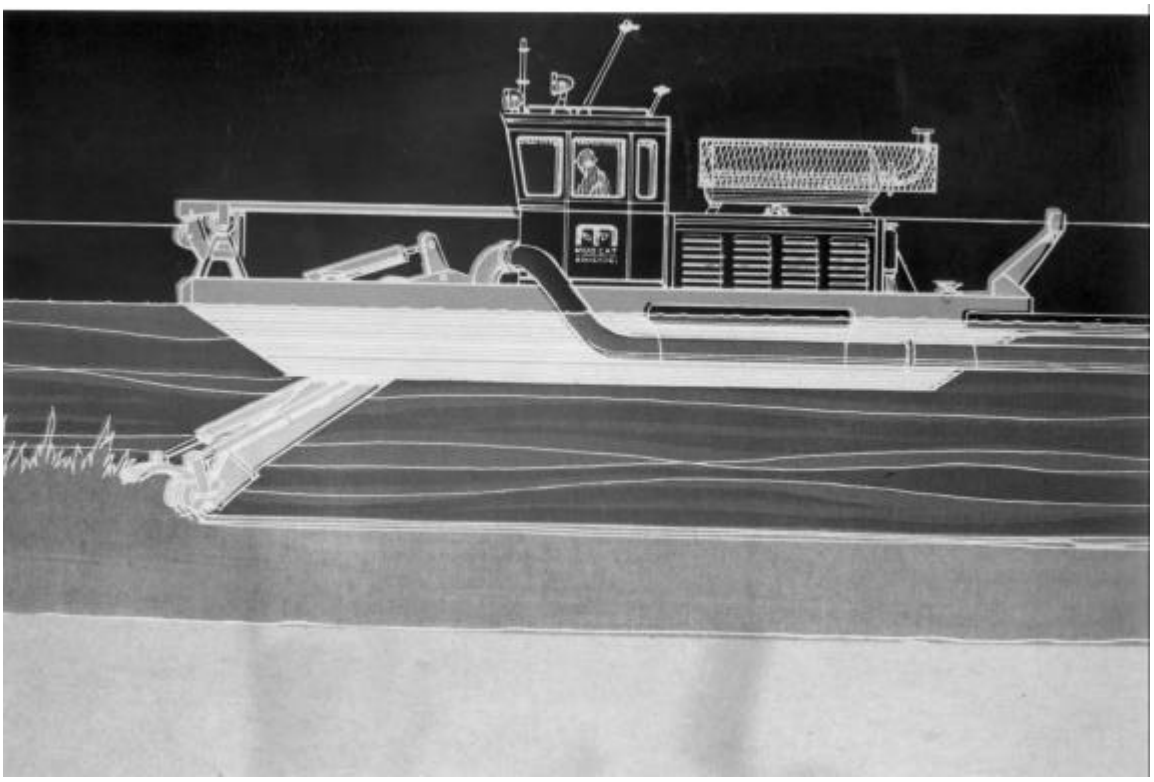

Photo 7-1. Example of a hydraulic dredge. Courtesy of General Administration.

Topographic Conditions

Located at the mouth of a 185 square mile watershed, it should not be surprising that sediment deposition and management are major issues for Capitol Lake. Refer to Figure MP-1 in the Map Packet. Sediments are suspended or transported downstream by the flow of the river to where they are deposited in the lake with the larger materials being deposited closer to Tumwater Falls. Sediment cores of the lake bottom indicate that the upper 15 to 20 feet of lake bottom sediments are comprised of soft, loose silt/sand/clay materials, which are underlain by very dense, glacially-derived, sand and gravel deposits.

As of 1973, the lake basin had an average depth of 9 feet. Typical summer depths for the North, Middle, and South Basins are as follows. (Refer to Figure MP-11 in the Map Packet)

North Basin..0 to 14 feet
Middle Basin..0 to 10 feet
South Basin....0 to 3 feet

Photo 7-2. Aerial photo of Southern Budd Inlet. c. 1936.
Courtesy of Walker Aerial Surveys and
Thurston County Roads and Transportation Services.

Photo 7-3. Aerial photo of the South Basin
during the summer lake drawdown c. 1996.
Courtesy of NIES Mapping Group Inc.

In the Middle Basin the top 3 feet of sediment was sampled at 15 sites throughout the basin. These cores indicated a highly variable grain size which typically composed of silts (60 percent), sands (27 percent), and clays (13 percent). Some natural sorting of material occurs in the lake where sands have a tendency to drop out in the Middle Basin sediment trap (located immediately north of the I-5 bridge). Finer silts and clays tend to accumulate throughout the Middle and North Basins.

In Percival Cove alluvial material such as sand, gravel, and cobbles are transported downstream by Percival Creek. Most of this material drops out in Percival Cove just west of the Deschutes Parkway bridge; however, some finer material may also pass under the bridge into the upper end of the Middle Basin.

Sediment Accumulation

As early as 1970, the Department of General Administration recognized that sediment accumulation in the lake would have to be actively managed if the lake's beneficial uses were to be maintained. That year the Walker and Byrne report estimated that 739,000 cubic yards of sediment had accumulated in the lake between 1949 and 1970, or the equivalent of 41,000 cubic yards per year. Since the Walker and Byrne report, various investigators have estimated the annual sediment load to the lake at between 20,000 to 57,000 cubic yards per year.

Based on further studies by Washington State University, plans were proposed to remove as much as 360,000 cubic yards of sediment from the lake during an initial sediment removal project, and to construct sediment traps in the South and Middle basins. This led to development of the Capitol Lake Restoration and Recreation Plan in 1977.

A 1996 report which compared the sedimentation from the years 1991-1996 to the years 1983-1991, indicated that the rate of deposition was reduced by 17 percent. It showed that 66 percent of the total annual sediment load is being deposited downstream of the South Basin and outside of the Middle Basin sediment trap. The report also indicated that there were changes in the sediment deposition rates within the basins.

The South Basin showed a net increase of 48 percent, which may be attributed to increased channel meandering and increased length of the main channel flow path with respective reductions in the flow velocity. These flow reductions result in less sediment being carried to the Middle Basin sediment trap which showed a net reduction of 37 percent. The North Basin had a net increase of 11 percent, which may be from material formerly deposited in the Middle Basin.

This technique indicated a sedimentation rate of approximately 35,000 cubic yards per year. Table 7-1 indicates the estimated sediment accumulation in Capitol Lake since its creation, based upon the various annual accumulation rates. These calculations indicate that while over 1.6 million cubic yards of sediment have been deposited in the lake, only 19 percent was removed by dredging.

The Capitol Lake Adaptive Management Plan Draft Environmental Impact Statement (1998) provided an estimate of the long term affects of the sedimentation upon the lake. It estimated that the gradual in-filling would result in the loss of open water within 20-25 years for the South Basin, 50-85 years for the Middle Basin and 100-150 years for the North Basin. When sediment can no longer be deposited into Capitol Lake, it would then be passed into lower Budd Inlet.

Lake Dredging Operations

Capitol Lake was dredged on two previous occasions. The first dredging project occurred in 1979 and involved:

- Removal of 360,000 cubic yards of sediment, primarily in the South and Middle Basins,
- Construction of sediment traps in the South and Middle Basins, and
- Construction of the dike and gravity dewatering facility in the southwest corner of the Middle Basin. *(This location became the Capitol Lake Interpretive Center and was subsequently redesigned to be the wetland mitigation site for Heritage Park.)*

A second dredging operation occurred in 1986 and involved:

- Removal of approximately 57,000 cubic yards of sediment from the Middle Basin trap and the area around the trap, and
- Dewatering the sediment using the gravity dewatering facility in the southwest corner of the Middle Basin.

In the South Basin, maintenance of the sediment trap was abandoned in the mid-1980s. Sand bar deposition and hydraulic meandering caused the main channel to become isolated from the trap which precluded further sediment deposition. Under these conditions, General Administration decided to discontinue further dredging in the South Basin unless it became necessary to mitigate flooding impacts or to provide recreational boating access to the lake. Therefore, the last dredging within the South Basin occurred in 1979.

Table 7-1
Deschutes River Sedimentation - 1952 to 1998

Years	Sedimentation per Year (cubic feet per year)	Dredging	Total Sediment Trapped in Capitol Lake
1952 - 1974	30,000 cu. ft.^{3} (A) x 22 years = 660,000 cu. ft.^{3}		**660,000 cu. ft.^{3}**
1975 - 1979	54,800 cu. ft.^{3} (B) x 5 years = 274,000 cu. ft.^{3}	250,000 cu. ft.^{3}	660,000 cu. ft.^{3} + 274,000 cu. ft.^{3} - 250,000 cu. ft.^{3} **684,000 cu. ft.^{3}**
1980 - 1983	54,800 cu. ft.^{3} (B) x 4 years = 219,200 cu. ft.^{3}		684,000 cu. ft.^{3} + 219,200 cu. ft.^{3} **903,200 cu. ft.^{3}**
1984 - 1986	34,650 cu. ft.^{3} (C) x 3 years = 103,950 cu. ft.^{3}	57,000 cu. ft.^{3}	903,200 cu. ft.^{3} + 103,950 cu. ft.^{3} - 57,000 cu. ft.^{3} **950,150 cu. ft.^{3}**
1987 - 1990	34,650 cu. ft.^{3} (C) x 4 years = 138,600 cu. ft.^{3}		950,150 cu. ft.^{3} + 138,600 cu. ft.^{3} **1,088,750 cu. ft.^{3}**
1991 - 1998	28,600 cu. ft.^{3} (D) x 8 years = 228,000 cu. ft.^{3}		1,088,750 cu. ft.^{3} + 228,000 cu. ft.^{3} **1,316,750 cu. ft.^{3}**
TOTALS	**1,623,750 cu. ft.^{3}**	**307,000 cu. ft.^{3}** ***(19 percent of Total)***	**1,316,750 cu. ft.^{3}**

Sources: A = USGS, 1973.
B = Entranco, 1984.
C = Entranco, 1990.
D = Entranco, 1996.

