

Capitol Lake
RESTORATION



**Committee Report and
Proposed Action Plan**

JUNE, 1988

CAPITOL LAKE ACTION PLAN

June, 1988

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PREFACE

The Capitol Lake Restoration Committee has prepared this report and proposed action plan in order to provide a starting point for discussions between all affected jurisdictions and agencies. These discussions will ultimately lead to a formal agreement which will guide future activities affecting Capitol Lake.

Because Capitol Lake is an ever-changing ecosystem, we envision that this action plan too will evolve as more information and new technology becomes available to help solve our water quality problems.

One thing we do not expect to change, however, is our commitment to assuring that Capitol Lake is preserved for public enjoyment and improved for future generations.

INTRODUCTION

I. INTRODUCTION

A. Formation of Restoration Committee

In early 1986 the City of Olympia, the City of Tumwater, Thurston County and State Government entered into an agreement to develop a long-range action plan to clean and preserve Capitol Lake. These jurisdictions were concerned that Capitol Lake, a highly-valued public resource, was increasingly threatened by surrounding urbanization. The jurisdictions agreed to cooperatively develop a program for Capitol Lake that would ensure the enhancement of the natural, economic and recreational benefits for this generation and those of the future. The agreement created a committee of representatives from each jurisdiction to determine the level of clean-up which would be reasonable for Capitol Lake and which would be practical for the participants to achieve. The objective was to formulate a long-range Management Action Plan which, if followed, would achieve and sustain the established clean-up goals. The committee intended to use existing studies and information in their work rather than commission new studies or investigations.

The committee included the chief administrative officials from Olympia, Tumwater and Thurston County, a member of the Governor's staff and an Administrator from the State Department of General Administration. The committee met from April 1986 through November 1986 to review past studies and consider technical reports and recommendations from a variety of interested agencies and individuals.

The work of the committee has culminated in this long-range Management Action Plan. This action plan will be submitted to all involved jurisdictions: Tumwater, Olympia, Thurston County, and the State of Washington. The course of action set out in the plan for the cleanup, restoration, and preservation of Capitol Lake and its tributaries will be the starting point for discussions between the jurisdictions. These discussions will lead to an agreement(s) setting a desired clean-up goal and a management action that defines responsibilities, roles, expectations, and expenditures.

B. History of Capitol Lake (Written by Ken Conte)

Less than 40 years ago, the Deschutes River Basin in the vicinity of Olympia and Tumwater consisted of tidal mud flats and tidelands. When Washington achieved statehood in 1889, the state became the owner of all the tidelands which had previously been held in trust by the federal government. The next year, the first legislature of the state authorized the state to sell tidelands into private ownership. The state was required to plat the tidelands prior to the sale and under this requirement the Deschutes River Basin was platted in the early 1890's. A number of platted parcels in the basin were subsequently sold until the mid 1930's.

In 1911, architects Wilder and White developed a Capitol Campus design for the state. This design included the formation of what is now called Capitol Lake. The proposed design went largely unnoticed until the World War I era, when State Senator Doc Carlyon became an active advocate for development of the lake.

During this time, a shanty town (Figure 1) had been constructed on the eastern shore area of what was to become Capitol Lake. Because it was an eyesore and health hazard, the City of Olympia dismantled it and burned it down in the late 1930's or early 40's.

1. Development of the Lake

In 1937, the legislature enacted Chapter 139 providing for the development and extension of the State Capitol grounds. This legislation initiated the Deschutes Basin Project calling for the creation of an artificial lake by constructing a dam near the present Fourth Avenue in Olympia through purchasing or condemning tidelands, as necessary. The improvements were intended to become part of the Capitol building and grounds. Under this Act the state began purchasing back the tideland parcels which were previously sold. Most of the parcels were purchased by 1954, although one was purchased as late as 1978.

In 1947, the legislature authorized a bond sale of up to \$1,000,000 to complete the Deschutes Basin Project. Included in this bond sale were final acquisition of the lands, completion of the dams, construction of the parkways surrounding the new lake, activities to preserve the banks of the basin, and development of access to the water for recreation. In 1951, the Fifth Avenue dam was completed and Capitol Lake was formed. (Figure 2).

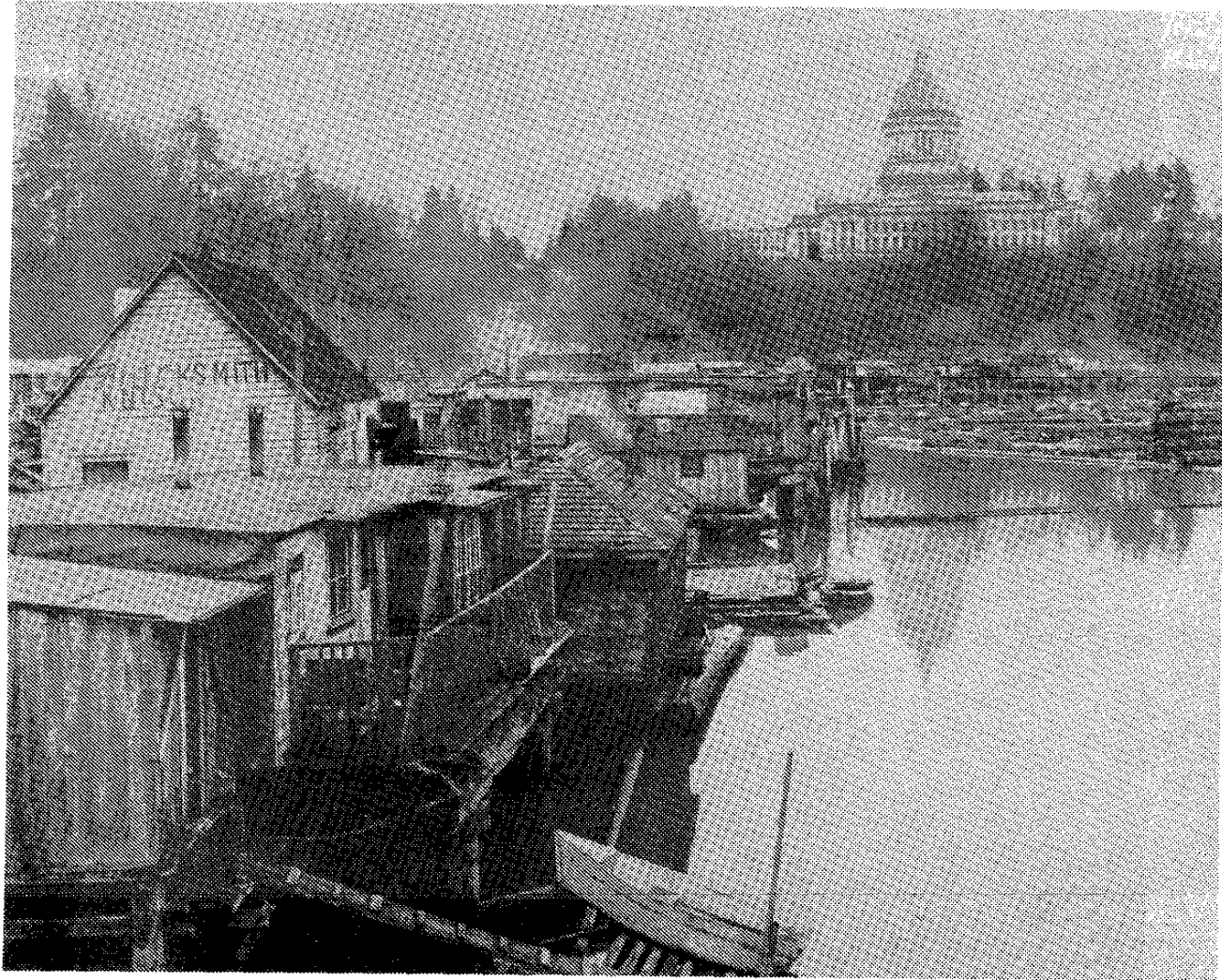
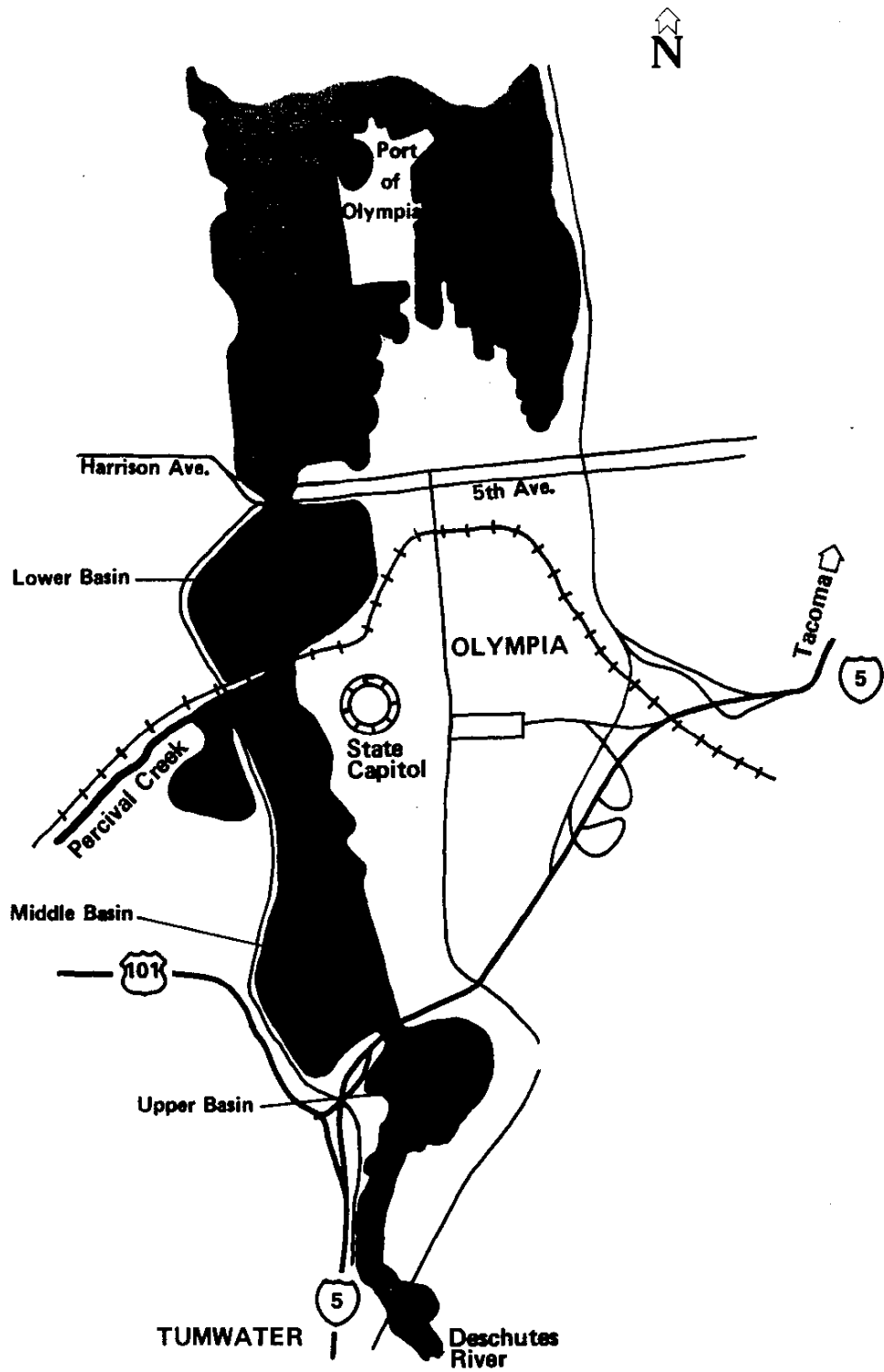


FIGURE 1. "Little Hollywood" in the shadow of the State Capitol, on the shore of what was to become Capitol Lake. (Photo courtesy of Susan Parrish, from the Vibert Jeffers Collection.)

Figure 2

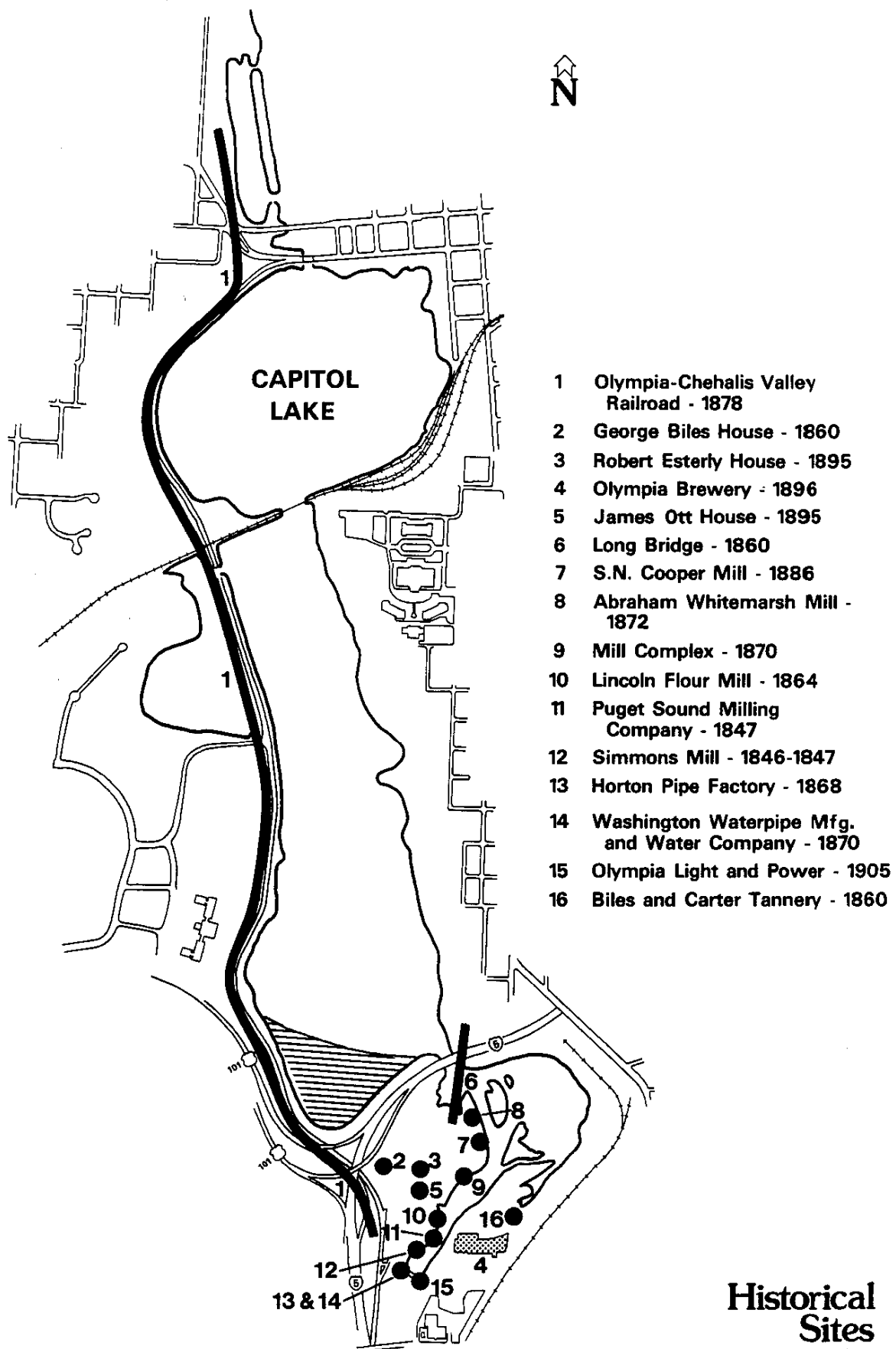


Vicinity
Map

Capitol Lake covers about 300 acres, has 4 miles of shoreline and is divided into 3 basins. The lower basin is adjacent to downtown Olympia; the middle basin is the largest segment and connects with Percival Cove and Percival Creek; and the upper basin is primarily Tumwater and is separated from the middle basin by fill from construction activities on Interstate 5. Most of the lake is owned by the state. As an extension of the state Capitol Campus, the Lake provides an attractive setting for Washington's governmental seat. Because most of the Lake's shoreline is publicly owned and remains undeveloped, numerous recreational activities take place in and around its waters. The Lake is one of the state's most important fish-rearing impoundments and the annual fall migration of spawning chinook salmon draws crowds of spectators. The Lake's diverse terrestrial and aquatic vegetation provides abundant habitat for wildlife making it a valuable biological resource in an urban setting. (Figures 3 and 4). Most importantly, the Lake has become an aesthetically valued and integral part of the State's Capitol Campus.

