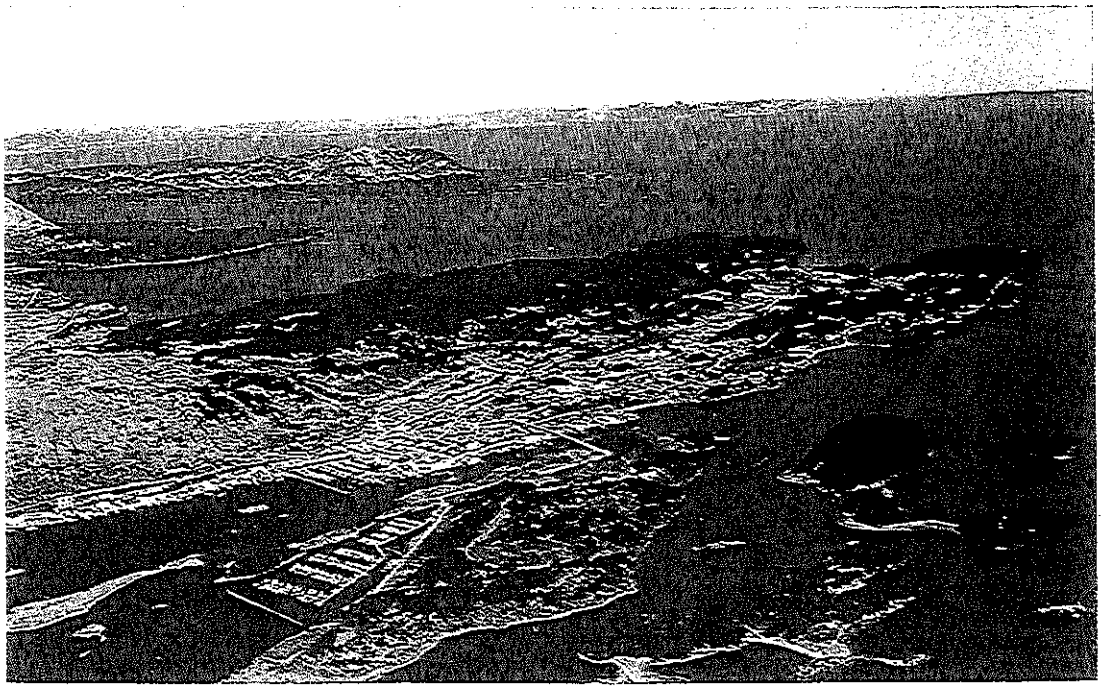
AN ASSESSMENT OF THE CHARACTER AND HEALTH OF KODIAK'S URBAN WATERSHEDS AND LAKES



Prepared by the

CLEAN LAKES FOR KODIAK

subcommittee of the

KODIAK SOIL AND WATER CONSERVATION DISTRICT

WITH FUNDING FROM THE

U.S. DEPARTMENT OF AGRICULTURE
NATURAL RESOURCES CONSERVATION SERVICE

SEPTEMBER 10, 1997

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Acknowledgments

Clean Lakes for Kodiak - a Citizen's group involved a number of community residents during its two and one half years of existence. The number of participants shrunk and swelled over the course of time. The mainstay of the group consisted of:

Chris Blackburn, Chair
Jim Ashford
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Al Burch
Bud Cassidy
Chris Clevenger
Dale Finley
Norm Sutliff

Jim Burton, District Chair, KSWCD
Omar Stratman, KSWCD
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Bill Burton, KSWCD
Bud Cassidy, KSWCD

Technical support was provided by:
Mark Blakeslee, Aqualife and author of the
Kodiak Urban Lakes Project: Technical Report.
Bill Rieth, Alaska Department of Environmental Conservation
Fred Sorensen, District Agent, Alaska Cooperative Extension Service, UAF
Steve Honnald, Alaska Department of Fish and Game
Bruce Short, Biologist

Others citizens who have been involved in some capacity include:
Kathy Colwell, Horseshoe Lake Community Council
Dave Colwell
Bill Donaldson
Marion Stirrup
Jon Houser
Deedie Pearson