Contaminated Sediments

Chemical tests of lake bottom sediments were performed for two recent studies to determine if there were any toxic chemicals present that would affect possible dredging or sediment disposal operations. The first study (samples collected in 1994) showed that sediments were free of toxic levels of arsenic, cadmium, copper, lead, mercury, zinc, polychlorinated biphenyls (PCBs), and total petroleum hydrocarbons. A second study collected samples in 1995, and involved a more comprehensive list of chemical tests. Tests for 76 organic and inorganic chemicals were made per the requirements of the Puget Sound Dredged Disposal Analysis (PSDDA). Three of the six sediment test sites in the Middle Basin exceeded PSDDA maximum contaminant levels for benzoic acid. Sediments containing high concentrations of benzoic acid could be safely disposed of at upland disposal sites, but could not be disposed of at deep, open-water PSDDA marine disposal sites.

Another important concern with the disposal of lake bottom sediments is that they may be contaminated with viable seeds from the noxious wetland weed known as purple loosestrife *(Lythrum salicaria)*. Tests conducted by Washington State University in 1995 were designed to determine the viability of seeds contained in lake bottom sediments. These tests indicated that the purple loosestrife seeds could still germinate at a wide variety of water temperature and salinity conditions. The test indicated that the marine water disposal of sediments with viable seeds posed a threat of spreading purple loosestrife to the Puget Sound shoreline near the disposal site. Sediments with viable purple loosestrife seeds would limit disposal options to sites where special containment measures could be implemented.

Alternative Dredging and Disposal Techniques

General Administration looked at several approaches to dredging material from the lake, as well as various disposal techniques. In 1995 and 1996 an environmental impact statement (EIS) explored these options and General Administration initiated the CLAMP process before a preferred dredging alternative was selected. The following descriptions are from that dredging EIS.

Hydraulic Dredging and Gravity Dewatering

A “hydraulic dredge” floats on the water and is equipped with a boom that extends to the bottom. At the end of the boom is either a spiral auger or cutterhead which digs into and loosens the bottom sediments. As this mechanical action is loosening the sediment, a large pump motor (dredges come in different sizes) pumps the sediment-water slurry to the shore. “Gravity dewatering” refers to the use of two or three ponds to allow sediments time to settle out and separate from the water before discharging the water back to the receiving water. Once the dredging/dewatering operation is complete, the ponds are drained and earth-moving equipment is used to load sediment onto trucks for delivery to upland disposal sites.

The old gravity dewatering facility in the southwest corner of the Middle Basin cannot be used in the future because it has been dedicated as a wetland mitigation site for Heritage Park. Therefore, if gravity dewatering is to be considered, a new facility that is 10 to 20 acres would be needed. If this technique was selected, a new study would be needed to determine the best location and design. Upland and in-lake sites may both be feasible, or the material could be sold for commercial purposes.

Mechanical Dewatering and Upland Disposal

With this method, a mechanical centrifuge separates the sediment-water slurry. Like the spin cycle in a clothes washer, centrifugal force separates solids onto a conveyor belt for delivery directly to a haul truck or railroad car. There would be localized violations of state water quality standards for turbidity at the dredging site, but not for treated return flows if it is chemically treated with a non-toxic polymer like Cat-Floc 2953. This is a Calgon product with the active ingredient (polyaluminum hydroxychlorosulphate or equivalent) which is added to the discharge water. It reduces turbidity of the runoff water but is a relatively costly additive. The potential toxic impacts associated with disturbance of lake bottom sediments would be the same as those described for gravity dewatering.

Hydraulic Dredging, Barge Transport, with Open-Water Marine Disposal

Hydraulic dredging would be the same as described above, except that the dredge slurry would be pumped through a floating pipeline, north to a marine barge moored at the Port of Olympia. The entire sediment/water slurry would be loaded into the barge and transported by tug to the marine open-water disposal site off Anderson-Ketron Island near Steilacoom in Puget Sound. At the disposal site, gates in the bottom of the barge would be opened and the sediment/water slurry would be dumped into the water and the sediments would settle to the bottom of Puget Sound. Any sediment with undesirable concentrations of benzoic acid or any other chemicals tested under PSDDA sampling protocol, could not be disposed of in this manner.

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CHAPTER 8 WATER QUALITY

Photo 8-1. Temporary Health Advisory sign at Capitol Lake Park after the sewer line failure. c. February 1995. Courtesy of General Administration.

Capitol Lake Watershed

The water in Capitol Lake originates from three principal sources. The Deschutes River with its 162 square mile watershed contributes 85 percent of the water for Capitol Lake. The Percival Creek basin drains 10 square miles of urbanized areas in West Olympia and West Tumwater and provides approximately 12 percent of the lake's water. The remainder of the water entering Capitol Lake comes from the local drainage area of approximately one square mile, brewery discharges, precipitation, and miscellaneous point or pipe discharges. (Refer to Figures MP-1 & MP-12 in the Map Packet.)

Lake volume and height are regulated by the tide gate in the Capitol Lake dam. While called Capitol Lake, the time which water spends in the lake is so short that a more accurate term would be "reservoir." During the winter months, water resides in the lake about two days. In the summer the residency time is increased to about 11 days due to the lower rainfall and reduced flows of both the Deschutes River and Percival Creek.

Water flow rates in the Deschutes River are low in summer months and high in winter months. Average daily flows of the Deschutes River in winter and spring range from approximately 500 cubic feet per second (cfs) to 850 cfs. This is reduced during June through October to less than 200 (cfs) from. These values are from the USGS river gauging station at the "E" Street bridge in Tumwater just upstream of Tumwater Falls. Water from Capitol Lake flows into Budd Inlet through the Capitol Lake Dam on 5th Avenue in downtown Olympia.

Capitol Lake Water Quality

Capitol Lake and the lower portion of the Deschutes River (mouth to river mile 20) are listed on the Washington State Department of Ecology's 1998 Section 303(d) list of Impaired and Threatened Surface Waters. (Refer to Table 8-1) Surface waters on this listing do not meet state water quality standards even after implementation of technology-based controls. The lower Deschutes River did not meet State standards for seven water/habitat quality parameters: fecal coliform bacteria, temperature, pH, dissolved oxygen, fine sediment, large woody debris, instream flow, and mercury.

Capitol Lake does not meet State water quality standards for fecal coliform bacteria and total phosphorus. Low dissolved oxygen, high turbidity, and fine sediments also have been identified as water quality problems in Capitol Lake. In addition, poor water quality in Capitol Lake has been linked to excessive algal growth associated with shallow depth, high water temperatures, and high nutrient levels. Swimming at Capitol Lake Park occurred from 1965 to 1985, but was prohibited after 1985 due to high levels of fecal coliform and public safety concerns over the limited water clarity.

Historically, unique dissolved oxygen problems developed immediately south (on the freshwater side) of the Capitol Lake dam, in a localized area known as the tide gate crater. The crater, which is an erosion-scoured depression, was created by the practice of summer drawdown. During the summer, all freshwater would be drained from the lake, and then, on the incoming tide, the tide gate would be held open and saltwater from Lower Budd Inlet would tumble into the North Basin. This tumbling action scoured and eroded a deep hole on the lake side of the dam. Over a period of years, water depths increased from approximately 25 to 40 feet. Saltwater, which is more dense than freshwater, settled into this crater and would remain for extended periods of time. Under these conditions, oxygen levels in the crater would fall to zero and toxic hydrogen sulfide gas developed. On one occasion in 1981, a release of hydrogen sulfide gas caused a fish kill in Lower Budd Inlet. This problem was eventually corrected with the installation of a siphon connecting the crater and Lower Budd Inlet. The siphon made it possible to maintain a steady flow of water through the crater, thus avoiding the problem of stagnation, oxygen depletion, and formation of toxic hydrogen sulfide gas.

Table 8-1
1998 Section 303(d) List of Impaired And Threatened Surface Waters

Water Body	Water Quality Parameter							
	Fecal Coliform	**Total Phosphorus**	**Temp.**	**pH**	**Dissolved Oxygen**	**Fine Sediment**	**Large Woody Debris**	**Instream Flow**
Capitol Lake - North Basin		X			@	@		
Capitol Lake - South Basin		X			@	@		
Deschutes River - Lower *(mouth to river mile 20)*	X		X	X				X
Elwanger Creek	X			X	X			
Huckleberry Creek			X					
Riechel Creek	X							
Deschutes River *(above river mile 20)*			X			X	X	X

@ = Problem from Capitol Lake Restoration Plan (1984)

Photo 8-2. Algal mats in the Middle Basin. c. 1969. Courtesy of General Administration.

Photo 8-3. Fishing pier in the Middle Basin during a summer drawdown. c. 1996.
Courtesy of General Administration.

High turbidity levels in the Deschutes River and Capitol Lake can occur during peak flow periods due to river bed and bank erosion and corresponding sediment transport. Turbidity levels in the lower river have been measured as high as 87 NTU during flood conditions. Capitol Lake also experiences elevated turbidity associated with freshwater algal blooms in summer months. Phosphorus is thought to trigger the algal blooms, and limited water exchange in the lake aids their persistence. Algal blooms form dense mats and are undesirable for several reasons: they detract from aesthetic appreciation of the lake; decaying vegetation can lead to reduced dissolved oxygen levels; and low dissolved oxygen can be stressful or lethal to fish. Noxious blooms of algae in Capitol Lake have been managed by periodic lake drawdowns that allowed for intrusion of saltwater from Budd Inlet.