The Lake's location also has historic and archaeological significance. Lying at the northern end of the Oregon Trail, the area contains artifacts from the first American pioneer settlements north of the Columbia River. The remains of early Indian fishing and hunting villages also are evident. (Figure 5.)

Figure 3



Historical Sites

Figure 4

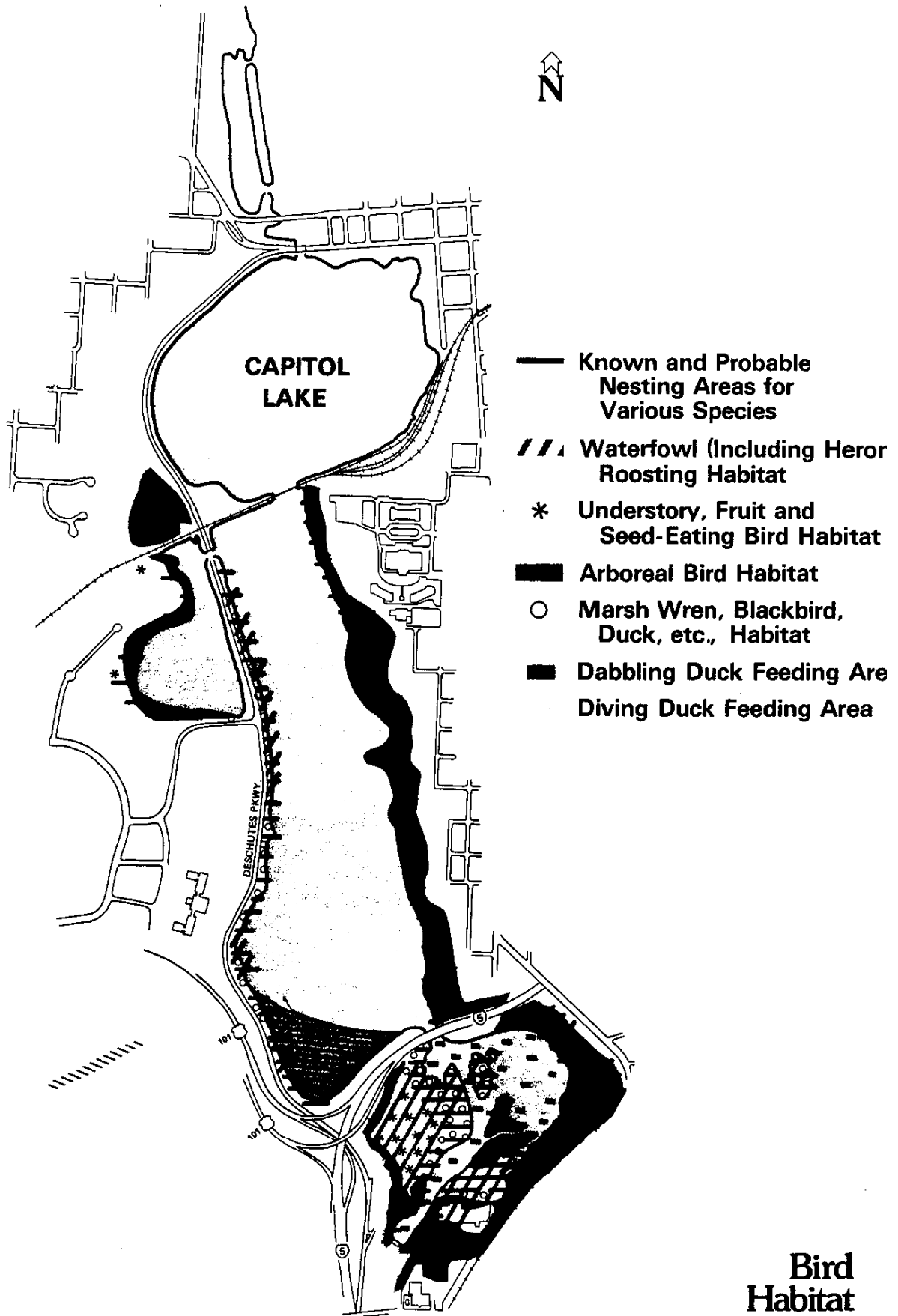
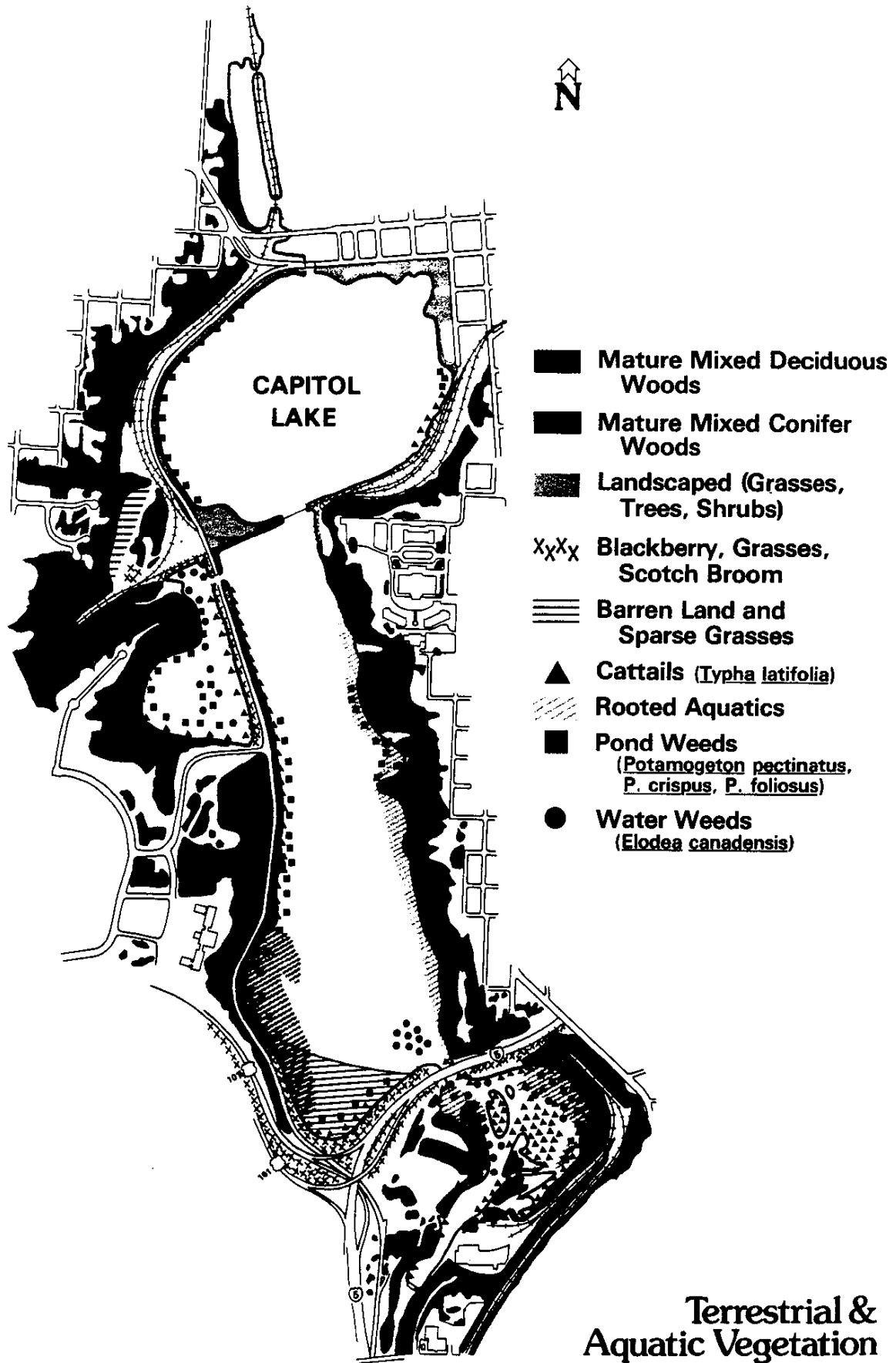


Figure 5



Key to an understanding of how to improve the water quality of Capitol Lake is an understanding of what Capitol Lake is.

The name "lake" is actually a misnomer. Before being dammed by the structure at 5th Avenue, the Capitol Lake area was part of the estuary formed at the mouth of the Deschutes River. Daily tidal fluctuations exposed mud which formed the substrate of the estuary. This rich mud even today contains decaying organisms which give almost every tide flat its characteristic "rotten egg" odor. Suspended sediments in the Deschutes River were carried out into Budd Inlet where, over time, a broad estuary was formed.

But changes were made in the flow patterns of the Deschutes which disrupted this pattern. Restrictions in water flow caused by the 5th Avenue dam and other structures, such as the I-5 bridge, have made the river drop its sediments sooner. This has meant that the mouth of the river has become a more "closed" system and the sediments have been slowly filling in the lake.

The lake is functioning just like a reservoir which is an impounded river system.

There are important differences between natural lakes and reservoirs which affect how these bodies of water function. The differences are listed below:

Lakes

Natural

Slow inputs of
nutrient energy

Shallow Impoundments

Artificial

Rapid inputs of nutrient
energy from river

Slow inputs of
sediments

Depth of water
buffers impacts

Requires little or
no maintenance

Rapid inputs of sediments
from river

Shallow water increases
sensitivity to inputs

Requires periodic maintenance
activities such as dredging

2. Problems in the Lake

During the 36 years of Capitol Lake's history, a variety of problems have surfaced. These problems include sedimentation from the Deschutes River, high coliform bacteria counts, an overabundance of nutrients which stimulate plant growth, and a deep crater at the tide gates which creates toxic gas. It was the continued presence of these problems which provided the impetus for the creation of the Restoration Committee. These problems will now be discussed in more detail.

Sediments brought into the lake by the Deschutes River started filling the lake soon after the lake was created. Historically, the Deschutes River had deposited its sediments in an estuary which was formed at the mouth of the river at the base of Budd Inlet. By slowing the river down, the newly created lake forced the river to drop its load of sediments within the basins of the lake (Figures 6 and 7). While this was expected, it was not envisioned how fast the sedimentation from the Deschutes River would fill up the lake.

In recognition of problems associated with this sedimentation, the Department of General Administration commissioned several studies and plans to restore and rehabilitate the lake in the 1950's and 1960's. In 1977, a permit was approved for work related to rehabilitating the lake. The scope of that permit included dredging and disposing of the dredge spoils,

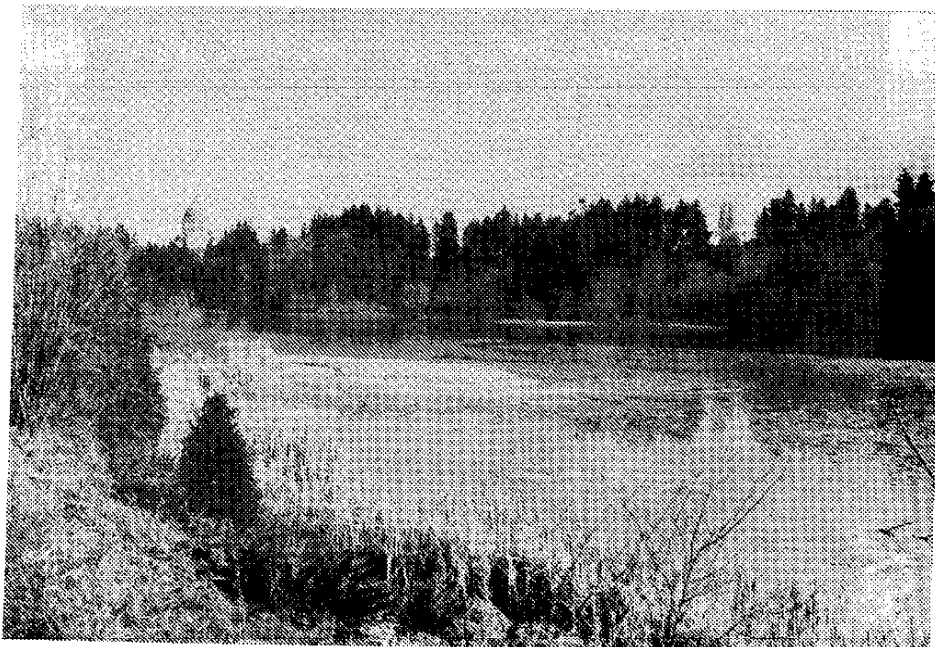


FIGURE 6. Sediments deposited in the western part of the middle basin of Capitol Lake.

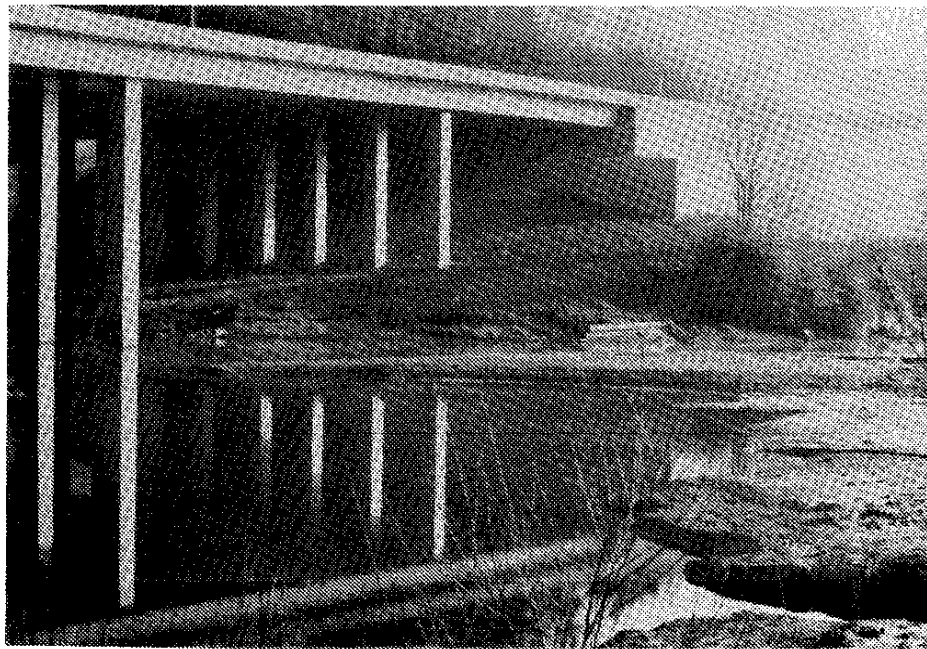


FIGURE 7. Sediments deposited in the upper basin of Capitol Lake below Interstate 5.

construction of sediment traps, and development of recreational areas adjacent to Percival Cove and Tumwater Historical Park. Also in 1977 the U.S. Army Corps of Engineers granted a permit for an initial dredging of 257,000 cubic yards of sediments and an additional 30,000 cubic yards annually for a period of 10 years. Up to 1986, a total of 250,000 cubic yards had been dredged from the Lake.