Special Thanks to:
City of Kodiak and especially the Hap Heiberg and folks at the City wastewater treatment lab
Jerome Selby, Mayor of the Kodiak Island Borough and staff for administering the grant
Jim Woitel, Drafting Technician, KIB, for providing mapping services
Mark Kinney, District Conservationist with the Natural Resources Conservation Service
Dwane Coffey, District Conservationist with the Natural Resources Conservation Service
Terry Nelson, Economist with the Natural Resources Conservation Service
Jim Schmidt, Assistant State Conservationist, Natural Resources Conservation Service

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Public Summary

Have you wondered how safe the lakes around our community are? Can you safely go swimming in them? What kind of fish are in the lakes? Can they be eaten? What other kinds of animals live or use the water. How big are the lakes? Are they deep?-- A citizen's group called CLEAN LAKES FOR KODIAK (CLK) has asked these kinds of questions and was given a federal grant to find out some of the answers. This report is the result of that effort.

Not only did CLK ask the above questions, but to understand the answers to the questions we learned about other characteristics of the lakes such as their chemical characteristics, their biological capacity and the quality of the water entering the lakes. We learned that the quality of the lake is just a reflection of what occurs upstream, that is, up in the *watershed.* A watershed is that catchment area above the lake where all rain and snow that fall on the catchment basin flows downhill and into the lake.

But these questions have been asked before because residents have witnessed sediment, oil, sewage, and plant growth in some of our lakes and have voiced concern.

To better understand the cause and effects of these impacts on lakes and watersheds, it was clear that one of the first things that needed to be gathered was information about the watersheds, drainages and the lakes. We found little bits and pieces of information in the various government offices. The information we found was generally collected for a specific project and was only a piece of puzzle. To complete the data base, we next attempted to fill in any gaps in the information. This we did by taking samples of the water flowing throughout the watershed and into the lakes. We had these water samples analyzed for their chemical content. We gauged the flow of the water entering and leaving the lake. We trapped fish, took their weights and measurements. We talked to folks about the types of waterfowl and other birds and mammals that frequented the lakes. We became familiar with the types of microscopic plants and animals that live in the water. We interviewed long time residents of the community to understand some the history of development in the area and to identify past practices that occurred around the lake. We shot a lot photographs and drew a lot of maps.

The result of our investigation demonstrated that more than anything else, a stream, a lake, a watershed is a complicated system. Conclusions about what may or may not be happening to these water bodies cannot be made using the two years of data we collected. The process of investigation is continual. The best that can be hoped for by our efforts is that we created a snapshot in time about the conditions of these systems. But other snapshots are needed. They can be compared against each other to determine the changes that occur throughout time.

Our investigation showed us that some of our initial assumptions were quickly proven wrong. Things that were automatically thought to be harmful were found to have little if any long term consequence. Some of our assumptions were right on. Still, our investigation raised more questions than it answered. As a citizen's group, we found that just information alone was not

enough for us to make conclusions and recommendations about what was occurring.

What we needed was a more technical understanding of the information collected and an understanding of the interrelationships of the data. We needed to learn about hydrology, chemistry, and biology.

In summary, we have found that our lakes are in relatively good shape and have been very resilient to past impacts. But, we also found out that it is not to early to heed some of the warning signs that tell us that changes are occurring. The biggest impact to our lakes is due to community expansion. The community of Kodiak is growing and will continue to grow. The expansion of the community means removing natural vegetation and replacing it with houses, yards, roads, water and sewer lines, playgrounds, stores, and businesses. As our community grows expect the the water in the lakes be impacted to some degree.

But a maturing community recognizes that you can have both community growth and healthy producing lakes occurring simultaneously. Decisions made about community development should consider their impacts downstream and their impacts to Kodiak's urban lakes. Goals set by for each lake should be determined and development measured to make sure the goals set for the lakes are met and impacts kept to a minimum. With the work that CLK has done to develop baseline data for Kodiak's urban lakes, impacts can be measured.