Limited water exchange and circulation in Capitol Lake in summer months also contribute to an increase in water temperature. Water quality standards for surface water temperatures were established to protect sensitive aquatic species, such as salmonids. Water temperature in the North Basin is often 3 to 5 degrees Celsius warmer than in the Deschutes River and typically near or above the Class A water quality standard (18 degrees Celsius maximum) during summer months.

Pollutants in storm drains and surface waters of the Deschutes River, Percival Creek, and local watersheds can reach Capitol Lake. An evaluation of nonpoint pollution sources by the Thurston County Environmental Health Division in 1993 stated that upstream pollutant sources included agricultural, residential, forestry, and urban stormwater. The most common pollutants were fecal coliform bacteria, phosphorus, and sediment.

The possibility of reduced dissolved oxygen levels in the South Basin during late summer and early fall concerns the Washington State Department of Fish and Wildlife (WDFW), because large numbers of adult salmon return to the Capitol Lake/Deschutes River system and typically congregate in the South and Middle basins. Where there are large congregations of fish, oxygen consumption can be substantial and according to a 1975 report by Orsborn, can result in dissolved oxygen levels that are several parts per million lower than the surrounding water. Although reduced dissolved oxygen (DO) levels in the south basin are a concern to WDFW, it is unlikely that large numbers of adult chinook salmon in an open lake environment would measurably further reduce DO levels.

Adequate oxygen supply has also been a consideration in rearing juvenile salmonids in net pens in Percival Cove. In the past, the WDFW has used flow diversion baffles at the mouth of Percival Creek to divert high-oxygen-content water into their floating net pens (which lie parallel to Deschutes Parkway) to maintain adequate oxygen supplies in the cove. However, this is no longer practiced due to physical limitations caused by sediment accumulation in the cove.

Pollutant Sources

The major sources of bacterial contaminants in Capitol Lake are polluted runoff in the Deschutes River, storm sewers, and fecal material from Canada geese and other waterfowl. Livestock in the watershed are the most likely source of bacterial loading to the river itself, although failing septic tanks, storm sewers, Percival Creek waters, birds, and other wild animals are also potential contributors. Human health is the primary concern associated with fecal coliform contamination. Class A standards for surface waters, in which primary contact recreation is acceptable, allow for a maximum of 100 colonies per 100 mL for freshwaters. The Class A standards for marine waters allow 14 colonies per 100 millimeters (mL) for marine waters (geometric mean, with no more than 10 percent of all samples exceeding 200 or 43 colonies per 100 mL, respectively) and are based on protections against shellfish contamination.

Fecal coliform counts in the Deschutes River are generally low, with occasional peak values in excess of water quality standards. For the period 1992 to 1996, water samples collected from the Deschutes River at the "E" Street Bridge (approximately ½ mile upriver from South Basin) had a geometric mean of 53 colonies per 100 mL. Fecal coliform counts in excess of 100 colonies per 100 mL were found in 25 percent (3 of 12) of these samples. Data reviewed for the Wetland Development Feasibility Analysis in 1990, indicated that nearshore water samples were more likely to have higher fecal coliform levels than open-water samples. This effect was attributed to a combination of potential factors, including waterfowl activity, polluted discharge from stormwater outfalls, and reduced water exchange rates in the nearshore zone.

Localized zones of poor water quality are typically found in backwater areas during low flow periods (June through October), particularly in the South Basin. Because the majority of the flow in the South Basin is restricted to the main river channel during low flow periods, backwater channels can have poor water circulation, elevated temperatures, and reduced dissolved oxygen levels. Another indicator of and contributor to poor water quality are thick algal mats that develop only in these backwater areas.

Despite periodic standards violations, water temperature, pH, dissolved oxygen, and turbidity values usually occur within optimal ranges for fish and other aquatic life (see Table 8-2), as specified for Class A Waters of the State, especially in the lake's main channel where the river flow maintains relatively good water quality conditions even during late summer and early fall periods.

Table 8-2
Summary Water Quality Data for Capitol Lake - March to August 1983[1]

Parameter	Range	Mean	State Standard - Class A
Water Temperature (degrees CE)	8.5-21.0	15.6	Not to exceed 18.0 CE. No increases above 0.3 CE, when natural temperature is above 18.0 CE.
pH	7.3-8.6	8.0	6.5 to 8.5 and human-caused variation less than 0.5.
Dissolved Oxygen (mg/l)	7.8-12.8	10.2	Shall exceed 8.0 mg/l.
Turbidity (NTUs)[2]	2.8-23.0	5.8	Not to exceed 5 NTU over background

1. *(Entranco, 1984).*
2. Nephelometric Turbidity Units. Also note that turbidity levels have been measured as high as 87 NTU during flood conditions *(Davis, Berg and Michaud, 1993).*

Summer Lake Drawdown

Since 1971, marine saltwater back flushing has been used to limit summer algal blooms and freshwater aquatic plant growth in the lake. This is possible because of the tide gate in the North Basin, which normally maintains a barrier between the freshwater of Capitol Lake and the marine waters of Budd Inlet. It was the custom, from 1971 through 1995, for General Administration to draw the lake down (to the sill elevation at the dam at -7.0 feet MSL, if possible) at least once during the summer, and to refill it with marine water on an incoming tide. During saltwater refilling operations, saltwater influence could extend upstream into the South Basin. In the past, a practice known as bumping (stepwise drawdown) was supported by the WDFW to assist juvenile salmon to migrate out of the lake and into Budd Inlet. Saltwater flushing also helped to control the growth of freshwater plants and algae, because most freshwater species die when exposed to the high salt levels in marine water.

During 1996 and 1997, modified drawdown and saltwater backfill operations were tested. The primary goal was to limit the amount of saltwater backfilling to avoid adverse impacts to freshwater aquatic plants in the nearshore zone of the lake. This avoidance procedure was tested as a method to protect aquatic and wetland plant communities established as mitigation for Heritage Park impacts.

Monitoring results indicated that the 1997 modified drawdown was successful in limiting the vertical influence of saltwater backfilling and did not affect nearshore aquatic plant communities which was one of the goals. However, the duration of saltwater/brackish water influence in the North Basin was limited to only a few days (compared to a few weeks in historic drawdown events), and may not have had any significant (controlling) influence on aquatic plant communities in that basin. Furthermore, saltwater/brackish water influence affected only a very small area (estimated at 5 percent) of the Middle Basin, and had no influence on control of aquatic plants in the remainder of the Middle Basin (95 percent) or in the South Basin.

In addition, water quality data showed no noticeable impact on freshwater algal growth in any of the three basins. This was due to the absence of significant saltwater/brackish water influence in the Middle and South basins, and to the retention of a 1-foot to 9-foot freshwater layer in the North Basin. Since only surface water samples were collected, the results showed no impact.

It was concluded that, although modified drawdown did protect nearshore aquatic and wetland plant communities, continued implementation of the modified drawdown would have limited value in achieving either of the original objectives of reducing freshwater algal blooms or of reducing aquatic plant growth. Recent studies also have documented fish kills and water quality impacts during the modified drawdown.

Budd Inlet Water Quality

Freshwater from Capitol Lake spills over the tide gate to enter Lower Budd Inlet where water salinity is about 28 parts per thousand. The tide gate prevents Budd Inlet waters from entering Capitol Lake. Budd Inlet is well mixed vertically during winter months. During summer months, Budd Inlet is typically stratified, which means that the surface layer (stratum) in the inlet does not mix well with deeper waters. The warm, freshwater from Capitol Lake remains near the water surface in the vicinity of the tide gate without significant mixing into the water column.

Thermal and saline stratification of the water column in Lower Budd Inlet contributes to depressed oxygen levels in near-bottom waters where dissolved oxygen concentrations are commonly below 4 milligrams per liter (mg/L) in summer months. Dissolved oxygen levels below 5 mg/L (i.e., the Class B marine water quality standard) are undesirable and potentially harmful to fish and shellfish spawning, rearing, and harvesting.

Recent monitoring in Lower Budd Inlet revealed fecal coliform levels were 60 to 80 colonies per 100 mL except during periods of high rains and runoff, when levels were approximately 200 to 300 colonies per 100 mL. Waters from the Deschutes River, Capitol Lake and Moxlie Creek are the predominant sources (93 percent) of fecal coliform loading to Lower Budd Inlet. Refer to Table 8-3 for a comparison of selected water quality measurements from Budd Inlet, Capitol Lake and the Deschutes River.

Table 8-3
Comparison of Selected Water Quality Measurements

Parameter	Lower Budd Inlet	Capitol Lake North Basin	Deschutes River
Temperature (C)	13.0 - 16.5	12.7 - 22.0	5.0 - 17.3
Dissolved Oxygen (mg/L)	5.5 - 11.2[@]	8.9 - 17.5	9.4 - 14.8
Turbidity (NTUs)	1.6 - 2.8	2.2 - 6.6	1.2 - 37

Data Sources: Entranco Engineers (1984)
Ecology Ambient Water Quality Data (1984 - 1990)
Thurston County Environmental Health Division (1997)

[@]Recent monitoring from the Budd Inlet Scientific Study has shown even lower dissolved oxygen concentrations, with 2.3 mg/l near the bottom and 4.4 mg/l near the surface.

Budd Inlet Scientific Study

In 1996 and 1997, the LOTT partnership collected water quality data throughout Budd Inlet. The Budd Inlet Scientific Study Final Report (1998) was by far the most comprehensive sampling program in the south sound and resulted in a new understanding of the dynamics of the inlet and its various freshwater inputs. The following discussion summarizes the relevant data for Capitol Lake.

The first factor used to determine the accumulated loading of a pollutant is water flow. Capitol Lake was by far the main freshwater source to Budd Inlet during all months. This ranged between 80-93 percent of all fresh water entering the most southerly part of the inlet (referred to as the inner inlet) and between 72-89 percent of all fresh water entering all of Budd Inlet (referred to as the Whole Inlet). A distant second was the sum of the other creeks, streams, the LOTT wastewater treatment facility, rainfall and other wastewater treatment plants along Budd Inlet. With this much contribution to Budd Inlet, it should not be a surprise that most of the pollutants entering the inlet originate within the Deschutes River/Capitol Lake drainage.