These dredge spoils were deposited in the southwest corner of the middle basin, creating a wetland and new wildlife habitat (Figure 8). In 1986 another permit was granted to dredge approximately 50,000 cubic yards of silt and sediment from the middle basin of Capitol Lake and deposit it again in the southwest corner of the middle basin behind the dike. In approving the latest permit, the Hearings Examiner for Olympia and Thurston County established a requirement for the Department of General Administration "to report on the feasibility of implementing a stream management plan for the Deschutes River before any future dredging application is requested for Capitol Lake." Such a plan had been requested by the Squaxin Island Tribe in comments to the Hearings Examiner on the 1986 permit. The Tribe proposed that a process be instituted for the Deschutes River Drainage which would address concerns with erosion and sedimentation. The Tribe asked that all parties involved in the watershed, which include many local, state and federal agencies as well as private parties, get together, agree on the problem, and set out to find a solution.

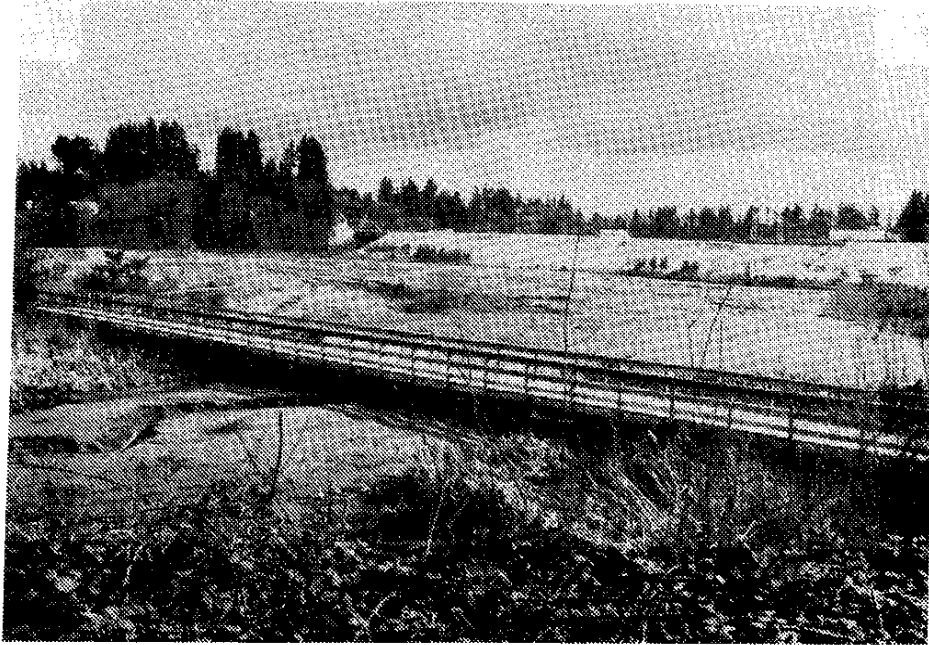


FIGURE 8. Dredge disposal site at southwest corner of middle basin.

In addition to problems with sedimentation, Capitol Lake has had excessive coliform bacteria counts over the past 10 years. Since 1981, the bathing beach operated by the City of Olympia has been able to operate for only a few weeks each summer due, in part, to these fecal coliform counts. In recognition of the poor water quality of Capitol Lake, the City of Olympia has undertaken a variety of corrective actions at the swim beach.

In 1982, the city installed a curtain around the swimming area to isolate it from the lake. They also installed a system of pipes to inject clean water into the swimming area and a system to recirculate, filter and disinfect a portion of the water. As a part of the operational procedures, aluminum sulfate (alum) was also added to the water in an attempt to remove inorganic phosphates and precipitate colloidal material including bacteria. This system was found to be ineffective.

A third problem for Capitol Lake is an abundance of nutrients which stimulate plant growth. Excessive growth of water plants can make it difficult to see into the water and can produce dense algael-mats and weed beds. The presence of algae blooms can reduce swimming in the lake because standards for water clarity in public swimming areas are exceeded. Boating is more difficult when extensive weed beds exist.

A fourth problem in the Lake was a deep crater at the tide gate structure on 5th Avenue.

Capitol Lake is periodically flushed with marine water. The purpose of the saltwater flushing is to control rooted aquatic plants that at one time were abundant throughout the middle lake basin. The practice began in 1971 and has been found to be very effective in controlling the plants (Finn, 1972; Finn and Tarr, 1975). The marine backfilling practice has also been used as a means to rapidly restore the lake level following a drawdown to accommodate maintenance activities within the basin. The backflushing procedure is identified as an important operational option for management of the lake by concerned agencies (from Capitol Lake Restoration Analysis).

Typically, during a routine marine flushing operation, the lake is allowed to drain to the elevation of the tide gate dam sill (-17 feet elevation, MSL). The gates are then opened during an incoming tide. The flow of marine water into the lake results in energy being released into the north basin. This energy is dissipated through turbulence and scouring of the basin floor, resulting in formation of the crater. The size and rate of crater formation are dependent upon the magnitude of the head differential encountered during each backfilling and the volume of the crater as it relates to energy dissipation (Capitol Lake Restoration Plan).

During the late summer, high temperature, decaying algae blooms, and small tidal exchange cause a natural depletion of the dissolved oxygen in Budd Inlet.

The dissolved oxygen levels were probably further depressed leading up to the fish kills of September 9 and 12, 1981, by an oxygen consuming discharge of sewage sludge at the Fiddlehead Marina. The sewage sludge was incorrectly being discharged at that outfall during LOTT construction. The oxygen-poor marine water was leaking into the lake crater past worn tidal gate seals at high tide and under the interface of fresh water. In the absence of oxygen, bacteria in the marine water at depth in Budd Inlet and the lake crater produced toxic hydrogen sulfide. When the tide gates were opened to let lake water out some marine water flowed into the crater, displacing sulfide-rich water into Budd Inlet. In addition, the outflowing water entrained the deeper Budd Inlet water bringing it to the surface. The hydrogen sulfide that contacted oxygen at the surface reacted chemically to produce free sulfur giving the water a white milky look. The mechanism of the sulfide "eating up" the available oxygen at the surface plus remaining sulfides produced a deadly situation to fish swimming in the surface layer (Allen Moore).

To correct this situation, in late 1986 the Department of General Administration installed a siphon at the crater to permit water from the crater to flow out to the marine side, leaving fresher oxygenated water in the crater. The intention of the siphon was to prevent hydrogen sulfide gas from being created. It is too early to judge the effectiveness of the siphon.

BACKGROUND REPORTS

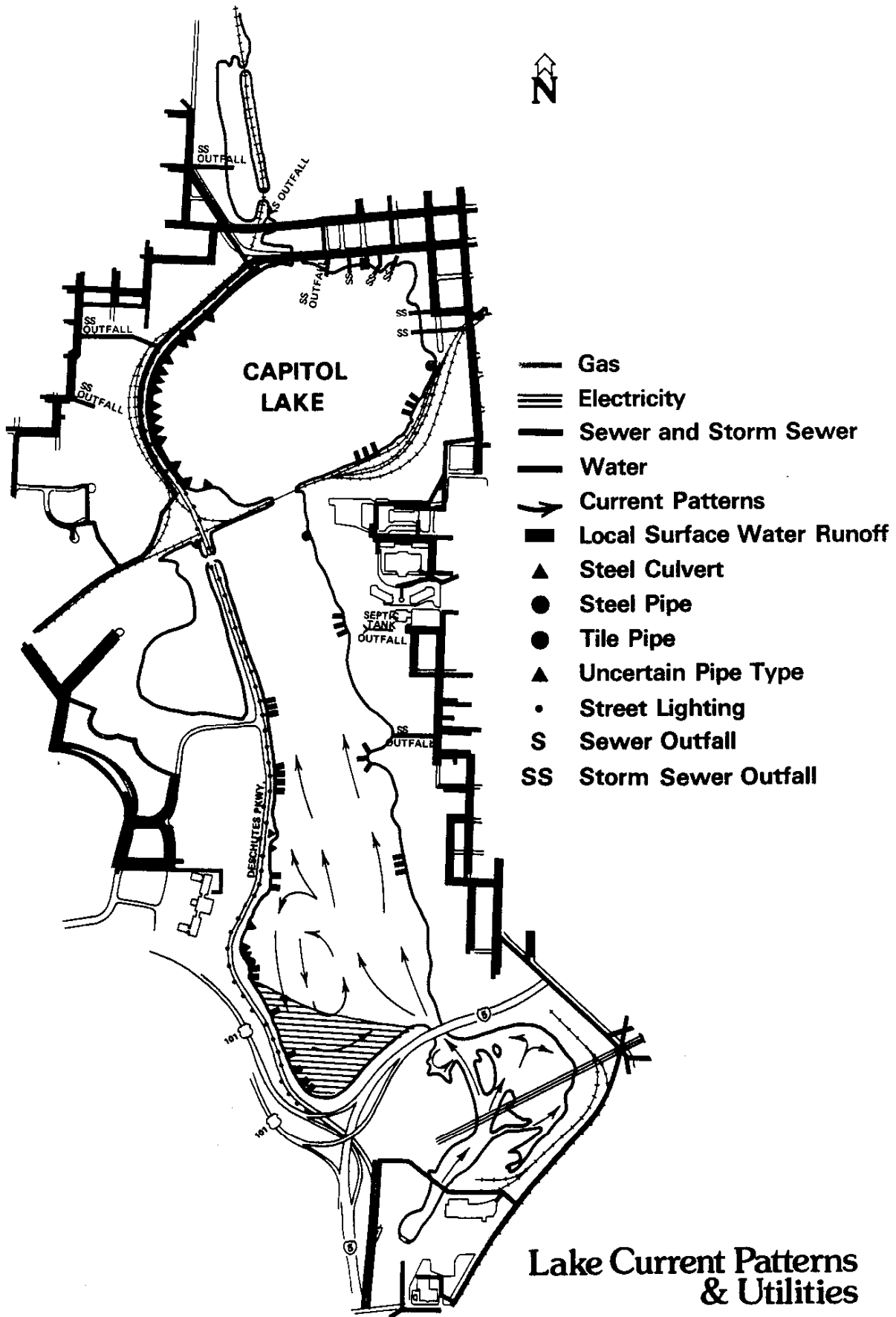
II. BACKGROUND REPORTS

One of the first tasks for the Capitol Lake Restoration Committee was to compile information from a variety of sources about Capitol Lake. Some of this information was available in previously-published reports and some of it existed only as information within various state and local government administrative departments. So the committee began a process which lasted for the entire 8 months that they met: hearing presentations on topics germane to the water quality and uses of Capitol Lake. The following discussion is a synopsis of each presentation.

A. ENTRANCO

In January of 1984, ENTRANCO Engineers prepared a "Capitol Lake Restoration Analysis" for the State Department of General Administration. This restoration analysis was prepared for an inter-agency task force that had been created in 1982 by Governor Spellman to provide an up-to-date analysis of the causes, consequences and solutions to previous and newly identified problems of Capitol Lake. The study was conducted to address the following topics: prevention of the fish kill mechanism which was associated with a tide gate crater; current rate of sediment deposition within the lake basin; the extent, cause and potential mitigation of the water quality problems that had historically plagued the lake; and the performance of the Capitol Lake swim beach restoration which had been completed in 1982 (Figure 9).

Figure 9



ENTRANCO recommended that a siphon be installed between the tide gate crater and Budd Inlet to remove marine water from the crater. This siphon would reduce the chance that toxic gases would be released and kill fish. They recommended that continued maintenance dredging of the middle Basin sedimentation trap be done and that a long-term maintenance dredging program for the entire middle Lake Basin be started. They recommended that a comprehensive drainage basin plan be developed to control sedimentation problems in Percival Cove. ENTRANCO felt excessive nutrient inputs were being handled adequately. The Conservation District and the Soil Conservation Service were working with dairy owners along the Deschutes; the Department of Ecology was coordinating with the Olympia Brewery for control of their discharge; and the Department of Fisheries was planning pilot scale studies for control of nutrient releases from Percival Cove. ENTRANCO felt that long-term surveillance monitoring should be done to detect sources of fecal coliform bacteria in the lake and that additional studies should be done to determine the effectiveness of the swim curtain in the Capitol Lake swim area.

B. Olympia Parks Department Presentation--Capitol Lake Swim Beach.

The water quality problems of Capitol Lake have led to frequent closures of the public swim area maintained by the City of Olympia in the north Lake Basin (Figure 10). Because of the chronically poor water quality of Capitol Lake, a swim area restoration project was undertaken in 1982. The objective of the restoration was to improve the water quality within the swim area so that it could be used all summer.

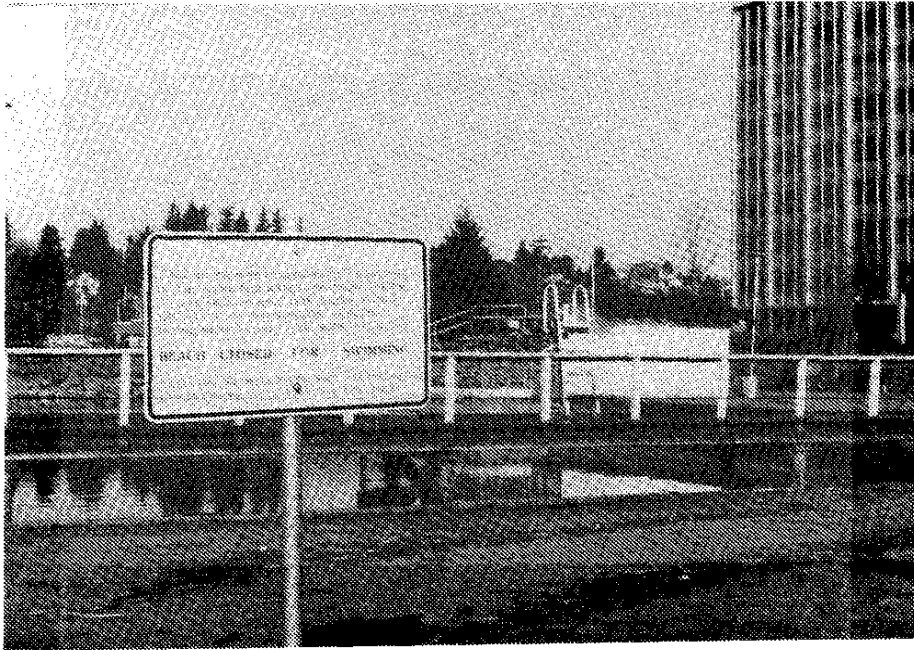


FIGURE 10. Olympia swimming beach closed due to bacterial contamination.

One of the techniques used was to surround the swimming area with an impervious curtain which would prevent the Capitol Lake water from entering the swim area. In order to do this, City of Olympia drinking water was poured into the curtained off area to dilute the Capitol Lake water. Sodium aluminate (alum) was used during the 1983 season to remove dissolved nutrients, algae, and other tiny floating particles from the water, however, difficulties were encountered in handling and dispersing the chemical. In 1983 the swim curtain shifted during the lake drawdown and gaps in the barrier permitted an exchange of untreated lake water with the swim area water throughout the operating season. This was not discovered until later in the year.

Terry Rodgers of the Olympia Parks Department reported on a new project that has been initiated by the Parks Department to study the swim beach. Two of the problems with the swim beach are:

1. High fecal coliform bacteria levels and large amounts of algae. While the algae are not a health hazard in themselves, they create a problem for a swim area because the water is not clear enough to provide safe swimming. The Health Department requires at least 4 feet of visibility in the water, so that life guards can detect any problems that children might be having. Once the algae develops in the lake, less than 2 feet of visibility is present. The Parks Department has tried treatment of the swim area with copper sulfate to kill the algae bloom, as well as pure alum. The Parks Department has added

as much as 1,000 gallons per minute of City water to the swim area, while the recommended amount from the swimming manual is 70 gallons per minute. Even at this high level of dilution, bacterial counts did not drop enough to permit swimming. The Parks Department's experience shows that the treatments that they have tried have not worked and the only remaining methods known to kill bacteria would have a residual effect on the fish life in Capitol Lake and, therefore, are not acceptable alternatives.