Just as lakes are a reflection of what is occurring up in the watersheds, the productivity of Kodiak's urban lakes are a reflection of how much a community values its lakes.
The challenge for the Kodiak community is to recognize the value of healthy lakes, streams and watersheds to the overall quality of life in this town.

Based on our investigations, CLK makes the following recommendations:

Recommended Actions

I. COMMUNITY - WIDE ACTIONS

1. Perform planning and create planning boundaries on a watershed basis. Activities that occur upstream in the watershed impacts downstream water quality.
2. Development of drainage plans that recognizes the importance of reserving drainage ways for the efficient movement of water through properties.
3. Retention of vegetational buffer areas adjacent to drainage ways must be accomplished to filter out sediment prior to the water entering drainage ways.
4. Evaluation of impacts of public works projects and public and private subdivision reviews on downstream water quality.
5. Investigate and determine the feasibility of devices such as sediment filters and oil and water separators at important drainage ways.
6. Recognition of the value of wetlands in limiting water quality impacts.
7. Retain important wetlands.

II. WATERSHED SPECIFIC ACTIONS

A. ISLAND LAKE WATERSHED

1. Support the rezoning effort of the Horseshoe Lake Community Council to rezone sensitive lands adjacent to Horseshoe Lake to NATURAL USE AREA zoning category. This action will preserve the adjacent wetland areas as well as the steep hillside area that brings water to this area.
2. Support paving of Selief Lane to reduce siltation into the Island Lake system and in a way that maintains habitat value for salmon rearing.
3. Deepen Upper Horseshoe Lake by impounding water to improve habitat and aesthetics.
4. Improve the flow of the Selief Lane drainage ditch to allow for more efficient flow of water down to Beaver Lake.
5. Look for the cause of sporadic high fecal coliform counts at points along the Selief Lane drainage and Island Lake.
6. Support homeowners attempts to preserve sensitive areas.

B. LILLY LAKE - POTATO PATCH LAKE WATERSHED

1. Clean up trash accumulating in Lilly Lake from adjacent commercial lots. Fence the property line between the public land and the commercial properties to eliminate problem.
2. Prevent the filling in of Lilly Lake by adjacent landowners to preserve the lake as the municipal float plane facility. Exert public ownership of the riparian area of the lake.
3. Determine the source of visual impacts to Potato Patch Lake (color, turbidity) and develop a plan to reduce these impacts.
4. Reserve and enhance the wetland area and upland area adjacent to the main culvert that empties into Potato Patch.

C. MISSION LAKE WATERSHED

1. Plan for a new low maintenance tide gate to retain the integrity of Mission Lake.
2. Determine the cause for excessive growth of lake vegetation. Excessive growth appeared in the lake in 1995 and was absent in 1996.
3. Monitor the water quality during the summer recreation and swimming season.

Introduction

CLK MISSION STATEMENT:

A citizen's organization interested in increasing the knowledge about Kodiak's urban lakes, streams and watersheds through the gathering of technical information and the development of baseline data in an effort to evaluate, restore and guarantee the health, scenic attributes, and recreational quality of these water bodies for fish and wildlife resources and for present and future Kodiak residents.

The purpose of CLK is stated above in the Mission Statement. Citizens are demanding that the quality of Kodiak's lakes to provide fish and wildlife habitat and safe recreation continues.

Residents were noticing visual changes to the lakes. Incidences of excessive sediment, oil and plant growth were becoming more common. It was also known that many septic systems were failing because they were old, installed improperly or not properly made inoperative when public utilities became available. But some of the impacts that occur to our lakes are not always visible ones. There can be changes in the water that are not visual. They can be more subtle. But can be determined by analyzing water samples and careful inspection of the lakes.

The changes in the lakes are not only a result of increased development around the lakes, these changes were a direct result of human growth and development along the streams and drainages that carry water into Kodiak's urban lakes. That is, the impacts that were being noticed in the lakes were occurring from activities upstream within the watershed or catchment basin. Though many of the impacts come from a single source of impact such as the clearing of vegetation for a home, most of the change was occurring from non-point, non specific sources such as road building, former landfills, and subdivision development.