In terms of water quality, values from Capitol Lake vary from season to season, but in a way which indicates worse water quality during the summer months. For Dissolved Oxygen (DO) typical winter values for streams and Capitol Lake were approximately 15 mg/L which then decreased slowly to approximately 11-12 mg/L during the summer and fall.

On the basis of ammonia loading, Capitol Lake was the largest contributor of ammonium to the inlet from November 1996 to May 1997. In early June 1997, its loading dropped to levels comparable to streams, due likely to the uptake by algae within the lake of the ammonium. The exception to this was during the 1997 lake drawdown which occurred in late July, when a large volume of fresh water was released from the lake causing the loading of ammonium over four days to equal the maximum loading computed for high, winter runoff conditions.

Nitrate is the predominant dissolved inorganic nitrogen parameter contained within streams and freshwater discharges. Typical concentrations within the streams and Capitol Lake ranged from 0.4-1.4 mg/L, however values from the lake dropped to low levels (<0.2 mg/L) in later July and August immediately after the drawdown. When viewed from a total nitrate loading perspective, Capitol Lake was by far the largest supplier of nitrate to the inlet in terms of loading, with the LOTT plant being the next largest source.

Dissolved inorganic nitrogen is the total pool of nitrogen used by phytoplankton to support growth. This is defined as the sum of ammonium + nitrate + nitrite. Capitol Lake dominates as the primary freshwater source of total dissolved inorganic nitrogen to the inlet with LOTT ranking second.

Phosphate is a nutrient need by phytoplankton for growth. While it is often at sufficiently low concentrations within lakes to limit algae growth, it typically is not growth limiting in marine waters. The phosphate concentrations in streams and rivers were always below 0.10 mg/L except with Capitol Lake where the levels decreased during the summer probably due to algal growth. Again, Capitol Lake was by far the most dominate freshwater source in terms of total loading to Budd Inlet.

Fecal coliforms are a type of bacteria that inhabits the guts of warm-blooded animals. These organisms may indicate the presence of fecal waste from both natural sources (such as wildlife) and anthropogenic origins (including sewage treatment facilities or septic systems). While Capitol Lake provided approximately 50 percent of the fecal coliform loading to Budd Inlet, the Moxlie Indian Creek discharge was found to represent 43 percent of the loading at a much lower flow rate than from Capitol Lake.

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CHAPTER 9 WETLAND VEGETATION

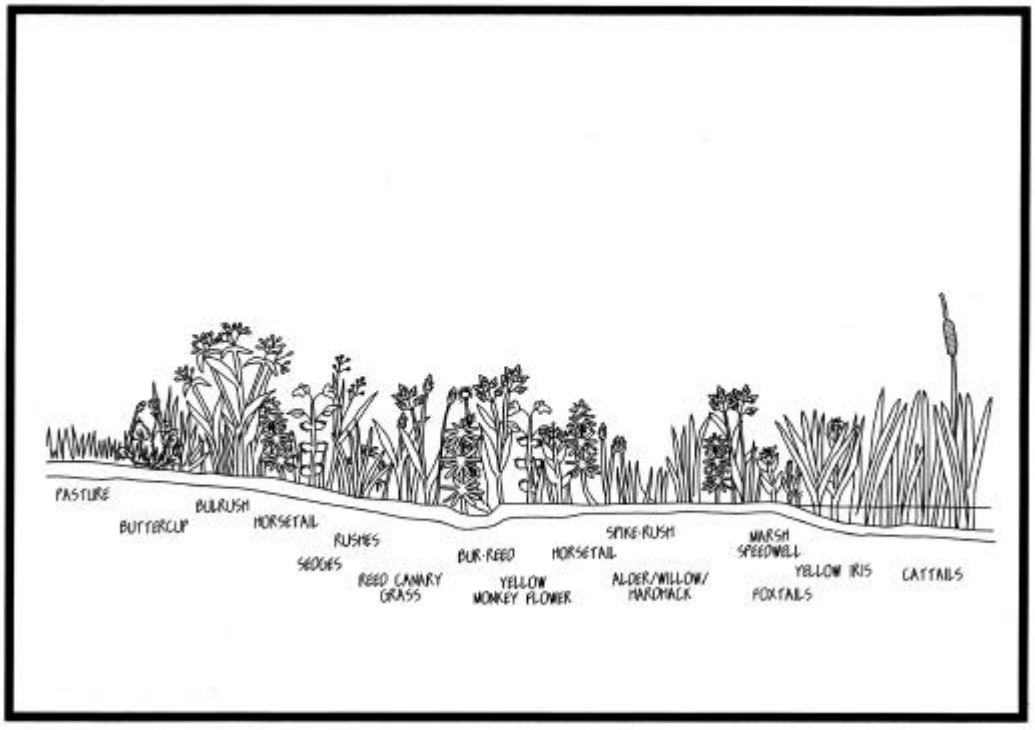


Photo 9-1. Emergent wetland cross-section.

In-Lake Vegetation

Water depth, water level fluctuations, circulation, velocity, dredging history, and salt content all play a role in what type of freshwater plant community currently exists in Capitol Lake's basins. The existing conditions reflect a plant community that has been affected by:

- Dredging of the Middle Basin in 1986,
- Dredging and dredge spoil disposal in the South and Middle Basins in 1979,
- Summer lake drawdowns and backflushing with saltwater,
- Daily and annual variations in the volume and velocity of water entering the basins from the Deschutes River, and
- Average lake level elevations between summer (higher) to winter (lower).

According to the National Wetland Inventory classification system Capitol Lake vegetation can be classified primarily as “Lacustrine.” Open-water areas of the lake contain rooted aquatic macrophytes as well as seasonal floating algal mats. The lake is fringed on most shores by emergent wetland vegetation typical of the lower Puget Sound region. Wet-tolerant scrub-shrub vegetation and freshwater forested wetlands occur either landward of the emergent

wetland or immediately adjacent to the waters edge along much of the shoreline. These vegetation communities have developed since the lake was formed in 1951. Prior to that, the system consisted of tidal mudflats with fringing tidal wetlands. There are no studies which document these conditions.

The existing vegetation communities, in and around Capitol Lake, have been described in previous reports. The communities are distributed primarily in relation to topography (elevation), which determines plant exposure to changing water levels. Normal lake levels are maintained at +6.4 feet MSL during summer months and at +5.4 feet MSL during winter months. The upland vegetation occurs above approximately +8 MSL. Shrub and forested wetlands occur at about +6 to +8 MSL, and emergent wetlands are found at about +4 to +6 MSL. Submerged aquatic vegetation is found in permanently submerged areas between approximately +2 to +4 MSL. (Refer to Figures MP-13 and MP-14 in the Map Packet.)

High turbidity appears to limit growth of submerged aquatic vegetation in portions of the lake deeper than about +4 MSL. Periodic flushing of the lake with saltwater from Budd Inlet has been used to control growth and distribution of submerged aquatic vegetation.

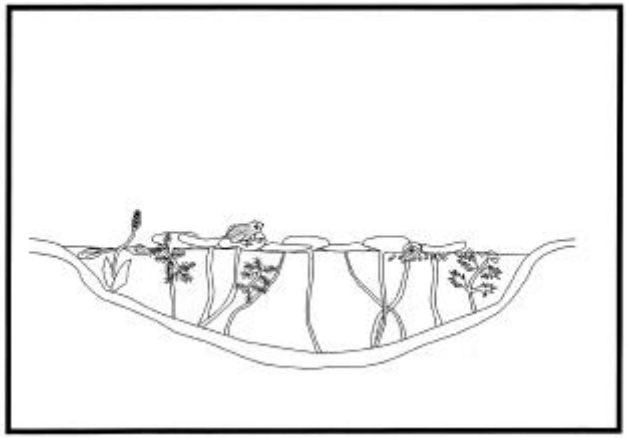
Table 9-1 provides a summary of the various wetland types by lake basin. The following descriptions conditions and Table 9-1 assumes that the Heritage Park mitigation wetland in the Middle Basin and enhanced shoreline wetland features in the North Basin are in place. Table 9-2 provides a visual comparison of these various wetland vegetation types.

Table 9-1
Wetland Vegetation Types[@]

	North Basin	**Middle Basin (& Percival Cove)**	**South Basin**	**TOTAL**
Submerged	29 acres	93 acres	3 acres	125 acres
Emergent	2 acres	13 acres	7 acres	22 acres
Scrub-Shrub	1 acres	3 acres	0 acres	4 acres
Forested	0 acres	13 acres	10 acres	23 acres
TOTAL	32 acres	122 acres	20 acres	174 acres

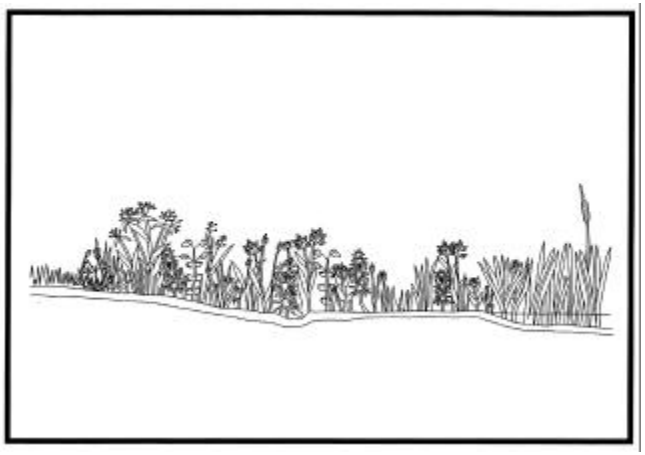
[@]Assumes Heritage Park mitigation in place.