(Addendum:

ORB REPORT

In early 1987, the City of Olympia commissioned a report from the ORB Organization for a plan to make the Capitol Lake swimming beach usable.

The following excerpt is the summary from their report.

Addendum Page 1

Water quality in the Capitol Lake swimming area has deteriorated considerably since the bathing beach area was constructed in 1964. During the past several years, the bathing beach has been able to operate for only a few weeks each summer due to high fecal coliform counts and water visibility restrictions caused by algae bloom.

A 1978 study of the lake by CH2M Hill states that the Deschutes River is a major contributor of nutrients which accelerate the algae growth and cause swimming safety problems. It also points out that the City of Olympia swimming beach is in a stagnant area of the lake so that flushing action by the through lake flow is limited.

The 1978 CH2M Hill study also identified the Deschutes River as a major source of fecal coliform contamination. The 1983 Entranco study indicated, however, that the source of fecal coliform in the Deschutes River had been eliminated and that pathogenic organisms no longer posed a major threat to water quality in the swimming area.

A discussion of the lake contamination from external sources is somewhat academic since the CH2M Hill report states that sufficient bacteria could be generated by the water fowl which inhabit the lake to equal that provided by other sources. In light of this information, the water fowl that inhabit the swimming area could contaminate that area by themselves. In addition, contamination from the swimmers and nutrients from the lawn fertilizers would add to the contamination of the area enclosed by the hypalon curtain.

Whatever the cause of the contamination, during the summer of 1985, both the fecal coliform and total coliform far exceeded the allowable levels for swimming areas.

This study concludes that the only practical way for the City to correct water quality problems in the bathing beach area is to isolate it from the rest of the lake and to recirculate and disinfect the water.

However, under RCW 70.90, whenever clean water or disinfectant or both are added to a pool of water used for swimming or recreational bathing, it must be classified as a swimming pool. Swimming pools must be designed to much higher standards of health and safety than natural swimming beaches, and plans for swimming pools must be approved by the Washington State Department of Social and Health Services rather than the County Health Department.

The City has used the Capitol Lake swimming location for many years. It has become a part of the community landscape and a focal point for the Capitol Lake fair activities. It does, however, have an apparent drawback in that it may require a pile supported structural foundation for any structure constructed on the site. Our estimates for the various alternatives have been prepared to include this worst case scenario. Should the City be serious about any of the schemes presented in this report, preliminary soil borings should be obtained at the site and the cost estimates revised to reflect the Soil Engineer's foundation recommendations. If these structures could be constructed on the existing fill, from \$300,000.00 to \$500,000 in cost could be eliminated.

Addendum Page 2

We have concluded that it is probably not economically feasible to enclose an area as large as the existing swimming area and bring it up to swimming pool standards. However, we believe that it would be feasible to construct an enclosed swimming area which would meet and surpass the standards currently required for the existing swimming beaches. In order to design such a facility, RCW 70.90 must be modified by the Washington State Legislature to allow the renovation of natural bathing beaches with an artificial wall and the addition of clean water or disinfectant to meet current health standards. Should such a change to RCW 70.90 be enacted, then alternatives No. 1, enclosing the existing swimming area for a cost of \$2,004,037.00 and 1(a), enclosing a smaller swimming area at a cost of \$1,374,039.00, would both become feasible solutions to the City's swimming beach problem.

Since the Legislature might not be willing to pass an amendment allowing renovation of bathing beaches as outlined above, we have proposed two additional alternative schemes. The first consists of the construction of a large 50-meter outdoor swimming pool with a shallow water training or wading pool. This scheme would require the renovation of the existing bathhouse and the construction of a new 50-meter outdoor swimming pool. It would also require a waiver from the State DSHS for a reduction in toilet fixtures. This scheme would cost some \$1,786,138.00, of which \$375,000.00 is for the pile foundation and structural slab. The second is alternative no. 3, which consists of a smaller indoor pool on the same site. The indoor pool would include a 25-yard x 25 meter main tank and a smaller 20' x 40' training tank. This alternative would require the removal of the existing bathhouse, the construction of a new bathhouse, and the construction of a new indoor swimming pool. This scheme would cost \$3,360,000.00, of which \$540,000.00 is for the pile foundations and structural slab.

C. Olympia Public Works Department -- 7th Avenue Storm Drain

Don Moore of the Olympia Public Works Department presented an analysis of the 7th Avenue storm drain. This storm drain is identified as being a source of fecal coliform bacteria and the City of Olympia conducted tests to determine why the storm drain had sanitary effluent in it and how that could be corrected. The tests discovered that transients in the area used the storm drain for toilet facilities. A downtown business had incorrectly hooked their sanitary outfall to the storm drain. This outfall was reconnected to the proper sanitary sewer outlet in 1983. Even though those problems with the storm drain were corrected, some bacterial pollution remains. The City of Olympia has decided that the remaining pollution is typical of what is found in urban storm water runoff.

D. Department of Ecology

Allen Moore of the Department of Ecology's Lakes Division of Water Quality gave a presentation on the Department of Ecology's involvement with Capitol Lake and the studies that have been done on it. He explained that the ENTRANCO study in 1984 had concluded that there are few identifiable point sources of pollution in the lake. Once these were cleaned up, nutrient levels were still high. This is partly because the lake doesn't function like a lake, but more like a wide spot in the river. He reported that the Department of Ecology is currently working on a new discharge

permit for the Olympia Brewery. The Brewery contributes between 15 percent (in the winter) and 30 percent (in the summer) of the nutrients necessary for algae growth in Capitol Lake. Once a new discharge permit has been written for the Brewery, the water quality and nutrient level of the lake should be improved. He cited a stream corridor study on the Deschutes River done by the Soil Conservation Service and the Conservation District which recommended improved streamside management practices by dairies in the Deschutes River valley. The Percival Cove hatchery operation also contributes some nutrients from their fish feeding operation.

Mr. Moore explained the impact of the crater at the tide gate on fish in Budd Inlet. The siphon at the tide gate is a solution to this problem. Also needed is an extension of the LOTT treatment plant outfall further out so that sludge is not deposited in this location again. (This will be completed as part of LOTT Phase II). Leonard Esteb of the City of Olympia reported that the outfall still exists, but is used only when chlorine treatment is required.

Mr. Moore talked also about the City of Olympia swim area and some of the efforts that have been made to retain swimming in that area. Those items were a swim curtain, treatment with alum, a sand filter and an ultraviolet light bacteria treatment. He said that the wading area is made up of 1/3 sand and 2/3 fine clay particles, which are very difficult to filter out with a sand filter. However, if they are not filtered out, the ultraviolet light bacteria treatment

would not work because that treatment requires clear water to work. Treating the swim area with chemicals is difficult due to the sensitivity of the fish population. Mr. Moore touched on the contribution of Percival Creek to the nutrient budget of Capitol Lake. Percival Creek contributes 8 to 10 percent of the total nutrients. The Thurston Regional Planning Council has completed a Percival Creek Corridor Plan and the cities and county are considering the adoption of this plan. It is not expected that the adoption of this plan will have a significant effect on the nutrient loading of Percival Creek. There are conflicts though with the LOTT Phase II study on utility extensions along the Percival Creek Corridor.

E. Thurston Regional Planning Council -- Percival Creek and Deschutes River

At the June meeting, Steve Morrison gave a presentation on the Percival Creek Corridor Plan. He discussed the water quality contribution that Percival Creek makes into Capitol Lake. Development in Percival Creek's watershed results in increased storm water runoff which is contaminated with urban pollutants such as oil and gas. That contaminated water eventually finds its way into Capitol Lake. The drainage from the Creek, however, is minor compared to the amount of water received from the Deschutes River. The Deschutes adds approximately 90 percent volume to the Lake versus 10 percent volume from Percival Creek. The Creek itself was studied and found to contain fecal contaminants coming

from Trosper Lake. The water from Black Lake via the Black Lake drainage ditch was not contaminated with fecal coliform. In the Percival Creek corridor area, out of 15,000 acres, the public owns less than 10 percent.

A second presentation was made by Tom Clingman on the Deschutes River Recreation Plan. That plan studied the Deschutes River Basin between Rich Road and Capitol Lake. The focus of this study was how to improve the recreational experience along the Deschutes River. That study identified different public access sites along the River to accommodate people who are fishing, river rafting, canoeing and swimming, and the Plan suggested areas where signs should be placed indicating the length of time it would take to reach Tumwater Falls Park. As well, access was proposed in several areas to more easily reach roads or housing developments.

F. Department of General Administration -- Authority Over Lake

The Committee heard a presentation by Bob Arndt, from the State Department of General Administration, about the RCW's and WAC's which govern the administrative authority over the Lake. Mr. Arndt reported that the City of Olympia is currently leasing the use of Capitol Lake for the Water Street swim area, but that the State of Washington is the legal owner. The lease expires in 1994.

G. Department of Fisheries -- Fish Rearing Operations (See also Appendix D)

The Committee then heard a presentation by Keith Keown, manager of the Deschutes Complex for the Department of Fisheries. He gave a presentation regarding the fish rearing operation in Percival Cove, as well as Capitol Lake (Figure 11).

Between the months of October and April, approximately 1.2 million chinook salmon are raised in Percival Cove. At the beginning of April, fish are released via Capitol Lake through a Lake drainage process. Normally, fish raised in this manner would migrate as far north as Alaska before returning to this area to spawn. However, the Department of Fisheries' operation holds the fish for a period of time beyond their normal release time so the instinct to migrate to Alaska is reduced, and these fish generally stay in the Puget Sound area. The Percival Cove operation is one of three main fish-rearing systems in Puget Sound (the Green River and the Sammamish River in Bellingham are the other two). Approximately 55 percent of the resident chinook program and 10 percent of the entire state-wide release is done in Percival Cove and Capitol Lake.

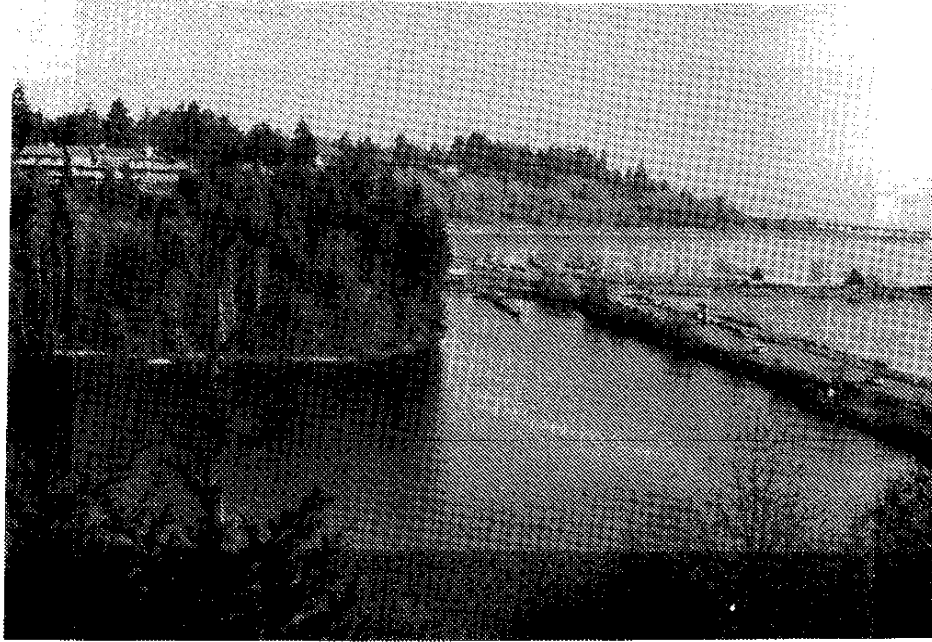


FIGURE 11. Percival Cove fish rearing operation.

FIGURE 12

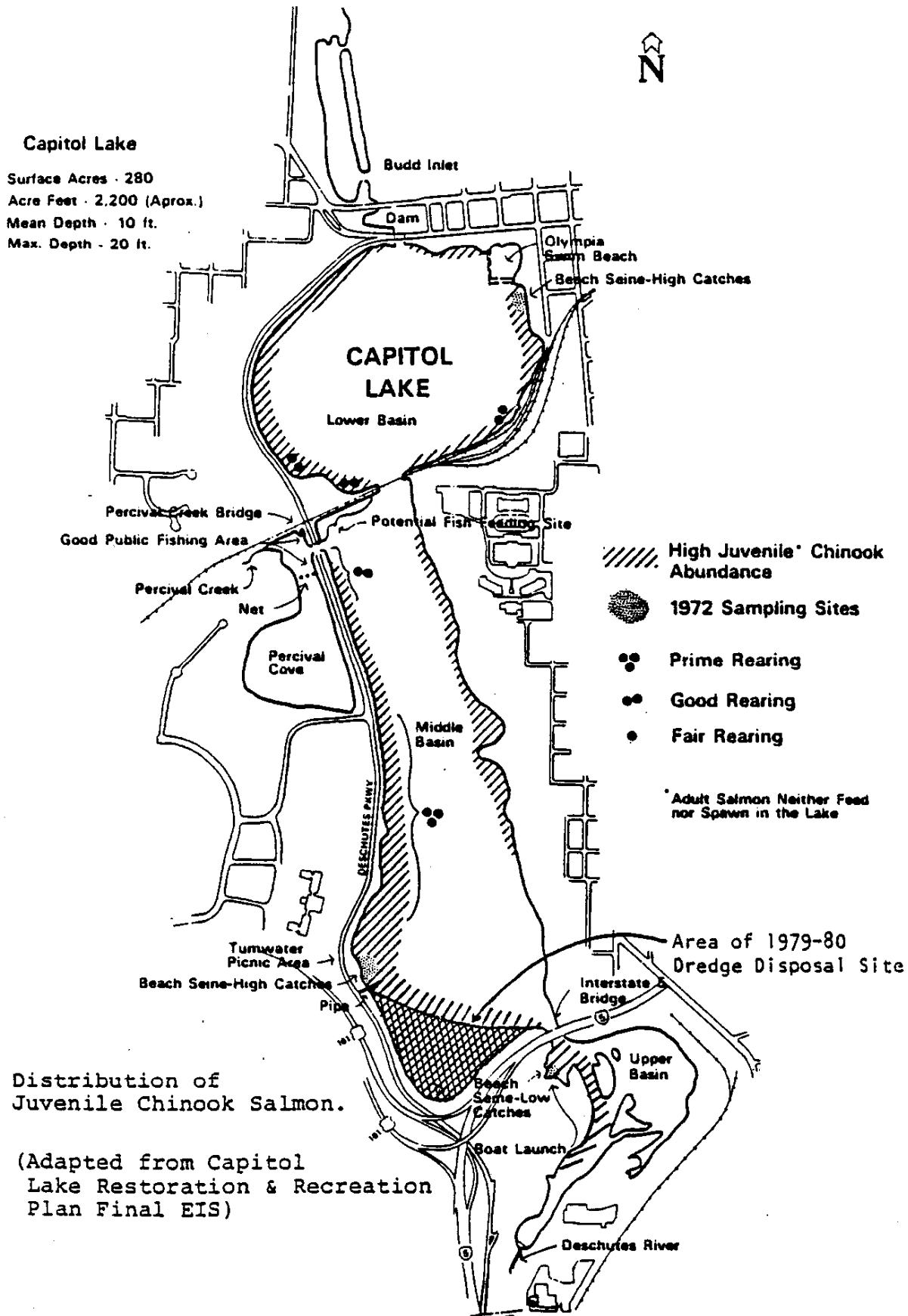


FIGURE 13

Timing of salmon and searun trout activity in Deschutes Basin¹

SPECIES	FRESH-WATER LIFE PHASE	MONTH											
		J	F	M	A	M	J	J	A	S	O	N	D
FALL CHINOOK	Upstream migration												
	Spawning												
	Intragravel develop.												
	Juvenile rearing												
	Juv. out migration												
COHO	Upstream migration												
	Spawning												
	Intragravel develop.												
	Juvenile rearing												
	Juv. out migration												
CHUM	Upstream migration												
	Spawning												
	Intragravel develop.												
	Juvenile rearing												
	Juv. out migration												
WINTER STEELHEAD	Upstream migration												
	Spawning												
	Intragravel develop.												
	Juvenile rearing ^{2/}												
	Juv. out migration												
SEARUN CUTTHROAT	Upstream migration												
	Spawning												
	Intragravel develop.												
	Juvenile rearing ^{2/}												
	Juv. out migration												

^{1/} Data supplied by Washington State Department of Fisheries

^{2/} Normally extends over a two year period

The Department of Fisheries does have several concerns, which they listed:

1. The dissolved oxygen levels in Budd Inlet often become dangerously low.
2. The presence of the crater at the dam which is the subject of the siphon project built by the Department of General Administration.
3. The water source for Percival Cove, which is Percival Creek and Black Lake, and the impact of storm water runoff in those areas.
4. The storm water runoff from Interstate 5 which contains oil, gas and other materials.