The economic importance of Kodiak's urban lakes is being recognized. Home sites with vistas of the lakes are more desirable. The lakes are fish factories important to the sport fishing activity that occurs at Mill Bay Beach and Mission Beach. Fish produced in the urban lakes are also caught in the nets of commercial fishermen. Their non economic uses of the lake are valued by the residents. The lakes are the homes of muskrats. They are the resting and nesting areas for waterfowl. They also provide a food source for kingfishers, loons and many species of ducks.

It is for these reasons that a group of Kodiak residents came together to form CLEAN LAKES FOR KODIAK. Their goal was to investigate the lakes, understand them, and keeping them healthy and productive while at the same time promoting a thriving community. The group learned what pollution is and what it is not. The group has an understanding of the cause and effect nature of impacts to water bodies. They have become advocates looking at all alternatives to accomplish a task then choosing the one that would least impact water quality. They have made decisions about how clean is clean enough. That is, our lakes will never be clean enough to meet drinking water standards. Decisions about water quality have to be made after looking at all competing uses for water in a watershed.

CLEAN LAKES FOR KODIAK members see Kodiak's lakes as attributes to the quality of life around town. It is essential that these water bodies first be recognized as important. Then measures need to be undertaken to consider and reject any actions that negatively impact them.

Having said all of the above, it must be stated that the attempt to address complex problems through a grassroots organization was a stressful process and one that did not occur based on a consensus of views. The belief system of the members of CLK was very broad. Though all members of CLK felt genuinely concerned about the lakes, how to proceed, at times, was a source of friction. This friction at times became a real struggle. But struggles are common in community decision making especially when the topic is a passionate one. The future state of these urban lakes evokes strong passions in the participants. But it is working through the struggle of conflicting views that became a goal of the group. That and making sure that the struggle did not becomes a bigger issue than the task at hand. This was a difficult task.

The effort undertaken by CLK, though contentious, is common process in this democratic society. It defines us not only as individuals, or members of a grassroots organization, but as a community members willing to work through the many struggles that arise in a dynamic and highly diverse community for the good of its residents. In this exercise for the good of the community's watersheds and urban lake systems and the good for those living in and around the City of Kodiak in the 21st century and beyond.

History of Clean Lakes for Kodiak- *a Citizen's Group*

Citizen interest in the condition of Kodiak's lakes has been gaining momentum in the last decade. As the town grew and matured, citizens were witnessing changes in the lakes that they perceived were negative. News articles about impacts to some of Kodiak's lakes appeared in the local newspaper. People were calling local governments and state agencies about incidences of oil in the lakes, increased sediment from runoff, sewage flowing into the lakes by malfunctioning septic tanks or broken sewer lines. Citizen were writing about impacts to fish, waterfowl and mammals that lived or used the lake. They feared that Kodiak's lakes were being abused, or worse, ignored. Because of this interest, the water quality of the lakes has generally improved with the installation of public utility lines and an interest in the lake by adjacent landowners.

The first organized citizen effort to address these concerns was a public meeting called by concerned citizens, the University of Alaska Cooperative Extension Service, a local representative of the Alaska Department of Environmental Conservation and the Kodiak Island Borough. Accounts of this local meeting appeared in the January, 1987 *ALASKA MAGAZINE.* Though nothing concrete came from this public meeting, it did serve to heighten the public's awareness about the lake systems around town as well as provide concerned residents of Kodiak a place to express their views on this subject.

Momentum increased when in 1990, citizens approached the local Kodiak Soil and Water Conservation District (KSWCD) to apply for a state grant. This grant would be used to take water samples in some of Kodiak's lakes and create baseline data about the water quality of water bodies. The Kodiak District is a local, grassroots organization chartered by the state of Alaska to carry out a comprehensive program of soil, water, and related natural resources conservation investigation. It was recognized that comprehensive information on the physical and chemical nature of these lakes did not exist. What little data there was, was spread around town in the offices of local and state agencies, but not consolidated in any one location. The grant request was not initially funded.