Table 9-2
Cross Sections of Freshwater Wetlands



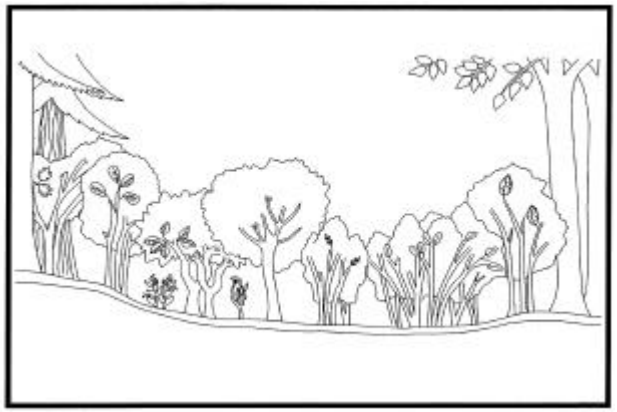
SUBMERGED AQUATIC WETLAND

Any area of open water with rooted aquatic plants (i.e., lily pads, pond weeds, etc.). Submerged aquatic vegetation does not always reach the surface.



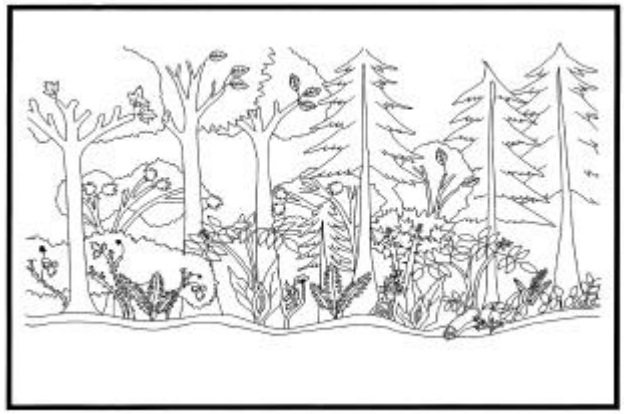
EMERGENT WETLAND

Any area of vegetated wetland where non-woody vegetation (i.e., cattails, grasses, sedges, etc.) covers at least 30% of the area.



SCRUB-SHRUB WETLAND

Any area of vegetated wetland where woody vegetation less than 20 feet tall (i.e., most species of willow, hardhack, dogwood, salmonberry, etc.) covers at least 30% of the area.



FOREST WETLAND

Any area of vegetated wetland where the woody vegetation over 20 feet tall (i.e., cedars, alder, cottonwood, hemlock and some species of willows, etc.) covers at least 30% of the area.

South Basin Wetlands

The South Basin is characterized by islands formed by sediment deposition from the Deschutes River. The southernmost of three islands is a forested wetland dominated by red alder *(Alnus rubra*) and black cottonwood (*Populus balsamifera*). Similar types of forested wetlands also form the eastern and southern perimeter of the South Basin and the riparian corridor of the lower Deschutes River. This forested wetland area has been estimated at 10 acres (not including the lower Deschutes riparian corridor). The remaining two islands in the South Basin are comprised of mixed scrub-shrub and emergent vegetation, estimated at 7 acres. The dominant plant is cattail (*Typha latifolia*), which forms a wide expanse around the islands, with other emergents (reed canary grass [*Phalaris arundinacea*] and spikerush [*Eleocharis palustris*]) along the edge. The center of the islands support a community of red alder (Alnus rubra) with willow (*Salix sp.*) and black cottonwood as a subdominant species. Since these islands are comprised primarily of emergent species, they have been classified as such in the tables and figures.

The primary submerged aquatic plants observed in the South Basin in 1997 were somewhat sparse algal mats (*periphyton*) located in shallower areas nearer shore. These mats were attached directly to the sediments on the lake bottom. The South Basin is most affected by river flows and has some riverine characteristics. It is assumed that the lack of rooted aquatic plants (*aquatic macrophytes*) is due to the faster water movement. This is also the explanation for the fact that the algal mats do not occupy the main channel of the South Basin, but instead have colonized the margins of the basin. The algae were identified as spirogyra (*Spirogyra sp*). Other algal species have been identified in previous years. Between 1971 to 1995, physical flushing during the annual summer drawdown and in some cases saltwater backflushing provided some control of these mats. During 1996 and 1997, a modified drawdown and backflushing protocol was tested. In those years, no saltwater reached the South Basin and physical flushing during drawdown was the only mechanism involved in removing algal mats from the South Basin. No drawdown was undertaken in 1998.

Few rooted aquatic plants were observed in the South Basin during the 1997 survey, those observed were mostly common waterweed (*Elodea canadensis*). (Refer to Figure MP-13 in the Map Packet.) During the 1997 survey, it was estimated that 3 acres of submerged plants (primarily algae) existed in the South Basin. In previous surveys, the rooted, submerged plant community was dominated by common waterweed and thin-leaved pondweeds (*Potamogeton pectinatis, and P. foliosus*). Annual changes in plant dominance may be a reflection of changes in flow, flood regime, and the drawdown/backflushing program. However, the total acreage devoted to aquatic macrophytes is somewhat consistent between years.

In 1995, the Tumwater sewer line to the LOTT treatment plant was broken and approximately 15,000 cubic yards of sediment and an estimated 3,000,000 gallons of raw sewage were added to the eastern shore of the South Basin. Although the sewer line was repaired, no sediment

removal or shoreline restoration was undertaken. Due to the mixing of sediment and raw sewage, these nutrients may have contributed to the submerged plant growth found in the 1997 survey.

Since 1993, the Thurston County Noxious Weed Control Agency has quarantined portions of Capitol Lake because of the presence of purple loosestrife (*Lythrum salicaria and Lythrum virgatum*). The County and the City of Tumwater have been working to eradicate purple loosestrife from wetlands in the Middle and South basins.

Middle Basin Wetlands

Freshwater wetlands currently exist along the margins of the long, somewhat narrow Middle Basin of Capitol Lake, and in Percival Cove. Percival Cove is hydrologically connected to the Middle Basin through a narrow channel at its northern end. Under existing conditions, the southwest corner of the Middle Basin contains a 12-acre wetland mitigation site. The Heritage Park mitigation site comprises the most diverse wetland complex in the basin.

The eastern shoreline of the Middle Basin is characterized by steep, forested slopes, dominated by mixed coniferous and deciduous forest, which limit the riparian wetland to a narrow band. Forested wetland exists along this nearshore margin (9 acres), and along the perimeter of Percival Cove (2 acres), and the Heritage Park mitigation wetland located in the southwest corner of the Middle Basin (2 acres). Altogether, forested wetlands occupy approximately 13 acres in the Middle Basin. Forested wetland species include; red alder, black cottonwood, western red cedar (*Thuja Plicata*), red salmonberry (*Rubus spectabilis*), blackberry (*Rubus sp.*), Indian plum (*Osmaronia cerasiformis*), with willows and cattails nearshore.

A scrub-shrub type wetland community occupies an estimated three acres in the southwest corner of the Middle Basin. This area had been used as a disposal site for spoils from lake dredging operations, and had naturally developed into a scrub-shrub, emergent wetland system. The area has been redesigned and planted as part of a wetland mitigation effort for Heritage Park. The scrub-shrub vegetation includes willow, red osier dogwood (*Cornus stolonifera*), black twinberry (*Lonicera involucrata*), Pacific ninebark (*Physocarpus capitatus*), salmonberry, red alder, and Douglas hawthorn (*Cratagues douglasii*). The forested wetland edges include red alder, big leaf maple (*Acer macropyllum*), black cottonwood, and western red cedar with an understory of scrub-shrub type plants. The riparian corridor of Percival Creek also has a fringe of scrub-shrub wetland. This is a structurally-diverse community dominated by red alder, reed canary grass, skunk cabbage (*Lysichiton americanum*), salmonberry, and Indian plum. Most of this area is outside the immediate area affected by the alternatives, and is not described or included in discussions or estimates of impacts.

The majority of the western shoreline of the Middle Basin is comprised of emergent wetlands. However, the most extensive emergent wetland area in the Middle Basin is at the Heritage Park mitigation site. There are approximately 6 acres of emergent vegetation in the main body of the Middle Basin, and 7 acres at the mitigation site, for a total of 13 acres of emergent vegetation. The dominant emergent vegetation outside of the mitigation site is cattails; however, various rushes and sedges (*Carex sp.*), reed canary grass, and purple loosestrife also exist in the emergent zone. Very little purple loosestrife is present now because General Administration has implemented an effective eradication/control program over most of the past decade. The riparian edge consists primarily of willows, spirea, blackberry, skunk cabbage, salmonberry, and others. Emergent vegetation at the mitigation site includes slough sedge, tufted hairgrass (*Deschampsia caeptiosa*), common spikerush (*Eleocharis palustris*), daggerleaf rush (*Juncus ensifolius*), yellow pond lily (*Nuphar polysepalum),* pondweed, wapato *(Saggitaria latifolia),* and small-fruited bulrush *(Scirpus macrocarpus*).

Common waterweed was the dominant submerged aquatic plant, representing 95 to 100 percent of the plant community, in the Middle Basin. Thin-leaved pondweed was present in deeper waters in the Middle Basin, but was quite sparse elsewhere. Many plants in the Middle Basin were covered with attached algae. Aerial photos of the lake, clearly depict how the river affects plant growth; bare (plant free) sediments exist along the main channel of the Middle and North basins. The submerged plant community in the Middle Basin was estimated at 93 acres; 82 acres in the main body of the basin, plus an additional 11 acres in Percival Cove.