(Addendum: An additional meeting was held with Department of Fisheries personnel and the author of this report to expand on the information provided previously.

Water quality problems have had a big impact on the operation of the fish-rearing operation in Percival Cove. Fingerling salmon used to remain in the cove from mid-September to the end of May. But, algae blooms and low dissolved oxygen levels in the water have delayed the beginning of the operation until mid-October. At the other end of the schedule, excessive sediment in the water from upstream erosion has cut short the operation at the end of April. The water quality situation in Budd Inlet has also had a major impact on the release date in the spring of the fingerlings.

Before 1979, the lake was drawn down in June, forcing the fingerling out into Budd Inlet. In 1979, there were several fish kills in Budd Inlet caused by the lake draw down occurring in conjunction with both lower summertime flows from the Deschutes River and the placement of a temporary sewage outfall in lower Budd Inlet. The outfall created a lowered dissolved oxygen level and the reduced flows from the Deschutes took too long to replenish the oxygen supply in lower Budd Inlet, resulting in fish kills.

Therefore, the Department of Ecology decided the lake should not be draw down after April.

Another impact of this draw down decision is that when the lake draw down occurred in June (when the flow from Percival Creek and the Deschutes is reduced), the Department of Fisheries was able to dredge the mouth of Percival Creek and the Cove to get rid of deposits of sediments. Now that the draw down has to occur in April (when flows from Percival Creek and the Deschutes are high), dredging is no longer practical. This means that a 1,000-foot curve barrier that used to direct oxygen-rich Percival Creek water into the Cove can no longer be maintained. As a result of the loss of the curve barrier, 50 percent of the Cove has low enough oxygen levels so it can no longer be used for fish rearing.

Fisheries biologists also believe that water quality problems from Black Lake (via the Black Lake Drainage Ditch and Percival Creek) are of increasing and paramount importance to fish-rearing in the Cove. Before 1980 there hadn't been any incident of blue-green algae blooms in the Cove. This algae consumes a large portion of the oxygen in the water and can lead to fish kills. In the past 7 years, the Cove has had 2 episode of blue-green algae blooms. The Department of Fisheries is concerned that this is a trend which jeopardizes the continued use of the Cove for fish-rearing. Therefore, the Department feels strongly that the water quality of Black Lake should be studied so that corrective action can be initiated (Figure 14).

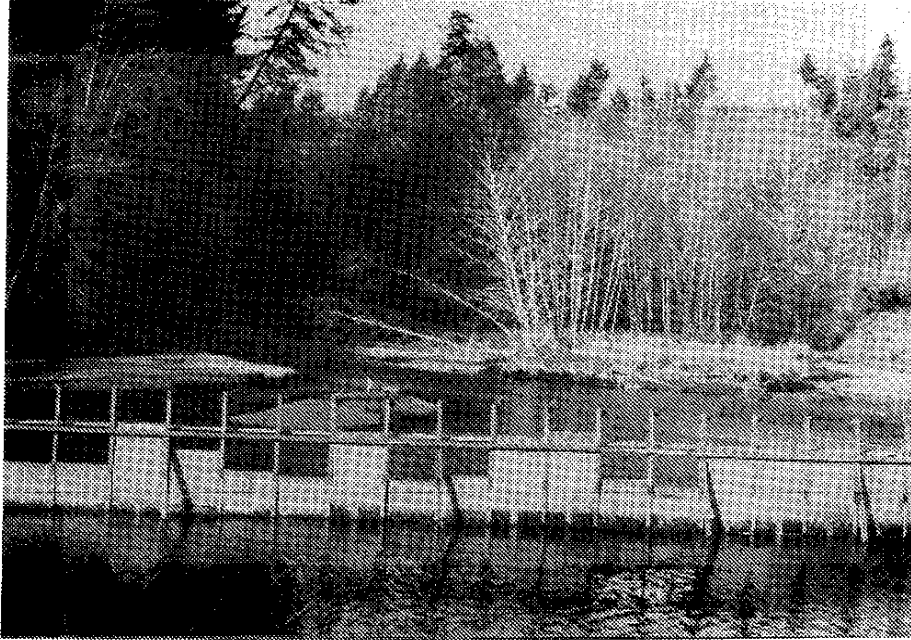


FIGURE 14. Mouth of Percival Creek where it enters Percival Cove and Capitol Lake. Structure shown diverts oxygen-rich waters into Cove.

In conclusion, while the Percival Cove fish-rearing facility has many operational benefits for the Department of Fisheries, they are unable to say where the operation fits into the Department's long-range fish culture plans because so many water quality variables are out of the Department's control.)

(The Department of Fisheries has recently made a decision to discontinue using the cove for its yearling chinook program.)

(The Department of Fisheries has recently made a decision to move most of its yearling chinook program out of Percival Cove. The Department will raise most of the 1.2 million yearlings in pens near Squaxin Island. They will construct two net pens in Percival Cove and raise 65,000± yearling there with the assistance of the Olympia Salmon Club. The zero-age chinook program will remain in Percival Cove.

The reasons for the change are (1) the uncertain water quality from Black Lake and Percival Creek, and (2) lack of control over how many fish are being released into Puget Sound. The latter concern stems from predation losses and flooding which allows an unknown amount of escapement from the Cove.)

H. Coot Company -- Wetland Creation

In the fall of 1986, the Committee was asked by the Coot Company to hear a proposal for restoration of Capitol Lake through creation of a natural ecosystem. The essence of this plan was as follows:

1. Separate the Middle and North Basins with a new dam to allow individual water management of the two areas; stop saltwater flushing of the Middle Basin.
2. Eliminate short-term dredging and allow Deschutes River sediment deposition to proceed naturally and build a delta in the Middle Basin. Maintenance dredging would be resumed in 20-50 years once delta formation had achieved a desired state.
3. Establish a natural, freshwater marsh upon the Middle Basin delta with an abundance of aquatic, vascular plants to capture and process pollution (especially sediments) and thereby cleanse the water.
4. Maintain the North Basin in a relatively plant-free, open water state to accommodate certain passive water recreation activities and maintain the visual aesthetics of a reflecting pool for the Capitol grounds.

I. Storm Water Runoff

In December, the Committee heard from representatives of the Tumwater, Olympia and Thurston County Public Works Departments concerning their efforts to control storm water runoff in their respective communities. Tumwater has recently accepted a Storm Water Comprehensive Plan prepared by Gardner Engineering Consultants. Gardner Engineering was present to discuss the main points of the Tumwater Storm Water Comprehensive Plan. Thurston County Public Works representatives presented some of the graphic displays that they have been preparing to address where there are storm water problems, where there are soil limitations for development and where there are pervious soils which do not provide protection for the underlying ground water. The City of Olympia Public Works representatives discussed their plans for a storm water utility and the information that they have about storm water impacts on the Capitol Lake Basin.

This storm water presentation concluded the series of background reports that the Committee heard.

GOALS AND POLICIES

III. Goals and Policies

The background reports the Restoration Committee heard provided the basis for the rest of their work. The next step for the committee was to formulate goals and policies which would guide the action recommendations for the clean-up of Capitol Lake.

Much of the discussion concerning the clean-up of the lake centered on providing for swimming in the lake. Capitol Lake is classified as a Class "A" body of water. This classification, established by the Department of Ecology, is a goal and is based on what activities the lake should be able to support. Class "A" waters are characterized by providing wildlife habitat, general recreation, and aesthetic enjoyment such as picnicking, hiking, fishing, swimming, skiing, and boating, fish and shellfish reproduction and water supply. There are water quality measurements associated with the Class "A" bodies of water. Although there is no comprehensive monitoring program of the Capitol Lake waters, the Department of Ecology does collect data from the "E" Street Bridge in Tumwater monthly. These data show that the waters of the Deschutes River which provide the main source of water for Capitol Lake do not presently meet the Class "A" standards for fecal coliforms. This means that the Lake is not currently swimmable.

In addition to the standards for the main basins of Capitol Lake, the Thurston County Environmental Health Department has established additional standards for the swim beach that has been operated in the past by the City of Olympia. Those standards add a water clarity measurement which the swim beach area has not been able to meet.

The committee decided that the long-term goal for Capitol Lake should be continually improved water quality. Clean water is the goal. Ideally, this goal would be reflected by making the water swimmable. The preponderance of evidence provided to the committee, however, indicated that this artificial system called Capitol Lake is unlikely to be able to be maintained as a site for any organized swimming."

The following set of goals and policies were developed by the committee to provide a framework for the action recommendations which must be accomplished in order to meet these goals.

Goal 1

Preserve the existing water quality of Capitol Lake through coordinated and active participation by all affected parties.

Policy 1-1. Storm water and surface water which flows into Capitol Lake should be managed through means which do not degrade the present water quality.

Goal 2

Improve the water quality of Capitol Lake to allow increased public recreational uses and enjoyment of the Lake.

Policy 2-1. Low-intensity uses should be encouraged in and around the lake.

Goal 3

Encourage more aggressive stewardship of Capitol Lake and improve coordination between affected parties.

Goal 4

Preserve the visual quality, wildlife, active and passive uses, and other environmental characteristics of Capitol Lake.

Policy 4-1. Preserve lakeshore vegetation for wildlife habitat and aesthetic values.

Policy 4-2. Preserve the reflecting pool qualities of the lake for the effect on State Capitol setting.

ACTION RECOMMENDATIONS

IV. ACTION RECOMMENDATION

In order for the previous goals and policies to be meaningful contributors to improved water quality in Capitol Lake, there are subsequent activities which must be undertaken.

These activities are the heart of this action plan. Listed below, they are divided into three sections. The first section addresses the management of the Lake itself, the second addresses point (or "end of a pipe") sources of pollution, and the third addresses non-point (no specific identifiable location source) sources of pollution. After each action recommendation, the agencies responsible for taking action are noted. If an agency should take the lead for implementing that action, that agency is underlined.

MANAGEMENT OF CAPITOL LAKE

1. Create "Capitol Lake Management Committee," composed of interjurisdictional representatives responsible for evaluating and monitoring all programs and strategies that affect the water quality of Capitol Lake.

This action item would create a committee empowered with the overall management of Capitol Lake. Under Olympia serving as

a lead agency to convene the group, a committee would be created to keep track of what all the jurisdictions and agencies involved in Capitol Lake are doing. This committee will ensure that the various actions affecting Capitol Lake are coordinated.

General Administration, Department of Ecology, Department of Fisheries, Olympia, Tumwater, Thurston County, Conservation District

2. Further explore and implement strategies to improve circulation in the lake.

Several of the background reports indicated that improved flushing and circulation in the lake were necessary to reduce the amount of algae growth present during the summer. There were conflicts, however, between various state agencies, so the intention of this action is that those agencies work together to come up with a flushing schedule and circulation mechanisms in the lake.

Department of Fisheries, Department of Ecology, General Administration

3. Perform maintenance dredging on a planned and regular schedule.

Sedimentation has always been a problem threatening the very existence of Capitol Lake. While maintenance dredging has occurred, it has not been a regular process. Reports by ENTRANCO Engineers (1984) and CH2M Hill (1977) indicates that regular maintenance dredging is necessary if Capitol Lake is to continue to exist. Regular dredging should be included in each state budget request unless specifically identified as being unnecessary.

General Administration

4. Develop and adopt interjurisdictional agreements that define how and where tree cutting and vegetation removal will be done along the lakeshore and hillsides of Capitol Lake.

In order to retain the aesthetic, recreational, and wildlife resource uses of Capitol Lake, it is important to regulate the amount of vegetation and tree removal that goes on along the lakeshore and the hillsides. The hillsides around the lake have soil stability problems and vegetation can act as a stabilizing force for those hillsides.

Any regulations adopted should be compatible with the Capitol Campus Master Plan.

Olympia, Tumwater, General Administration, Thurston County

5. Establish a long-term water quality and rainfall monitoring program along Deschutes River, Percival Creek and Capitol Lake.

Since the creation of Capitol Lake, several monitoring programs have been initiated. Each has lasted for only 1 or 2 years. In order to gauge the effectiveness and the impact of upstream actions on the water quality of Capitol Lake, it is necessary to know what the existing water quality is and how much rainfall contributes to the waters of Capitol Lake. This action recommendation would establish an on-going monitoring program for the Capitol Lake basin. General Administration should coordinate data collection.

General Administration, Department of Ecology, Thurston County, Tumwater, Olympia

POINT SOURCES OF POLLUTION

6. As jurisdictions prepare their basin plans for stormwater, they should address strategies which seek to minimize the impacts of stormwater on the water quality of Capitol Lake.

Each jurisdiction is currently setting up a stormwater utility in order to manage the large quantities of water that urban development generates in the form of stormwater runoff. That runoff has the potential to degrade existing water quality.

Each jurisdiction consider ways to minimize the impact of stormwater on the water quality of Capitol Lake.

Olympia, Tumwater, Thurston County

7. Implement a program of maintenance of storm water facilities, such as the oil/water separators along I-5 corridor.

There are several storm water control facilities which contribute water to Capitol Lake. In order to be effective, these facilities have to be maintained.

Department of Transportation, Olympia, Tumwater, Thurston County

8. More aggressively pursue enforcement actions against illegal discharges into Deschutes River.

There are several sources of discharge of pollutants and sedimentation into the Deschutes River which ultimately end up in Capitol Lake, unfortunately. Because of inadequate funding, the Department of Ecology has been unable to pursue these enforcement actions. This action item is intended to elevate the priority in both funding and work program scope.

Department of Ecology

9. Develop and implement system of monitoring Brewery discharges to insure compliance with permit.

The Olympia Brewery is currently operating under an expired discharge permit for its water discharges into the Deschutes River. However, there is little or no monitoring done by the Department of Ecology to determine whether the brewery is in compliance with its permit.

Department of Ecology

10. Evaluate discharge permits at Brewery to reduce phosphorus loading in Deschutes River.

The Olympia Brewery's discharge permit has been expired for 3 years. The Department of Ecology has not yet rewritten the permit. The Brewery is responsible for up to 30 percent of the summer phosphorous loading for Capitol Lake. Therefore, it is important to work toward reducing that phosphorous loading via a new discharge permit.

Department of Ecology

11. Reduce nutrient loading from Percival Cove fisheries operation.

The fish feeding operation in Percival Cove contributes nutrients to Capitol Lake. The ENTRANCO study of Capitol Lake recommended actions such as dredging and seasonal diversion of Percival Creek flows to reduce that nutrient loading. Those recommendations were not acted on.

Department of Fisheries

12. Identify and correct where appropriate current status of 25± outfalls into lake.

There are approximately 25 outfalls into Capitol Lake. Monitoring should be done to establish the content of those outfalls and the contribution they make to water quality problems in Capitol Lake. If monitoring indicates problems, correction should be undertaken.