In 1993, the KSWCD again identified the acquisition of baseline data on Kodiak's urban lakes as a high priority. At the same time the Natural Resources Conservation Service (NRCS), formerly known as the Soil Conservation Service, was in Kodiak to give a presentation to the KSWCD on how to implement a District project. The NRCS program spoke of designing a project where concerned citizens, working in cooperation with local governments and agencies, would manage a local natural resources issue.

A citizen's group was born as a result of this agency/District cooperation in late 1993. Calling themselves CLEAN LAKES FOR KODIAK (CLK), they were organized under the local KSWCD. Membership consists of residents of Kodiak who are, homeowners, fishermen, bird watching enthusiasts etc. A Cooperative Agreement between the NRCS, the KSWCD (on behalf of the CLK), and the Kodiak Island Borough (who would administer the funds) was signed on June 14, 1994. Funding for the project expired on December 31, 1996.

Geography of Kodiak Island

I. GENERAL SETTING

The watersheds discussed in this study are located in and around the City of Kodiak on the northeast corner of Kodiak Island, Alaska. The City of Kodiak is the main town on the island. It is where the majority of the 15,000 residents of the island live.

Kodiak Island is an archipelago made up of a large group of rocky and mountainous islands that jut out into the North Pacific at a latitude of 58 degrees north and 152 degrees west longitude. It is located in Northwestern Gulf of Alaska. It is the second largest island in the United States (behind the big island of Hawaii) measuring 55 miles wide and over 100 miles long. The coastline is rugged and fjords penetrate deeply toward the spine of the island so that no point on the island is greater than 12 miles from tidewater.

II. WEATHER

The island's weather is influenced greatly by a warm ocean current from the south called the Japanese Current. Kodiak has a "maritime" climate which is characterized as mild by Alaska standards. Rains are light by nature but long in duration. Temperatures seldom fall below zero degrees Fahrenheit. Summer temperature may reach into the high 70's. About 70 inches of precipitation in the form of rain fall around the City of Kodiak. The island is often lashed by low pressure storm systems that generate gale force winds, rain and fog. Because of the island's mountainous terrain, the east side bears the brunt of the summer storms with up to 5 times as much rain than the island's west side.

III. GEOLOGY

Geologically, Kodiak Island is thought to be an extension of the Kenai Peninsula with mountains that rise out of the sea to an elevation of up to 4,000 feet. The rock is primarily composed of fine-grained mud stone, shale and slate. A granitic batholith is exposed along the center of the island. The association of fine grained rock started as sediments that collected in a deep water oceanic basin. This material was compressed and hardened into rock then raised above sea level. Once above exposed it was subjected to the erosional forces of nature and especially by the advancing glaciers of the Pleistocene age. These glaciers scoured the rock creating Kodiak's mountainous landscape. As the ice age ended, the glaciers melted creating many streams that reworked and redeposited the glacial material throughout the river valleys. Melting continental glaciers also raised sea level around the world. This increase in sea level flooded many stream beds and valleys around the island and has created the fjord like landscape we see today around the island. Another factor important in describing Kodiak's geologic make up are the numerous episodes of ash fall that have blanketed the island. This ash is a product of violent volcanic activity occurring west of the island on the Alaska Peninsula.

It is the highly erosive mud stone/shale material and volcanic ash that easily weathers when exposed. This weathered material creates the dusty conditions that occur around Kodiak when the weather is mild. This sediment also is carried downstream by the island's drainage networks.

IV. SOILS

The general soils map for the Kodiak area demonstrates that soils here are relatively thin and poor of nutrients. These cold temperature soils generally are formed from shale and/or volcanic ash. The creation of soil is influenced by topography and drainage. The shallow depth to bedrock in most areas make use of the soil for septic systems difficult and somewhat unsuccessful. Erosion is high at these same sites when the vegetation is removed.

V. VEGETATION

The northeastern part of Kodiak Island is botanically different from the rest of the island. The island can be divided into two major life zones:

1. Hudsonian Zone - consists of Sitka spruce forests, poplar and birch.

2. Arctic Zone - treeless tundra

Northern Kodiak is covered with a thick blanket of Sitka Spruce forest and the southern portion of the island is grassland and tundra. Kodiak's urban lakes study area is located in the transition area between the recently arrived Spruce trees and the previous grasslands vegetation. It is estimated that the tree line is moving south over the island about a mile every 100 years.