North Basin Wetlands

Forested wetlands, dominated by red alder and black cottonwood, are to the north of the intersection of Deschutes Parkway and the railroad tracks. However, this wetland community is not expected to be affected by the alternatives, and therefore has not been included in descriptions of impacts or estimates of acreage of wetland communities. There is no existing forested wetland in the immediate (affected) vicinity of the North Basin, and only a small scrub-shrub wetland (< 0.5 acre) is located in a small depression a few hundred feet from the shoreline.

The southeastern shoreline of the lake, adjacent to Heritage Park includes constructed and enhanced emergent wetland sites. This includes a narrow band of emergent wetland and a small island of cattails along the southeastern shoreline of the basin (approximately 2 acres). These wetlands have a mix of emergent vegetation that can tolerate water fluctuations. These include slough sedge, common spikerush, daggerleaf rush, small-fruited bulrush, tufted hairgrass, wapato, yellow pond lily, and pondweed. The majority of the remaining shoreline of the North Basin is abrupt and has little emergent vegetation, other than a few small patches of cattail and willow.

The submerged plant population in the North Basin was entirely dominated by common waterweed during the 1997 survey. Similar to the Middle Basin, plant growth was denser in deeper water further from shore. As described for the other basins, the plant community composition in 1997 was not the same as observed in past surveys. It is not known why common waterweed currently dominates the plant community; this dominance possibly results from the modified drawdown and backflushing regime used in 1996 and 1997.

Overview of Lake Wetlands

Forested wetland in the three basins accounts for approximately 23 acres in perimeter areas around the basins. Forested wetlands consist primarily of red alder, black cottonwood, and western red cedar with Douglas Fir and an understory of willows, alder, Indian plum, salmonberry, and blackberry. Scrub-shrub wetlands occupy 3.5 acres, dominated by red alder and willow. Emergent vegetation occupies another 22 acres, dominated by common cattail.

Although the types of submerged aquatic plant appear to change due to influences from the river and other factors, the acreage supported by submerged plants is fairly consistent. According to the 1997 survey, an estimated 3 acres of the South Basin (12 percent) contained in aquatic plants. The Middle Basin had 82 acres (68 percent) and the North Basin 29 acres (29 percent). This, plus the additional 11 acres in Percival Cove, represents a total of 125 acres of submerged aquatic plant habitat under existing conditions.

Under existing conditions, logs and root wads are frequently carried into the lake by the Deschutes River. Much of this large woody debris is trapped in the South and Middle basins, and some is carried into the North Basin. In the North Basin, General Administration has installed a log boom upstream of the Capitol Lake dam and tide gate to intercept any logs or root wads to avoid possible damage to the tide gate. Periodically, General Administration removes and disposes of this material so that it doesn't impact the tide gate or recreational activities in the lake.

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CHAPTER 10 WILDLIFE

Photo 10-1. Geese and other waterfowl along Percival Cove. c. Summer, 1998.
Courtesy of Thurston County Water and Waste Management Department.

Wildlife in the City

Wildlife species use and distribution in an area is determined primarily by availability of food, water, and cover appropriate to the species. The presence or absence of these physical characteristics determines whether or not appropriate nesting, rearing, foraging, and resting habitat is available for a particular species of wildlife.

The species richness-the number of different species found in a defined area-and the abundance of a species in an area are influenced by the diversity and size of habitats. Habitats that are large in area, and rich in plant species and vegetation structure, generally have a greater richness and abundance of wildlife. Habitats with few plant species and uniform vegetative structure tend to have a lower richness and abundance of wildlife.

Habitat Around Capitol Lake

Wildlife observations in the Capitol Lake area and wildlife occurrences documented in the literature, were reviewed to determine the species using habitat in and around Capitol Lake. A 1977 list of probable wildlife species was prepared from a literature review. This list was amended in 1997 by the Heritage Park EIS and these findings are the basis for the following discussion of species.

The general classes of birds that were observed include dabbling ducks, diving ducks, Canada geese, shore birds, perching birds, and raptors. Mammals that were observed include deer, muskrat, beaver, mink, otter, striped skunk, raccoon, voles, mountain beaver, fox, deermouse, bushytail woodrat, mole, sea lion, and bats. Other wildlife reported to be present in the area include chipmunks, frogs, turtles, snakes, lizards, crayfish, and snails.

The U.S. Fish and Wildlife Service (USFWS) reports that the bald eagle (*Haliaeetus leucocephalus*)-federally listed as a threatened species in accordance with the endangered species act-occurs in the vicinity of Capitol Lake. Bald eagles have been observed perching in mature trees along the South Basin of Capitol Lake near the Tumwater Historical Park and along Percival Cove. It was also noted that the birds occasionally seen there are accustomed to the relatively busy environment, given the proximity of Interstate 5 and human activity in the park. Bald eagles and peregrine falcons also have been sighted hunting in the lake, but no nesting sites have been identified within the lake basin.

The USFWS has identified three "Species of Concern" as possibly occurring in the vicinity. "Species of concern are those species whose conservation standing is of concern to the USFWS, but for which further status information is still needed." These species of concern include the long-eared bat (*Myotis evotis*), the long-legged bat (*Myotis volans*), and the Pacific Townsend's big-eared bat (*Corynorhinus townsendii townsendii*).

The Washington State Department of Fish and Wildlife (WDFW) priority habitat and species program database was reviewed to identify wildlife species and habitats requiring protective measures and/or management guidelines in the lake basin. The database indicated that State species of concern documented in the area include the purple martin, the green- backed heron, the great egret, the wood duck, and mink.

The purple martin is a candidate species, which means that WDFW is sufficiently concerned about the status of this species that it is conducting additional studies to determine if it should be listed as a sensitive, threatened, or endangered species. "Federal Candidate species are evaluated individually to determine their status in Washington and whether inclusion as a priority species is justified."

The green-backed heron is a state-monitored species, which means that it is being monitored by WDFW to preclude it from becoming a rare, threatened, or endangered species. The great egret also has been observed in the Budd Inlet vicinity and is a state-monitored species. Data are kept on wood duck and mink because they are game species.

Current impacts to wildlife include periodic disturbances from dredging of the Middle Basin and Percival Cove, the construction of the Arc of Statehood bulkhead, an annual summer lake drawdown with modified saltwater flushing, and occasional lake drawdowns to increase flood storage. Dredging activity and noise may cause waterfowl to temporarily move to areas with less disturbance. Drawdown of the lake temporarily reduces open-water habitat available to waterfowl for resting and feeding. Other disturbances to wildlife at the lake include urban noise, human activity, and predation from domestic pets.

Nuisance Canada Geese

In 1997, the domesticated and resident Canada goose population around Capitol Lake became much more noticeable. General Administration employees had just refurbished the lawn at Marathon Park and although the temporary chain link fence kept out the geese, it would soon be coming down. The resident population of geese and ducks has found the grasses along Percival Cove and Deschutes Parkway to be especially inviting. Joggers often find themselves skipping around a gaggle which has set up to graze and fiercely defend any intrusion into their territory. Lunchtime visitors to Capitol Lake Park have found themselves outnumbered by these avian lawn mowers who feed by pulling out the grass, roots and all so they almost defoliate the park. But, one of the most endearing reminders of who currently rules these public spaces are the slippery and stinky calling cards which keep children from romping through the grass.

Although no local, State or Federal agency keeps track of Canada goose populations on local lakes, national trends indicate that urban goose populations are on the increase. Canada geese living along the Atlantic Flyway have reportedly increased from about 140,000 to over 1 million birds in the period from 1989 - 1996. At the same time, only 250,000 geese actually migrated to Canada, according to Federal and state wildlife agencies. So where did all of these non-migratory or "resident" geese come from?

A century ago, hunters on the East Coast used to tether Canada geese as live decoys. Goslings from those birds never learned how to migrate and their descendants now live on. It is reported that the US Fish and Wildlife Service (USFWS) also brought non-migratory geese to bird sanctuaries. But the major factor may simply be the birds' adaptation to a changing habitat. As urban and suburban development claimed more lakes and wetlands as prime real estate, that natural habitat has been replaced with lawns, parks and golf courses. Prime goose habitat! With many urban areas off limits to hunting and lacking any natural predators the migratory ways of the geese changed to one of a year round resident. Resident geese do fly short distances in response to the seasons and to get food, but do not migrate. In 1989 and 1990, a total of 580 Canada geese from the Seattle metropolitan area were trapped, banded and relocated to sites along the Snake River in Idaho. In 1991 the relocation program was expanded to include 2,654 geese. However, the results of this capture and relocation program were mixed. Concerns have been raised regarding over- saturation of the natural habitats along the river. Also, it appears that once the goslings have imprinted on grassy lawns as their prime food source, it's too late for them to change their diet. So instead of migrating, the transplanted goslings just invaded the parks and grassy spaces up and down the Snake River.

Local Canada Goose Population

Thurston County first became aware of waterfowl population concerns in 1991, with complaints from the residents of Ken Lake, Scott Lake, Lake St. Clair and others. The records of resident Canada goose population records within Thurston County are limited. In 1997, two Thurston County lakes were surveyed by the United State Department of Agriculture (USDA). The first, Long Lake, is situated within "The Lakes" region of Lacey with four smaller and hydrologically interrelated lakes. Lake Lawrence, in comparison, is located in southeastern Thurston County and is the largest lake in a series of smaller but more isolated lakes. However, both lakes have extensive numbers of shoreline residences at approximately the same density. At Long Lake, the USDA survey found 190 geese of which 30 percent were goslings. This compared to Lake Lawrence, with 60 geese, of which only 20 percent were goslings.