Olympia, Tumwater, General Administration, Department of Transportation, Department of Ecology

NON-POINT SOURCES OF POLLUTION

13. Work with timberland owners in the upper Deschutes River basin to institute the Timber/Fish/Wildlife (TFW) process so that baseline studies are done to assess the effect of logging on the water quality of the Deschutes River and Capitol Lake.

As the Upper Deschutes River Basin goes through a cycle of logging, the possibility exists that flows in the Deschutes River will increase significantly, which also increases the sedimentation in the river and ultimately in Capitol Lake. Base line studies should be done to assess the effect of such extensive logging on the water quality of Capitol Lake and the Deschutes River.

Conservation District, Health Department, Department of Natural Resources, Weyerhaeuser

14. Map extent of logging in upper Deschutes basin and make recommendations for future.

In the near future, the upper Deschutes River basin will have gone through a logging cycle and regeneration of trees will take place over the next 40 years. A study should be done which would map the extent of current logged over lands in the upper Deschutes basin and make recommendations for future rotations of trees. Such a study would take into account the effect such extensive logging has on peak flows in the Deschutes River and the impact on the water quality of Capitol Lake.

Department of Natural Resources

15. Designate the Deschutes River as a high priority area for work by the Thurston County Conservation District.

Past reports indicate that some farming practices on the Deschutes River contribute fecal coliform bacteria to the river and thence to Capitol Lake. The Conservation District should work with farmers along the river to implement Best Management Practices which reduce nonpoint source pollution. If efforts to implement these practices fail, and if particular farms are found to be responsible for water pollution, enforcement action should be taken by the Thurston

County Health Department and the state Department of Ecology.

*Thurston County Health Department, Conservation District,
Department of Ecology*

16. Establish stream corridor conservation team to work with farmers along the Deschutes River to reduce environmental impacts.

After the action recommendation number 15 above has been completed, a team from the Conservation District should be assembled to work with farmers along the Deschutes who are responsible for pollution to help them reduce the environmental impacts of their farming practices on the water quality of the river.

Conservation District

17. Correct erosion problem areas along Deschutes River.

There are areas along the Deschutes River where banks are actively eroding and land owners are losing many feet of riverfront property each year. Much of this soil is carried by the river into Capitol Lake, further intensifying the sedimentation problems experienced by the lake.

Soil Conservation Service, Conservation District

18. Study water quality problems and causes in Black Lake to assess ways to curb impact on Capitol Lake and Percival Cove.

The Department of Fisheries has expressed concern about the water quality of Black Lake. This water ends up in Percival Cove and has an impact on the fish rearing that takes place in the cove. A study should be conducted to assess the water quality problems and their causes at Black Lake and recommend actions which would improve the water quality and prevent further degradation.

Health Department

19. Study Percival Creek drainage basin to assess water quality impacts on Capitol Lake and Percival Cove.

The Percival Creek drainage basin is a rapidly urbanizing area, which contributes a large amount of storm water runoff into Percival Creek and ultimately Capitol Lake. A study should be conducted to assess the water quality impacts of that storm water runoff and to make recommendations for control of it.

Health Department, Olympia, Tumwater, Thurston County

20. Study impact of wetlands of upper Deschutes basin on water quality.

There are extensive wetlands in the upper Deschutes River Basin, which help filter out the pollutants and sediments from upstream sources. An inventory and a preservation strategy should be developed to protect these wetlands.

County Planning and Health Department

21. Planning for the cleanup of Capitol Lake should take place in the context of the watershed planning and ranking process established through the Puget Sound Water Quality Management Plan.

During the preparation of this Plan, communities in Thurston County began the task of watershed planning and watershed ranking. The watershed planning process focuses on ways to reduce nonpoint source pollution on a watershed or basin-wide area. Since efforts to clean up Capitol Lake depend on activities going on throughout the Deschutes River watershed, watershed planning is an integral part of the clean up effort.

Olympia, Tumwater, Thurston County

22. Toward the end of their data and information gathering sessions, the Restoration Committee was presented with a proposal to create a freshwater wetland in the Middle Basin of Capitol Lake. The Committee felt they did not have sufficient data or adequate expertise to evaluate the proposal properly.

The Restoration Committee does recommend that the Capitol Lake Management Committee, once it has been created, contact an expert in wetland biology or hydrology (perhaps at the University of Washington or Washington State University) to evaluate the feasibility of wetland proposals.

ACTION RECOMMENDATIONS

Short-Term Impacts

<u>ACTIONS</u>	<u>TIMETABLE</u> (Implemented Within)	<u>PRIORITY</u> (High, Medium, Low)	<u>COST (est.)</u>	<u>WHO RESPONSIBLE</u>
1. Create "Capitol Lake Management Committee," composed of interjurisdictional representatives responsible for evaluating and monitoring all programs and strategies that affect the water quality of Capitol Lake.	1 Year	High	Unknown	G.A., DOE, DOF, Oly, Tum., T.C., Cons. Dist.
2. Further explore and implement strategies to improve circulation in lake.	1 Year	High	Unknown	DOF, DOE, G.A.
3. Perform maintenance dredging on a planned and regular schedule.	On-Going	High	\$1.3 million/2 yrs.	G.A.
4. As jurisdictions prepare their basin plans for stormwater, they should address strategies which seek to minimize the impacts of stormwater on the water quality of Capitol Lake.	On-Going	High	\$250,000	Oly, Tum., T.C.
5. Evaluate discharge permits at Brewery to reduce phosphorus loading in Deschutes River.	1 Year	High	Unknown	DOE
6. Develop and implement system of monitoring Brewery discharges to insure compliance with permit.	On-going	High	Unknown	DOE
7. Identify and correct where appropriate current status of 25± outfalls into lake.	1-2 Years	Medium	\$25,000	Oly, Tum.
8. Correct erosion problem areas along Deschutes River.	1-2 Years	Medium	Unknown	SCS, Cons. Dist.
9. Develop and adopt interjurisdictional agreements that define how and when tree cutting and vegetation removal will be done along the lakeshore and hillsides of Capitol Lake.	2-3 Years	Low	\$4,000/juris.	Oly, Tum., G.A.
10. More aggressively pursue enforcement actions against illegal discharges into Deschutes River.	3+ Years	Low	Unknown	DOE

ACTION RECOMMENDATIONS

Long-Term Impacts

<u>ACTIONS</u>	<u>TIME/TABLE</u> (Implemented Within) (High, Medium, Low)	<u>PRIORITY</u> (High, Medium, Low)	<u>COST (est.)</u>	<u>WHO RESPONSIBLE</u>
1. Establish a long-term water quality and rainfall monitoring program along Deschutes River, Percival Creek, and Capitol Lake.	1-2 Years	High	\$107,000/2 Yrs.	G.A., DOE, T.C., Tum., Oly
2. Reduce nutrient loading from Percival Cove fisheries operation.	1-2 Years	High	Unknown	DOF
3. Study Percival Creek drainage basin to assess water quality impacts on Capitol Lake and Percival Cove.	1-2 Years	High-Medium	\$250,000	Health, Oly
4. Further study on the impact of farming activities on the water quality of the Deschutes River should be done.	2-5 Years	Medium	\$50,000	Cons. Dist., Health DNR, Weyerhaeuser
5. Designate the Deschutes River as a high priority area for work by the Thurston County Conservation District.	2-5 Years	Medium	\$100,000	Cons. Dist.
6. Study water quality problems and causes in Black Lake to assess ways to curb impact on Capitol Lake and Percival Cove.	1-2 Years	Medium	Unknown	Health
7. Implement a program of maintenance of storm water facilities, such as the oil/water separators along I-5 corridor.	3-5 Years	Low	Unknown	DOT, Oly, Tum., T.C.
8. Work with timberland owners in the upper Deschutes River basin to institute the Timber/Fish/Wildlife (TFW) process so that baseline studies are done to assess the effect of logging on the water quality of the Deschutes River and Capitol Lake.	5-10 Years	Low	Unknown	Cons. Dist., Health DNR, Weyerhaeuser
9. Map extent of logging in upper Deschutes basin and make recommendations for future.	5-10 Years	Low	Unknown	DNR
10. Study impact of wetlands of upper Deschutes basin on water quality.	5-10 Years	Low	Unknown	Planning, Health
11. Planning for the cleanup of Capitol Lake should take in the context of the watershed planning and ranking process established through the Puget Sound Water Quality Management Plan.	2-5 Years	High	Unknown	Oly, Tum., T.C.

ANALYSIS OF USES OF CAPITOL LAKE

V. ANALYSIS OF USES OF CAPITOL LAKE

The committee developed a list of uses for the lake and they divided that list into activities in which there was high interest, activities for which there was only a moderate interest, activities in which there was a low interest level and several activities which the committee felt generated no interest.

For each of the high interest level activities, the committee examined conflicts and constraints for providing that activity at Capitol Lake. The conflicts were different for each activity, but some of those identified included maintenance for that activity, conflict with lake drainage (which occurs every year), dam operation, liability, excessive nutrient levels, lake circulation, erosion control, lake debris, pollution, lake depth, parking, wildlife in the south basin and traffic conflicts. Table 1 is a chart which lists each of the activities the lake is or could be used for and identifies the competing interests, issues or conflicts for providing that activity at Capitol Lake.

TABLE 1

Chart of Uses for Capitol Lake versus Competing Issues (see also Appendix R)

LAKES USES	Administration Authority	Enforcement	Implementation	Maintenance	Lake Drawdown	Source of funds	Dam Operation	Liability	Public Reaction	Nutrient Level	Turbidity Level	Chemical Treatment	Lake Circulation	Erosion Control	Lake Debris	Coliform Bacteria	Other Pollution	Lake Depth	Fish Rearing	Parking	Noise	Restroom Facilities	Boat Launch	Lake Plant Life (Rooted Plants)	Wildlife in South Basin	Safety	Speed	Commercialization	Ducks and Geese	Traffic		
<u>HIGH INTEREST LEVEL</u>																																
Swimming - Controlled Area	•																															
Boating - Overall	•																															
Canoe/Rowboat	•																															
Sail, Small	•																															
Wind Surfing	•																															
Fishing - Overall	•																															
Canoe/Rowboat	•																															
Trotting, Small Power	•																															
Shore	•																															
Fish Rearing/Viewing	•																															
Aesthetics	•																															
Picnic Areas	•																															
Jogging/Walking	•																															
Bird/Nature Watching	•																															
Tourism Access	•																															
Relaxation/Sun Bathing	•																															
Storm Drainage Basin	•																															
Special Events	•																															
<u>MODERATE INTEREST LEVEL</u>																																
Boating - By Basin	•																															
Low Power	•																															
Low Speed	•																															
<u>LOW INTEREST LEVEL</u>																																
Radio Controlled Boating by Basin	•																															
<u>NO INTEREST</u>																																
Swimming - Overall	•																															
Boating	•																															
High Power	•																															
High Speed	•																															
Water Skiing	•																															
Float Planes	•																															
Jet Skis	•																															

• = consideration by Committee of interaction between lake uses and issues related to lake use.

Heritage Park/Fish Rearing
Fishing, power boating,
skiing, etc.

Power/passive boating,
skiing, picnics,
jogging
Power boating,
skiing, shore fishing,
any of the more
intense people uses

Passive uses,
fishing

Fishing, active/passive
boating, skiing

Boating, all types

APPENDICES

APPENDIX A

Appendix A

Partial List of Reports on Capitol Lake and Tributaries

	<u>Date</u>	<u>Author</u>	<u>Type</u>
Open Space and Recreation Plan for Capitol Lake	1966	CLCC*	Rec.
Water Pollution Control and Abatement Plan for Deschutes River Basin	1974	TRPC	WQ
A Review of Consideration for Future Open Space and Recreation Plan for Capitol Lake and Visual Basin.	1975	CLCC	
Hydraulic and Water Quality Research Studies and Analysis of Capitol Lake Sediment and Restoration Problems	1975	WSU	
Chemistry and Biological Factors for Consideration in the Management of the Deschutes River - Capitol Lake (Finn and Tarr)	1975	WDOF	WQ
Capitol Lake Restoration--Design Engineering Report	1976	WDGA	WQ
Capitol Lake Restoration and Recreation Plan	1977	WDGA	WQ, Rec.
Water Quality in Capitol Lake, Olympia, Washington	1978	WDOE	WQ
Desch R. Basin Suspended Sediment Transport Study	1979	WDOE	
Effects of Point Source Discharges and Other Inputs on Water Quality in Budd Inlet, Washington	1979	WDOE	WQ
Deschutes River Basin Instream Resource Protection Program	1980	WDOE	WQ
Deschutes River/Capitol Lake Water Quality Assessment	1982	WDOE	WQ
Stream Corridor Management Plan for the Deschutes River	1984	TCCD	WQ
Capitol Lake Restoration Analysis	1984	WDGA	WQ
Operations and Maintenance Manual for C. L. Dredge Sports Treatment Site	1984	Brown & Caldwell	

Percival Creek Corridor Plan--Volume II Upper Reach	1985	TRPC	WQ
Percival Creek Corridor Plan--Volume I Canyon and Middle Reaches	1985	TRPC	WQ
Deschutes Corridor Recreation Plan	1986	TRPC	Rec.
Peak Stream Discharge During 30 Years of Sustained Yield Timber Management in Two Fifth Order Watershed in Washington State	1986	Weyerhaeuser	
Aquatic Feasibility Study	1987	OLY	WQ, Rec.

*UW - Oceanography

*CLCC - Capitol Lake Coordinating Committee

APPENDIX B

A. HIGH INTEREST LEVEL USES

1. Controlled Area Swimming

This activity would include swimming, wading, etc., in a controlled area of the lake, most likely in the North basin at either the existing swim park site or perhaps at Marathon Park. The inclusion of swimming in the list of high interest level uses for the lake greatly expands the list of potential conflicts and increases the difficulty of providing the water quality necessary to allow for swimming-related activities. Some of the issues are as follows:

- a. Administrative Authority - As with all activities on or around the lake, this authority rests with the State Department of General Administration which can, by contractual agreement, delegate the operations authority to the user as is currently done in the case of the Capitol Lake Swim Park area.
- b. Lake Drainage Drawdown - Lake drawdown operations performed by General Administration may have an impact on the swim area by causing pressure problems on whatever separation wall is needed between the lake and the swim area.
- c. Public Reaction - There appears to be some sentiment for retention of an outdoor swimming facility in the North basin of Capitol Lake.

- d. Pollution - The largest conflict with a swim area is pollution (chemical, turbidity, nutrient levels, lake debris, etc.). Treatment of the various pollution types must either be compatible with other potential lake uses (especially fish rearing) or the swim area must be isolated from the lake so that treatment can occur. High nutrient levels increase the algae bloom in the lake during summer months causing turbidity problems for swimmers and life guards. High coliform bacteria counts are a health hazard to swimmers. Lake debris can be a safety hazard if the debris and swimming are not confined to separate areas of the lake. Gas and oil pollution from power boats can also be a problem for swimmers.

- e. Lake Depth - Lake depth can also be a problem if siltation is allowed to decrease the depth of areas utilized for diving, boating, etc.

- f. Parking/Traffic - Any areas of the lake utilized for swimming will need to provide adequate facilities for parking, passenger load/unload, bus service, etc.

- g. Restroom Facilities - Restroom facilities will be needed in the vicinity of any swimming activity.

- h. Use Conflicts:
 - (1) Fish rearing because chemical treatments would be required to provide a clean enough lake to swim in.

(2) Active boating because of the safety hazards of mixing skiers, power boats, jet skiers, etc., with swimmers.

(3) Storm drainage because water quality may be degraded too much for swimming.

2. Boating - Passive - Overall

The activity includes canoeing, rowboating, wind-surfing, sailing with small boats, etc. It encompasses those forms of boating powered by wind or human power. Certain of the activities may need to be regulated by lake basin due to the potential conflict between wind-surfers and small sailboats.