VI. HYDROLOGY

The hydrology of Kodiak Island is a reflection of its shallow depth to bedrock and thin soils. The island sheds water quickly. Rivers and streams respond quickly to rain events by rising quickly and dropping just as quickly after the event.

There is a rain distribution difference between the east side and west side of the island. Because rain storm systems originate from the southwest, the east side of Kodiak Island receives more rain. The mountain chain that divides the island longitudinally intercepts most of the rain causing a rain shadow effect on the island's west side.

Three watersheds make up the study area. Their location include the limited area of land that sits between the crest of Pillar Mountain and the sea. This location is also the same area that the city of Kodiak and it's infrastructure are located. The topography of the watersheds are a result of glacial action that scoured parts of Alaska 10,000 years ago. This glacial activity has left a landscape of over steepened slopes with numerous landslide scars or slumping or rock and soil.

Socio-Economic Conditions

The economic base of Kodiak Island is structured around commercial fishing and seafood processing. Kodiak's diverse fishing fleet has in the past been ranked as the #1 fishing port in the United States. This ranking is based on the poundage of fish product landed dockside in Kodiak. Fish such as salmon, halibut, cod and pollack are abundant. Shellfish such as King, dungeness, and tanner crab as well as shrimp and scallops are also processed here. Surimi or fish paste is made here and is the major ingredient in imitation seafood products.

There is a strong federal government presence in Kodiak. The Kodiak Coast Guard base (now called the "Integrated Support Command - Kodiak") is the largest U.S.C.G. facility in the United States. It is home to 3 coast guard cutters, 6 C-130 Hercules transport planes, and 9 helicopters. The primary role of the Coast Guard is to provide search and rescue missions in support of the U.S. domestic fishing fleet, harbor navigation, and enforcement of maritime regulations as they relate to commercial fishing.

The Kodiak National Wildlife Refuge occupies three-forths of the main island of Kodiak. Though it was created to protect a number of resources, the premier resource is the Kodiak Bear. These magnificent animals are the world's largest carnivore with males reaching heights of 10' and weighing up to 1500 lbs.

Tourism continues to grow rapidly. Float planes and charter boats ferry hunters and fishers to remote corners of the island and offshore where encounters with land and marine wildlife are common. Other passive uses of the resources have grown. Bear viewing and photography have grown in popularity in recent years.

Timber harvesting on private lands on Afognak Island and northern Kodiak has developed into a large scale effort because of favorable markets. Sitka spruce is the sole species of evergreen tree found on the archipelago. Logged trees on Kodiak are marketed primarily in the Orient.

Goals, Objectives and Actions

I. GOAL #1 COMMUNITY STEWARDSHIP/EDUCATION

Public Involvement

When we talk about all citizens becoming stewards of public lands, we state that the public is entitled to utilize resources of the land, but that the long term productivity of the land and resources should continue. Though the quality and quantity of that resource may change with time and use, the resource will still be passed on to future generations. So the word "stewardship" really speaks about the ability to manage renewable and non-renewable resources in a responsible manner for our use today and for use by future publics.

All citizens must be educated about their responsibilities in this effort. They must become active stewards of the land and the water resources. A goal of land stewardship must be a goal the community can buy in to.

OBJECTIVE #1 - **Educate the public and local officials about what a watershed is, how it functions, and how it affects water quality in Kodiak's lakes.**

Action #1. Have knowledgeable individual conduct a workshop on watersheds and water quality for the public and appointed and elected officials.

Action #2. Develop a watershed and water quality program video to present to students, adults, businesses, and governments.

OBJECTIVE #2 - **Increase awareness among individuals and the public in general about how land uses affect water quality.**

Action #1. Designate a water quality field agent who will provide assistance in educating individuals, the public, and decision makers about the connection between land uses and their effects on water quality.

Action #2. Conduct workshops about the trade offs between water quality and development.