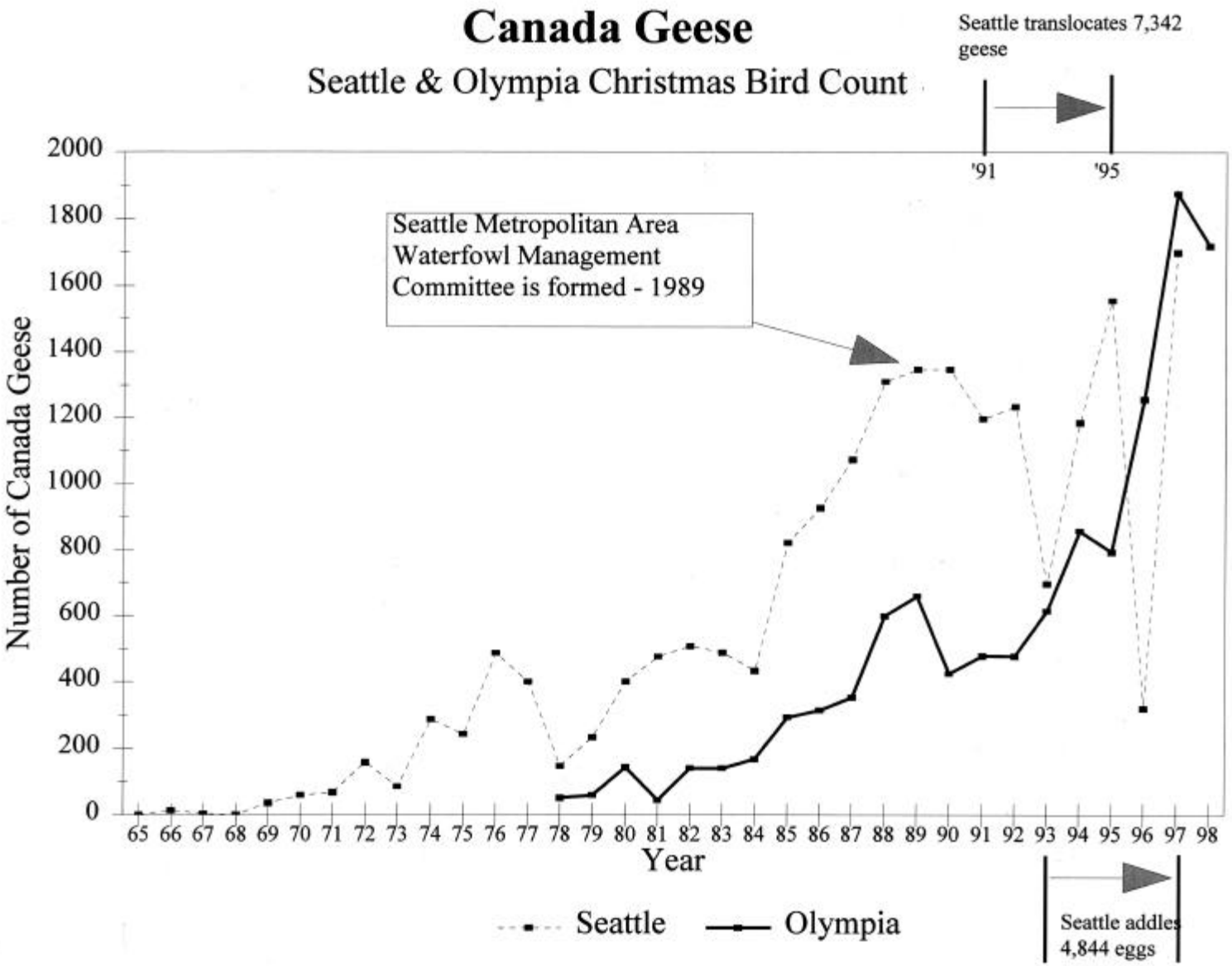
A completely unscientific survey of Canada geese in early June 1998 found 466 geese on the lake compared to less than 50 in February 1998. There were 94 geese at Marathon Park, 173 at Tumwater Historical Park and on the water in the South Basin and 199 geese at Percival Cove being near the Percival Creek Bridge and on the middle basin of the lake. There was construction at Heritage Park so no geese were found there. Of these, the survey showed 13 goslings near the Percival Creek bridge (actually on the slope) and another 23 goslings at Tumwater Historical Park. Goslings represented only 8 percent of the total number of geese, which is lower than at other local lakes.

Newly discovered data from the Audubon Society Christmas bird count has surfaced for Seattle and Olympia. Table 10-1 indicates that the number of resident Canada geese in the Olympia area was greater in 1997 than Seattle's population. Also, more concerning is the fact that the Canada goose population for Olympia increased by more than 600 adults between the 1996 and 1997 surveys.

Canada Goose Impacts to Water Quality

Literature on public health and water quality indicates that in general, waterfowl is not a serious public health threat. However, geese can contribute to the organisms which cause "swimmer's itch," and in large populations waterfowl can degrade the water quality within urban water bodies. A 1985 report on Lake Ballinger in Mountlake Terrace indicated that 12 percent of the phosphorus loading was due to waterfowl. However, a 1993 study of Seattle's Green Lake estimated that 52 percent of the annual phosphorous budget of that lake could be traced to waterfowl.

Table 10-1


Canada Geese
Seattle & Olympia Christmas Bird Count
Seattle translocates 7,342 geese
'91
'95
Seattle Metropolitan Area Waterfowl Management Committee is formed - 1989
Number of Canada Geese
0
200
400
600
800
1000
1200
1400
1600
1800
2000
65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98
Year
Seattle
Olympia
Seattle addles 4,844 eggs

Capitol Lake is on the Washington State Department of Ecology 303d list of Impaired or Threatened Water Bodies due in part to excessive fecal coliform levels from a variety of sources. Even though a goose weighs significantly less than a human, it produces 60 percent more feces per day, while generating 30 percent less fecal coliform bacteria per gram of feces. So in human terms, the number of fecal coliform bacteria produced by 100 geese per day is approximately equivalent to 54 humans.

Waterfowl pollution was not identified as a serious water quality problem in the Budd Inlet Deschutes River: Watershed Action Plan, which was adopted by the Washington State Department of Ecology in 1995 and includes Capitol Lake. The Capitol Lake Restoration Analysis report prepared in 1984 for General Administration contained a nutrient budget for the lake. That report estimated that the "bird population utilizing Capitol Lake is the equivalent to 500 to 1,000 annual residents." Further, the amount of phosphorous loading due to "birds" on an annual basis has estimated to only be 1.3 percent.

Without an accurate baseline population of resident or migratory waterfowl using Capitol Lake, it will be difficult to determine if current nutrient loading is higher than in 1984. However, if the resident goose population has increased in recent years, then this could represent a significant new source of nutrients. High levels of nutrients can lead to excessive algae and aquatic weed growth, which in turn can adversely affect recreation and water contact activities. These activities have been adversely affected in Lake Lawrence and Long Lake. Capitol Lake is also on the 303d list due to excessive levels of phosphorous, a component of goose droppings.

Possible Canada Goose Management Techniques

There are basically four techniques to managing nuisance goose populations, which include:

1. Habitat Modifications and Barriers,
2. Scare and Harassment Techniques,
3. Birth Control and Hunting, and
4. Public Education.

Habitat Modifications and Barriers

Habitat modifications can involve the establishment of tall grass or wetland vegetation around the perimeter of the open water. Instead of flying, geese normally walk between open water and feeding areas. This is the situation at Capitol Lake Park and along Deschutes Parkway. At Percival Cove, geese even cross the street to feed on the grass next to the sidewalk, but always return to Percival Cove. Resident geese appear to congregate in only a few areas along the lake. They are also not hiking up the steeper slopes of the Deschutes Parkway to graze on other patches of grass.

Geese like open landscapes where they can see their predators. So the landscaping or barriers need to be located along the shoreline where the geese are transitioning from walking to swimming. Low dense shrubs (such as junipers), uneven surfaces (such as lava rock) longer grass and even a two foot high fence can be effective barriers to geese. Existing expanses of grass along the shoreline could be allowed to grow higher than the geese like, or converted to less desirable ground covers (such as pachysandra, periwinkle, and enouymus). Finally, to be entirely effective, no gaps in the fencing or landscaping barrier can be allowed.

Some promising new alternatives are in the development and early market phase. These involve making grass undesirable to the geese. The USDA is exploring ways of creating compounds which could treat grass so that it was nauseating to the geese. One of the compounds is naturally occurring in citrus fruits, methyl anthranilate. It is enjoyed by humans but detested by geese. Other compounds being tested would cause a narcotic effect in the birds.

Another option to consider is limiting the good nesting site locations. If waterfowl populations are an existing problem, then it would therefore not be advisable to create small islands or peninsulas which would increase the nesting opportunities. Making existing nesting areas unavailable for birds is an option, but requires a permit from the USDA. And before such a permit is issued, the applicant must demonstrate that nonlethal habitat management techniques were unsuccessful in controlling damage.

Scare and Harassment Techniques

"Goosebusting" is providing new employment opportunities for parks, golf courses, commercial business parks, homeowners associations and airports as resident geese become a serious problem. Scare and harassment techniques include a long laundry list which includes: rubber snakes, Mylar tapes, loud speakers, high frequency sound devices, swan decoys (tried at Marathon Park), owl decoys, live swans, potato guns, scare eye balloons, geese distress calls, trained and untrained dogs, remote control boats (tried in the 1980's in Percival Cove to reduce fish predation), propane cannons, and pyrotechnic guns.

While passive measures are the easiest to implement, the literature indicates that they have a relatively low degree of success. It appears that most communities with serious problems are relying on trained dogs to harass geese. In 1998, the City of Kirkland, Washington allocated $50,000 to try some new techniques. The first is a new grass treatment product called "Turf Shield" which claims to adhere to the grass better than the product "Reject It." The Park Department has also decided to hire two border collies to keep the geese out of the city's numerous parks along Lake Washington. In locations which have tried all the other measures, dogs have reportedly reduced the resident goose populations by up to 80 percent. However, the fundamental problem of too many geese is not addressed. And it then becomes someone else's nuisance. This is why an isolated success may be possible, within a resident population which may still be increasing.