Potential Conflicts are:

- a. Administration Authority - Again this is the responsibility of the General Administration - they control traffic on the lake.
- b. Enforcement - This is currently the responsibility of General Administration and the state patrol regulated by WAC's.
- c. Lake Debris - Uncontrolled debris from the Deschutes River will be a safety hazard for all types of passive boating activities.

- d. Parking/Boat Launches - Any enhancement of the lake for these passive boating uses will necessitate provision of parking and boat launch facilities to accommodate the users.
- e. Use Conflicts - Active boating due to safety hazards of mixing power boats, skiers, jet skiers, etc., with passive boating.

3. Fishing - Overall

This activity would include the more passive types of fishing, fishing from row boats/canoes, fishing from small, low-powered trolling boats (small electric type trolling motors) and fishing from shorelines. The use of gasoline powered fishing boats has not been included due to potential pollution from gas and oil spills, the higher noise level generated and higher potential for erosion of the lake bank due to wave actions.

Potential competing interests/issues are as follows:

- a. Administrative Authority
 - (1) General Administration authority to regulate area and time in which use occurs;
 - (2) General Administration to regulate type of boats allowed.

b. Enforcement

- (1) General Administration/Washington State Patrol responsible for enforcement of General Administration regulations;
- (2) Department of Game responsible for fishing regulations.

c. Erosion Control

- (1) Allowance of shore fishing increases bank erosion possibilities;
- (2) Need slope protection on the banks.

d. Lake Debris

Floating/submerged debris can be a safety hazard for fishing boats.

e. Parking

- (1) Parking facilities required for fisherman regardless of type of fishing;
- (2) Parking facilities required for boat trailers;
- (3) Parking along Deschutes Parkway detracts from aesthetic qualities of the Lake as well as intensifies use of street.

f. Boat Launch

- (1) Facility needed for launching of canoes, row boats, trolling boats, etc;
- (2) Launch facility should be near boat trailer parking.

g. Competing Uses

- (1) Passive boating such as sailing;
- (2) Active boating (if allowed) such as skiing, jet skiing, float planes, etc., due to safety hazards, noise interruptions;
- (3) Passive shoreline uses such as jogging, picnicking, etc.
 - perhaps not allow shoreline fishing in areas designated for walking, jogging, picnicking, sunbathing
 - fishing pier would eliminate this conflict;
- (4) Swimming - fishing and swimming areas should be separated.

4. Fish Rearing/Viewing

This activity includes the use of Capitol Lake and Percival Cove as a fish rearing facility as currently done. This activity also includes the viewing of the fish populations returning to the Deschutes River to spawn.

Competing issues and interests are:

a. Administrative Authority

- (1) Use of the Lake and Percival Cove for fish rearing is under the administrative authority of General Administration;
- (2) Viewing areas are under authority of the City of Olympia (Fourth and Fifth Avenue bridges) and General Administration.

b. Pollution

- (1) Nutrient level - due to growth of plant life;
- (2) Turbidity - algae, fish can't see food sources;
- (3) Chemical treatment - treatments used to reduce coliform bacteria are fatal to fish population.

c. Competing Uses

- (1) Active boating due to waves (bank erosion), noise, oil pollutants, etc.;
- (2) Shore fishing due to bank erosion;
- (3) Storm drainage basin if pollution control measures are not incorporated.

5. Aesthetics

The intent of this use is to utilize the lake as an aesthetic, serene open space which offers a quality view for those passing by the lake.

Competing issues and interests are:

a. Maintenance

Who will maintain the lake and shorelines to ensure they offer a quality view.

b. Erosion Control

This will not be a problem if no other uses are allowed on the lake.

c. Parking/Noise

Again, no problem if viewing of the lake is its only use.

d. Commercialization

This will tend to degrade the aesthetics of the lake as commercialization expands.

e. Competing Uses

- (1) Especially any active uses such as power boating, skiing, etc., due to pollutants, noise, bank erosion, etc.
- (2) To a lesser degree, the more intense people uses such as picnicking and swimming due to noise, litter, etc., which will accompany those activities.
- (3) Special events for short defined periods of time due to noise, lights, litter, pollutants, etc.
- (4) Storm drainage if pollution control measure are not incorporated.

6. Picnic Areas

This activity envisions the use of the lake shoreline for picnicking. The picnicking activity would be allowed along the publicly owned portions of the lake shoreline.

a. Administrative Authority

The administrative authority to allow the current or expanded use of the lake shorelines for picnicking lies with General Administration.

b. Enforcement

(1) Enforcement will be required if rules and regulations regarding the consumption of alcohol are in place for picnic areas.

(2) Also required if only certain areas of the shoreline are designated as allowing picnicking.

c. Maintenance

(1) Will be required if picnic tables, barbeques, picnic shelters, drinking water outlets, etc., are provided.

(2) Increased picnic use will most likely require increased grounds maintenance in high picnic activity areas.

d. Funding

- (1) Necessary to provide picnicking facilities.
- (2) Necessary to provide picnicking facility maintenance.
- (3) Necessary to provide ground maintenance.
- (4) Necessary to provide enforcement.

e. Parking

Parking should not create a problem unless an effort is made to intensify the use of the lake shores as a picnic area - current levels of this use are not creating a parking problem.

f. Restroom Facilities

- (1) Existing restroom facilities are more than adequate to support the existing picnicking intensity.
- (2) More intense picnicking use may require additional facilities.

g. Wildlife

- (1) Again existing picnicking levels do not appear to be a problem to the lakes wildlife.

- (2) Expansion of the picnicking use could compete with wildlife for space along the lake shore - especially if the picnicking areas are not confined.

h. Commercialization

- (1) Commercialization of the lake shoreline will compete with picnicking for space.
- (2) Certain types of commercialization (deli's, food stands, ice cream vendors, etc.) will increase the need for additional picnicking space.

i. Ducks and Geese

- (1) Large population of ducks and geese will tend to interfere with the picnicking use of the shoreline.
- (2) Concentrated picnic areas will also tend to concentrate the ducks/geese populations - potentially creating related areas of pollution concerns due to droppings.

j. Competing Uses

- (1) Active boating use (power boating, skiing, etc.) to some extent in that they detract from relaxation offered by a picnic.

- (2) Jogging/walking unless activity locations are separated.

7. Jogging/Walking

This use envisions allowing the publically owned shores of the lake to be used as running/jogging/walking trails. This use currently exists in an unrestricted, unregulated manner.

Competing Issues/Interests:

a. Administrative Authority

- (1) Lies with General Administration
- (2) To keep from ruining lawn area around lake, General Administration may want to institute a regulation against running on lawn. (Would require enforcement and may necessitate need to provide better running surface).

b. Maintenance

- (1) Running on lawn ruins lawn for other uses by wearing a path in lawn - path will get large without maintenance or regulation.
- (2) If running surface is installed, may need to be maintained for safety reasons (eliminate glass, leaves, rocks, etc.).

c. Funding

- (1) To widen running surface and/or install better one.
- (2) To maintain new running surface or repair lawn damage.
- (3) To enforce regulations dealing with running on lawn.

d. Competing Uses

- (1) Active boating may create a noise conflict with jogging/walking use of lake shore.
- (2) Picnicking could be a competing use if not separated from jogging/walking paths.
- (3) Commercialization of lake shore will conflict with jogging/walking unless activities are sufficiently separated.

8. Bird/Nature Observation

This use is intended to allow the lake and its shorelines to be used for bird/nature observation.

Competing interests/issues are:

a. Administrative Authority

(1) General Administration authority to control area in which this activity occurs.

(2) General Administration authority to establish specific areas (perhaps even exclusive areas) for this activity.

b. Enforcement

Required if areas are set aside exclusively for bird/nature observation.

c. Competing Uses

(1) Active boating (power boats, skiing, etc.) as this activity will discourage settlement of wildlife in the lake environment due to noise, etc.

(2) Shoreline uses (fishing, picnicking, jogging, commercialization, etc.) - unless controlled to specific areas - as this activity will eliminate wildlife shoreline habitat areas and will also discourage wildlife settlement.

(3) Swimming - unless in controlled area - will also discourage wildlife settlement.

9. Tourists Access

This use is envisioned to provide greater access to the lake and its facilities by tourists. This is anticipated to include tour buses, motorhomes, trailers, etc. The type of tourism envisioned is a passive type of tourism geared toward people related activities.

Competing interests/issues are:

a. Administrative Authority

(1) Authority to allow such activity lies with General Administration.

(2) Authority to provide facilities for increased tourism use lies with General Administration.

b. Enforcement

(1) Increased tourist activities may require increased levels of security by the state patrol.

(2) Enforcement of parking regulation for tourist activity lies with the state patrol.

c. Implementation

Implementation of plans for tourist parking, but turnarounds and other facilities is the responsibility of General Administration.

d. Maintenance

(1) Maintenance of facilities would be the responsibility of General Administration.

(2) Increased maintenance levels may be required if facilities are provided focusing on the lake as a tourist attraction.

e. Funding

The state is responsible for funding required to provide additional tourist facilities such as bus pullouts and turnarounds, parking areas for additional and larger vehicles, etc.

f. Parking

(1) Existing parking facilities will need to be expanded to allow for larger vehicle parking.

- (2) Addition automobile parking facilities will also be needed if lake is promoted as a tourist destination.

g. Restroom Facilities

Increased tourist population will require additional restroom facilities.

h. Noise

Noise generated by tourist activities may interfere with the more passive people oriented activities such as picnicking, jogging/walking, relaxation, etc.

i. Competing Uses

- (1) More active/intense boating activities such as power boating, skiing, etc.

- (2) Shore fishing, unless the activity is separated from tourist areas.

10. Relaxation/Sun Bathing

This use is contemplated as an extension of some of the other more passive people uses of the lake. This use would seem to fit well with less intense people uses such as picnic areas, nature watching and

visual aesthetics. This use would also be compatible with the less intense boating uses such as canoes, row boats and small sail boats.

Competing issues and interest are:

a. Administrative Authority

Most likely necessary if activity were to be limited to specified areas for some reason. Such action would then also require enforcement.

b. Restroom Facilities

(1) Current facilities are adequate for current needs and most likely would support some increased level of this use.

(2) If use intensifies to a large extent the increased people population will require increased restroom facilities.

c. Commercialization

(1) Current level is low and creates no conflict.

(2) Increased shoreline commercialization will conflict with relaxation due to noise level increases.

(3) Small levels of increased commercialization may actually be a benefit to the relaxation use of the shoreline by offering items

desired by people (eats, drinks, snacks, reading material, etc.)

d. Competing Uses

- (1) Active boating activities such as power boats, skiing, jet skiing, etc. due to noise level increases.
- (2) Shore fishing if allowed to occur in same areas as relaxation occurs.
- (3) Increased levels of some of the people activities such as picnicking, jogging, etc.
- (4) Special events due to increased influx of people, pets, noise, etc.
- (5) Tourism if tourism centers and relaxation areas are not separated.

JLK:rt/287.8

APPENDIX C

AGREEMENT

AGREEMENT made this 20th day of March, 1982
between the City of Olympia, the City of Tumwater, Thurston
County and the State of Washington.

Recitals

The parties agree that Capitol Lake is a highly valued public resource and that they all have a common interest in maintaining and preserving public enjoyment and access to Capitol Lake. The parties desire to cooperate in an effort which will bring about a program for Capitol Lake that will assure enhancement of natural, economic and recreational benefits for this generation and those of the future.

NOW THEREFORE, the parties form this agreement solely for the purpose of studying all reasonable ways to achieve this common objective and mutually agree as follows:

(1) Formation of Committee: The parties agree to form a committee to develop a long range management action plan to clean and preserve Capitol Lake. Committee members from Olympia and Tumwater and from Thurston County shall be the chief administration official from each jurisdiction. The member(s) from the State of Washington shall be a member of the Governor's staff and the Director of General Administration. The Committee will be called the Capitol Lake Restoration Committee (the "Committee").

(2) Role of Committee: The overall objective of the Committee is to develop a long range management action plan for Capitol Lake and its tributaries to be submitted to the participating jurisdictions. This process involves two phases.

- A. Determination of the level of cleanup which would be a reasonable and practical goal for the participants to achieve. It is intended that this phase of the work would be completed on or about July 1, 1986.
- B. Formulation of a long range management action plan to achieve and sustain the established cleanup goal, within an agreed period of time. It is intended that this phase of the work would be completed on or about December 31, 1986.

It is intended that the Committee use primarily existing studies and information in its work rather than commission new studies or investigations.

(3) Submission of Goal and Plan: Upon completion, the cleanup goal and management action plan shall be submitted to all involved jurisdictions, setting forth an appropriate course of action for the cleanup, restoration and preservation of Capitol Lake and its tributaries. It is agreed that the cleanup goal and management action plan as submitted shall form the starting point for discussions leading to an agreement between all affected jurisdictions setting a desired cleanup goal and a management action plan to achieve and sustain that goal.

(4) Report by Committee Members: Each member of the Committee shall keep his/her legislative or executive body well informed of the progress and conclusions of the Committee as it proceeds with its work. It is intended that each member represent the interests and desires of his/her jurisdiction when participating in Committee work.

(5) Support and Resources: The jurisdictions agree to support the work of the Committee by the provision of resources, including staff time, reasonably determined by the Committee to be necessary for the accomplishment of its tasks.

IN WITNESS WHEREOF the parties have executed this Agreement as of the day and year first written above.

CITY OF OLYMPIA

by William Daley
Mayor
Title

CITY OF TUMWATER

by A. Stewart
Mayor
Title

THURSTON COUNTY, WASHINGTON

by Jes Eldridge
CHAIRMAN
Title

STATE OF WASHINGTON

by Don R. Faust
Chief of Staff
Title

APPENDIX D

APPENDIX D

From Capitol Lake Restoration Analysis

by ENTRANCO Engineers

January, 1984

I
FISHERY USE OF CAPITOL LAKE

Washington Department of Fisheries Rearing Operations

The State of Washington Department of Fisheries (WDF) conducts rearing of juvenile fall chinook salmon in Percival Cove. It is the second largest release site in terms of numbers of fall chinook and first in terms of pounds of fall chinook in the State of Washington. Percival Cove (an advanced release pond) has been modified in an attempt to improve water flow conditions throughout the cove and to retain fish via screens at the outlet. There are two distinct groups which utilize Percival Cove, a yearling chinook program, and a 0-age chinook or zero program.

The yearling fall chinook which are approximately one year of age are transferred from George Adams and/or McKernan hatchery to Percival Cove between October 1 and November 30, depending upon water quality conditions in the cove. The yearly goals are 1.1 million released fingerlings for this group. These fish are fed until the following April when space requirements for the second batch of chinook (0's) require that these fish be released to make room.

The release procedures require that yearling chinook be forced out of Percival Cove and Capitol Lake into Budd Inlet through a bumping process. Artificial feeding is stopped and the screens at the exit of Percival Cove are removed. Capitol Lake is then drawn down over a three-day period, dropping the lake elevation approximately four feet. On the fourth day a complete drawdown takes place to the sill of the tide gate structure at which time the majority of the yearling chinook are liberated into Budd Inlet.

The second group of chinook to be reared in Percival Cove (the 0's) arrive during the latter part of April as three month old fish. They currently remain in Percival Cove until the first week in June. The release goal for this group is 7 million fish, however

each year the number varies as the fish scheduled for this program are excess fish (cuts) from a number of hatcheries in the Puget Sound drainage basin. In 1983, approximately 8 million were released from Percival Cove.