Ken Lake Case Study

One local success story is Ken Lake in Olympia. The 24 acre lake lies within the Capitol Lake watershed and is only 1.25 miles from Capitol Lake, as the goose flies. The entire lake is surrounded by single family residences on 1/4 acre sized lots. There are also two small homeowner association parks on the shoreline. In 1990, Ken Lake residents estimated a resident goose population of 20-25, which increased to 45-50 in 1991. A trapping and release program was first used on the lake, but has been discontinued due to lack of suitable relocation sites. Current management efforts at the lake include the use of noisy fire crackers set off as the geese are about to land. Diligence is required and 4 - 5 retired residents around the lake are able to scare the geese away. Success is largely due to this community effort and 24 hour-a-day presence on the lake.

Birth Control and Hunting

Canada geese are protected under the Migratory Bird Act of 1918 (50CFR) which also protects other migratory waterfowl. Individual states negotiate hunting seasons for Canada geese, but outside the hunting season, the birds are strictly protected. However, non-migratory waterfowl or "resident" geese are not protected. Many states on the Eastern Seaboard have adopted special hunting seasons aimed specifically at these resident flocks, but the long term effectiveness of this approach is inconclusive. However, most resident goose populations are located within urban areas and close to people, locations where hunting is prohibited.

After the earlier goose relocation program, the Seattle area began an "addling program" to deal with eggs in the nest. It first involved shaking the egg to kill the embryo and then replacing it in the nest. This was replaced with the use of a mineral oil spray that suffocates the embryos. Eggs are always returned to the nest, because if they were removed, the goose would lay another to replace it. If only addling is done, then the goose population would remain stable for the short term and only slowly decrease as natural mortality reduces the number of adults.

Although labor intensive, this approach offers the highest degree of population growth control. The USDA has been implementing the Seattle area program. In 1997, such a program was evaluated by Thurston County for Lake Lawrence and Long Lake but was rejected at that time. Further, the *Thurston County Pest and Management Policy* does not have any guidance for addressing nuisance geese.

Some jurisdictions also rely on "roundups" of resident geese. These are scheduled during the molting season (May - July) when the birds loose their flight feathers. Workers corral the geese and send them off to the slaughterhouse. Then local food banks receive a supply of goose burgers and goose breasts. However, such public events may rally animal rights advocates, which can result in protests and other media catching events.

Thurston Waterfowl Management Steering Committee

The Waterfowl Management Steering Committee includes a coalition of the federal, state, county and city officials, Black Hills Audubon Society, the Lake Improvement Association, citizen activists and General Administration. The City of Lacey will be the lead entity for financial and contract management purposes. Work has begun to develop an extensive monitoring plan for this summer utilizing volunteers to calculate an accurate resident goose population count and survey their migration patterns around the county. The regional goose committee is also working on a Request for Proposal and budget to hire a consultant who will prepare the management plan.

Public Education

In many instances, the major attraction for geese is the supplemental food offered by people to attract and keep the birds coming back for more. The USDA recommends that "if geese are a problem, then all feeding should be discontinued to force the birds to revert to natural food sources," which in many cases means they will move elsewhere. The USDA also notes that "nuisance goose control techniques will not work in areas where goose feeding is allowed to continue."

In 1991, a picture in The Olympian newspaper of a child feeding the geese at Tumwater Historical Park elicited a letter to the editor. The letter was authored by a Ken Lake homeowner. It described the issue as a countywide problem and recommended that as a first action "we need an education program that explains to our county residents that we have a problem and explain why people should not feed geese." The letter also recommended that the Thurston County Commissioners pass a law, similar to that of Mountlake Terrace, which makes it illegal to feed the geese.

The fine in that community is $300 and is an important part of their waterfowl management program for Lake Ballinger. This issue played out in the community and print media, and no local jurisdiction in Thurston County has adopted such an ordinance. Many communities around Seattle have posted "Do Not Feed the Geese" signs but there are no reports on how affective these have been in changing people attitudes or actions. 20:lb

APPENDIX A

Memorandum of Agreement

On January 21, 1997 seven parties listed below agreed to participate and develop the **Capitol Lake Adaptive Management Plan**. This Memorandum of Agreement (MOA) includes "Adaptive Management" principles and the following:

1. Organizing Principles: The parties agree to engage in a collaborate process in the development of the management program. This process will build on earlier studies and planning efforts and be characterized by trust, coordinated involvement by jurisdictions, agencies and the public, collaboration, consensus decision making, sharing of responsibility for planning and management actions, and an understanding that as new data is introduced, the process should be adjusted accordingly (Adaptive Management).

2. Formation of Committees: The parties agree to form a Steering Committee to meet periodically to provide direction and assistance to the planning process and validate the management approaches and study plans developed. Steering Committee members will be senior officials representing the respective organizations. A standing technical committee will also be formed to develop technical study proposals and lake management strategy options.

3. Planning Process: The parties agree to formally initiate the planning process in January 1997 and attempt to complete the first round of intensive community planning by the end of September 1997, culminating in an adaptive management plan by early 1998. This will include phases complementing the Heritage Park permitting process during January through May, and developing technical strategies form March through September. The adaptive management plan developed in the first calendar quarter of 1998 will be re-evaluated every two years through 2004 and every five years thereafter.

4. 1997 Lake Management: The parties will initiate an adaptive management process to include testing alternative strategies for lake management. The first priority will be to develop a set of evaluation objectives for the 1997 lake activities. The parties also agree that if no alternative strategy is agreed to for testing by June 30, 1997, then the lake will be managed on the basis of the 1996 strategy for this year.

5. Agency and Jurisdiction Participation: The parties agree that their participation in the planning process will be fully coordinated within the respective organization by a designated senior official, that they will provide technical support as resources permit, that they will clarify or reconcile policy or programmatic differences that might exist within their organization so that the organization's position is clear and official, that they will anticipate and facilitate the resolution of any regulatory issues which may

develop during this planning effort or its ultimate implementation, that they will help ensure that the planning and SEPA products that are developed during the process will meet regulatory requirements for future management actions, and that they will maintain objectivity while exploring new ways of doing business.

6. Heritage Park Permitting: The parties agree that this process resolves concerns raised during the Heritage Park permit pre-submission discussions, that they will work together during the permitting process to ensure that the permit decisions are made in a timely manner, that all issues of theirs and others are fully coordinated, and that conditions attached to any permits will be consistent with an adaptive lake management program and vice versa.

Signed by:
WA State Dept of General Administration
WA State Dept of Ecology
WA State Dept of Fish and Wildlife
Squaxin Island Tribe
City of Olympia
City of Tumwater
Thurston County

Agencies Invited by Steering Committee:
WA State Dept of Natural Resources
Port of Olympia

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APPENDIX B

Adaptive Management Plan Ground Rules

1. Steering Committee Membership

The Capitol Lake Adaptive Management Plan (CLAMP) Steering Committee includes the following members:

Richard Blinn	Thurston County
Jeff Dickison	Squaxin Island Tribe
Andrea Fontenot	Port of Olympia
Grant Fredricks	WA Department of General Administration
Sara LaBorde	WA Department of Fish and Wildlife
Sue Mauermann	WA Department of Ecology
Margaret McPhee	City of Olympia
Chris Parsons	City of Tumwater
Howard Thronson	WA Department of Natural Resources

2. Steering Committee Meetings

a. Except for June and July of 1997, the CLMP Steering Committee will meet the 1st and 3rd Thursdays at 8:00 a.m. in Room 207 of the General Administration Building unless other arrangements are made.
b. Public Forums will be held at the General Administration Auditorium or another appropriate location and will be scheduled as needed.
c. Other special meetings will be scheduled as needed.
d. All meetings are open to the public and anyone with an interest in the process is invited to attend.
e. The first 5 minutes of the meeting is reserved for public comment.

3. Responsibilities of Chair/Vice-Chairs (Co-Chairs)

a. The Chair, Grant Fredricks, will conduct the committee meetings and public forums. Chris Parsons will serve as the Vice-Chair in the Chair's absence.
b. The staff will work with the committee chair and vice-chair to establish the agenda for committee meetings and public forums.
c. The chair or his/her appointee shall represent the committee at other meetings or functions as directed by the committee.

4. Responsibilities of Staff

   a. Staff to the Steering Committee will be Steven Morrison of Thurston Regional Planning Council (TRPC) and Gary Larson for the Department of General Administration (GA).
   b. TRPC staff will be responsible for meeting organization, presentations, minutes, mailings, map and text drafting, and other duties as directed by the committee.

5. Technical Advisory Committee Membership

   a. Technical personnel representing the jurisdictions of the Steering Committee will meet as required to provide input to the Steering Committee.
   b. Each Steering Committee member will provide a list of persons who could provide technical assistance to this planning process on at least the following major issues:
      - Sedimentation
      - Drawdown
      - Fisheries Habitat
      - Water Quality
   c. Other technical assistance may be requested of the Steering Committee members on a case by case basis.

6. Committee Process

   a. Water pistols, water cannons and water balloons are to be left a home or checked at the door before meetings.
   b. All participants in this planning process bring with them the legitimate purpose and goals of their organizations. All parties recognize the legitimacy of the goals of others and assume that their own goals will also be respected. These discussions will try as much as possible to maximize attainment of all the goals of all the parties.
   c. A commitment is made to attempt to reach consensus on a plan for Capitol Lake.
   d. All issues addressed by any party must be addressed by the whole group.
   e. The same priority will be given to solving the problems of others as you would give to solving your own.
   f. A commitment is made to listen carefully; ask questions to understand and make statements to explain or educate.
   g. All participants accept the responsibility to keep their friends and associates informed of the progress of the discussions.
   h. A commitment is made to support and implement a Capitol Lake Adaptive Management Plan in an agreed upon final form.
   i. Participants agree to check rumors with the chair and/or staff prior to acting.

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