In 1982 the release process for the 0's was somewhat altered based upon a request by the City of Olympia. In June the screens were pulled from Percival Cove and the 0-age chinook were allowed to migrate on their own into Capitol Lake. The actual bumping process did not take place until July at which time the residual chinook (0-age) were flushed out. WDF feels that this procedure (1982) was quite successful over the previous year's procedure of bumping, in early June, immediately after pulling the screens. WDF observations indicated that the 0-age chinook were dispersed fairly evenly throughout Capitol Lake from the tide gate south to the Olympia Brewery. The fish feed on naturally occurring organisms found in Capitol Lake. The release procedure desired for 0-age chinook from Capitol Lake into Budd Inlet is accomplished through volitional migration over the tide gate structure or fish weir. There are no known problems with juvenile chinook exiting Capitol Lake through the tide gates. Should water quality problems develop in Capitol Lake or in Budd Inlet, WDF requires the capability to draw down Capitol Lake to force fish out of the lake and/or improve water quality conditions. This capability is also required of other agencies involved in the management of Capitol Lake for maintenance or emergency situations. Lake drawdowns conducted prior to June may cause severe losses to the 0-age chinook due to their inability to tolerate saltwater conditions.

In 1984 0-age chinook plants are planned for both Percival Cove and Capitol Lake. The hatcheries programmed for supplying these fish include:

McAllister Creek Hatchery	- 4 million
Coulter Creek Hatchery	1.5 million
Skykomish Hatchery	<u>1.5 million</u>
Total Plants	7 million

These numbers might vary somewhat from year to year as program requirements or facility production change.

In previous years, observations have been made by WDF personnel that recorded juvenile fish (salmonid) use throughout the entire lake system. These observations have been partially recorded in an EIS (Capitol Lake Restoration and Recreation Final EIS by Department of General Administration, Washington) published in 1977 (see Figure 1).

The flow curtain installed in Percival Cove is designed to direct Percival Creek water flow into the stagnant portions of Percival Cove, however it is only partially effective and large dead spots still occur. Three major tears have occurred on this curtain within the previous two years. This is partially attributable to the heavy sediment load which has deposited on the curtain. The original curtain (900' total length) is operating at 120' total length.

Between the discharge of yearling fish at the beginning of April and the planting of 0-age fish in Percival Cove in May, a 2-3 week period occurs where the cove is drained and maintenance activities take place. The maintenance activities consist of sediment removal within Percival Cove. These sediments are placed in other areas of the cove to level out bottom contours. Upon completion of cove maintenance, filling procedures take place through manipulation of tide gates and Deschutes River flows. The rate of filling is dependent upon the Deschutes River flows at this period of time. The range is from 2 to 6 days for complete filling of Capitol Lake and Percival Cove from its drawdown levels. The lake may be down from 8 to 14 days. The 1983 drawdown occurred during the first week in March as requested by the City of Olympia for maintenance work on storm drains.

Washington Department of Game Operations

Washington State Department of Game (WDG) manages migratory fish species within the Deschutes basin (which includes the Deschutes River and Percival Creek drainage) primarily on a natural propagation basis. The exceptions are rainbow trout, which are planted in Trooper and Black Lake which may revert to steelhead behavior, and a summer run steelhead fry plant that has

Capitol Lake

Surface Acres - 280
 Acre Feet - 2,200 (Approx.)
 Mean Depth - 10 ft.
 Max. Depth - 20 ft.

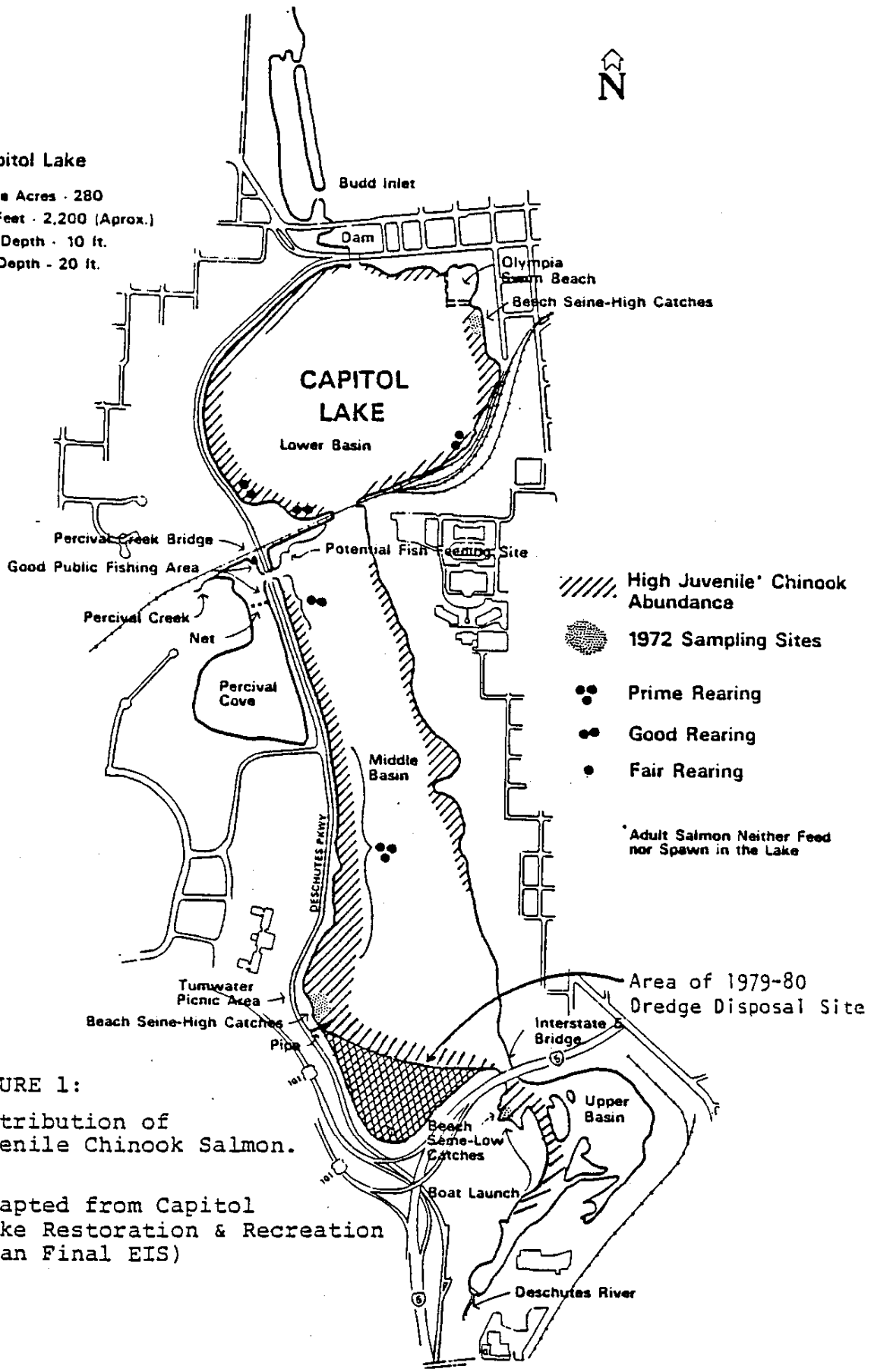


FIGURE 1:
 Distribution of
 Juvenile Chinook Salmon.

(Adapted from Capitol
 Lake Restoration & Recreation
 Plan Final EIS)

been initiated in 1982. The major migratory species managed by WDG is the winter run steelhead trout. This species has historically migrated into Percival Creek from December 15 through April 30 and into the Deschutes River from December 1 until April 30. Adult steelhead migrating up the Deschutes River pass through the Tumwater Falls ladder which is kept open after chinook spawning season is concluded. Adult steelhead moving into Percival Creek pass through a passage facility located at Percival Cove which is currently operating in the open position. On occasion this passage facility is blocked to prevent juvenile chinook escaping out of the Percival Cove rearing facility. This blockage makes the passage facility into a trap and holding area.

Outmigration of smolts from Percival Creek occurs during the month of April. These smolts average 9" to 12" in Percival Creek and 7" to 9" in the Deschutes River system. Downstream smolts moving through Percival Creek during the month of April would normally enter Percival Cove when 0-age chinook are being reared. In 1982, WDF put a fine mesh net in place to allow these smolts to pass by Percival Cove and into Capitol Lake.

In 1982, WDG began a reestablishment program for summer run steelhead which were thought to be in the system historically. Fry plants were made in the Deschutes River with runs expected 3-4 years in the future.

Sea-run cutthroat trout are another species managed by the Washington Department of Game. These fish are an important part of the sport fishery within the Deschutes River basin (including Capitol Lake). The sea-run cutthroat trout are moving through the tide gate structure on a year round basis with spawning occurring in the Deschutes River and Percival Creek. The sport fishery in Capitol Lake is closed during the month of April to protect the downstream steelhead migrants.

Adult Returns to Capitol Lake

All migratory adult trout and salmon entering the Deschutes basin pass through the Capitol Lake tide gate structure located under the 5th Avenue W. bridge in Olympia. The migratory period for these fish are as follows:

Fall chinook salmon	-	Sept. 1 - Nov. 15
Coho salmon	-	Sept. 15 - Dec. 31
Winter run steelhead trout	-	Dec. 1 - April 30
Summer run steelhead trout	-	June 1 - Aug. 31
Sea-run cutthroat trout	-	Year-round

When the fish ladder, which is adjacent to the tide gates, is operating, 50-60% of all adult fish entering Capitol Lake bypass the fish ladder and enter through the tide gate system. The other 40-50% enter via the fish ladder through a V trap into a holding box or pen. This holding pen was installed in 1982 by WDF as an accommodation to the Indian fishery and WDF management biologists. The trap provides the capability to give male chinook adults to the Squaxin Indian Tribe and to enumerate the run for determination of fish quantities passing through the tide gate. The ability to provide excess males to the Squaxin Indian Tribe (which has fishing rights in Budd Inlet) provides additional protection for females which may have been caught in the gill net fishery and severely stressed during handling as they were removed. The fish ladder is operated from September 1 through December when 90% or better of the adult chinook are expected to pass through Capitol Lake. The associated trap at the end of the fish ladder is temporary in nature and is installed only for the adult chinook run.

After the chinook enter the tide gate trap or Capitol Lake, there may be one to two months time differential before these fish are ripe enough to spawn. These fish migrate to the Deschutes River trapping facilities located at Tumwater Falls or to Percival Cove. Recent tag experiments indicate that approximately 65% \pm 15% of the adults migrate to Percival

Cove and the remaining 35% ± 15% migrate to the Tumwater Falls facilities. In 1982 adult chinook were not intentionally released upstream in Percival Creek or the Deschutes River. Adult coho and steelhead were passed up Percival Creek for natural spawning.

Adult coho returns at the Tumwater Falls site are passed up river with the exception of tagged fish captured for management (WDF) purposes. Adult coho returns for the last six years are as follows:

1977	6800
1978	2300
1979	7000
1980	3000
1981	4300
1982	8900

WDF observes good survival of this stock with excellent contribution to all fisheries.

The fish way gate which can influence the lake elevation and is located at the upper end of the fish ladder is set at its bottom configuration of -5 (City of Olympia datum) to allow for attraction and passage water during the September 1 to November 15 period. The remainder of the year it is put in the upper position of 0.

In 1981, 14 million eggs were taken from returning fall chinook into the Deschutes River system. In 1982, 8.2 million eggs were taken. The adult fish may be dry spawned at the Percival Cove trap site or a beach seine may be pulled to collect milling adults for transfer to the Tumwater Falls adult holding facility. The green eggs and sperm are then taken to Adams, McKernan or Minter Creek hatcheries for incubation until the eyed stage. At the eyed stage a percentage of these eggs may be distributed to Simpson, Skagit, Mcallister, Minter Creek, and/or Hood Canal hatcheries for additional incubation and fry rearing.

APPENDIX E

more than 10 percent of samples exceeding 100 organisms/100 ml.

(B) Marine water – Fecal coliform organisms shall not exceed a median value of 14 organisms/100 ml, with not more than 10 percent of samples exceeding 43 organisms/100 ml.

(ii) Dissolved oxygen.

(A) Freshwater – Dissolved oxygen shall exceed 9.5 mg/l.

(B) Marine water – Dissolved oxygen shall exceed 7.0 mg/l except when the natural phenomenon of upwelling occurs, natural dissolved oxygen levels can be degraded by up to 0.2 mg/l by man-caused activities.

(iii) Total dissolved gas – the concentration of total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature – water temperatures shall not exceed 16.0° Celsius (freshwater) or 13.0° Celsius (marine water) due to human activities. Temperature increases shall not, at any time, exceed $t=23/(T+5)$ (freshwater) or $t=8/(T-4)$ (marine water).

When natural conditions exceed 16.0° Celsius (freshwater) and 13.0° Celsius (marine water), no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3° Celsius.

For purposes hereof, "t" represents the permissive temperature change across the dilution zone; and "T" represents the highest existing temperature in this water classification outside of any dilution zone.

Provided that temperature increase resulting from nonpoint source activities shall not exceed 2.8° Celsius, and the maximum water temperature shall not exceed 16.3° Celsius (freshwater).

(v) pH shall be within the range of 6.5 to 8.5 (freshwater) or 7.0 to 8.5 (marine water) with a man-caused variation within a range of less than 0.2 units.

(vi) Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vii) Toxic, radioactive, or deleterious material concentrations shall be less than those which may affect public health, the natural aquatic environment, or the desirability of the water for any use.

(viii) Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

(2) CLASS A (EXCELLENT).

(a) General Characteristic. Water quality of this class shall meet or exceed the requirements for all or substantially all uses.

(b) Characteristic Uses. Characteristic uses shall include, but are not limited to, the following:

(i) Water supply (domestic, industrial, agricultural).

(ii) Wildlife habitat, stock watering.

(iii) General recreation and aesthetic enjoyment (picnicking, hiking, fishing, swimming, skiing, and boating).

(iv) Commerce and navigation.

(v) Fish and shellfish reproduction, rearing, and harvesting.

(c) Water Quality Criteria.

(i) Fecal Coliform Organisms.

(A) Freshwater – Fecal coliform organisms shall not exceed a median value of 100 organisms/100 ml, with not more than 10 percent of samples exceeding 200 organisms/100 ml.

(B) Marine water – Fecal coliform organisms shall not exceed a median value of 14 organisms/100 ml, with not more than 10 percent of samples exceeding 43 organisms/100 ml.

(ii) Dissolved Oxygen.

(A) Freshwater – Dissolved oxygen shall exceed 8.0 mg/l.

(B) Marine water – Dissolved oxygen shall exceed 6.0 mg/l, except when the natural phenomenon of upwelling occurs, natural dissolved oxygen levels can be degraded by up to 0.2 mg/l by man-caused activities.

(iii) Total dissolved gas – the concentration of total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection.

(iv) Temperature – water temperatures shall not exceed 18.0° Celsius (freshwater) or 16.0° Celsius (marine water) due to human activities. Temperature increases shall not, at any time, exceed $t=28/(T+7)$ (freshwater) or $t=12/(T-2)$ (marine water).

When natural conditions exceed 18.0° Celsius (freshwater) and 16.0° Celsius (marine water), no temperature increase will be allowed which will raise the receiving water temperature by greater than 0.3° Celsius.

For purposes hereof, "t" represents the permissive temperature change across the dilution zone; and "T" represents the highest existing temperature in this water classification outside of any dilution zone.

Provided that temperature increase resulting from nonpoint source activities shall not exceed 2.8° Celsius, and the maximum water temperature shall not exceed 18.3° Celsius (freshwater).

(v) pH shall be within the range of 6.5 to 8.5 (freshwater) or 7.0 to 8.5 (marine water) with a man-caused variation within a range of less than 0.5 units.

(vi) Turbidity shall not exceed 5 NTU over background turbidity when the background turbidity is 50 NTU or less, or have more than a 10 percent increase in turbidity when the background turbidity is more than 50 NTU.

(vii) Toxic, radioactive, or deleterious material concentrations shall be below those of public health significance, or which may cause acute or chronic toxic conditions to the aquatic biota, or which may adversely affect any water use.

(viii) Aesthetic values shall not be impaired by the presence of materials or their effects, excluding those of natural origin, which offend the senses of sight, smell, touch, or taste.

(3) CLASS B (GOOD).

(a) General Characteristic. Water quality of this class shall meet or exceed the requirements for most uses.

Capital Lake *