Action #3. Install interpretive turnouts at appropriate sites adjacent to lakes that highlight the importance of caring for watersheds and the benefits of water quality.

Action #4. Promote water quality awareness through community events like adopt-a-lake.

II. GOAL #2 MINIMIZE IMPACTS IN THE WATERSHEDS AND LAKES AND MAINTAIN WATER QUALITY

Pollution comes in many forms. Examples of pollution include sediments from roads, parking lots and clearing and rock removal during development. Bacteria is pollution that enters the lake by poorly operating septic tanks and cracked sewer lines. Chemical pollution has occurred from the spillage or leakage of home heating oil. Lawn fertilizers and pest control products are chemicals that enter our lakes and streams.

OBJECTIVE #1 **Continue to acquire water quality information to build water quality data base by implementing a regular water sampling program.**

Action #1. Ascertain the source of elevated fecal coliform readings that result after high rainfall events. These high readings occurred in the Selief Lane drainage and at the "swimming beach" at Island Lake.

Action #2. Minimize the amount of sediment entering drainages by applying dust control, paving roads or through mechanical methods such as filters or settling ponds.

Action #3. Change local municipal codes to limit the removal of vegetation, soil and gravel resources in watersheds and around lakes without an approved erosion control plan.

Action #4 Develop storm water plan to address cumulative storm water impacts.

Action #5 Preserve remaining high value wetlands by preventing their filling.

Action #6 Implement an "Adopt-A-Lake" program to perform regular cleaning of the lakes both along the shore and under the water.

OBJECTIVE #2 MAKE WATER QUALITY A MAJOR CONSIDERATION WHEN REVIEWING PRIVATE AND PUBLIC DEVELOPMENTS AND PROJECTS

Action #1 Incorporate concerns about water quality in the analysis of projects reviewed during the decision making process by government departments, and advisory commissions.

Action #2 Make impacts to water quality a criterion in making decisions about capital projects.

Action #3 Coordinate a committee of interested citizens interested in the decision making process of policy making boards, committees, and commissions as they relate to water quality. .

Action #4. Create a water quality hotline and designate a party who will respond to water quality complaints.

Description of Kodiak's Watersheds and Lakes

There are three watersheds that make up the study area. These have been named: 1. Island Lake system watershed. 2. Lilly/Potato Patch Lake watershed and 3. Mission Lake watershed.

Geographically, each watershed sits adjacent to one another. Two of the watersheds are urban in character. These are the two watersheds that sit closest to sea level. But this is only generally true. As the town has grown, use of the flatter ground has been maximized and development of the hillsides is occurring more often.

I. ISLAND LAKE SYSTEM WATERSHED

This watershed is 745 acres in size and starts up on Pillar Mountain. Precipitation falling on Pillar Mountain drains into Selief Lane ditch joining the water from Upper and Lower Horseshoe lake. This water flows into Beaver Lake then to Dark and Island Lakes and continues down to Mill Bay Beach. It is the largest watershed in the study area and is the least developed. It sits higher in elevation than the other watersheds. Portions are thickly forested. Bear and deer wander the area. Beaver, land otter, and muskrat are also found here. Waterfowl are common. Coho salmon make their way up the system in moderate numbers.

The status of this system is healthy. This is attributed to the fact that a large fraction of the watershed remains wooded and undeveloped. Coho salmon found in the system are abundant and healthy. The watershed has good spawning and rearing habitat. Adult fish continue to return.

There are, however, initial symptoms of potential problems. Siltation and the presence of fecal coliform are chronic problems. Siltation comes from the unvegetated portions of the watershed usually due to residential development or from natural land slides. Siltation has the potential of reducing future salmon production if left unchecked. Another concern is the presence of fecal coliform. Coliform, when found in a water body, confirms the presence of contamination by the fecal matter of warm blooded animal, including man. Pathogens (disease) are usually rare (or non-existent) in sewage and coliform are relatively harmless except when present in large numbers. Fecal Coliform tests will confirm the presence of fecal waste contamination but other tests are needed to determine the presence of pathogens (e.g. Salmonella, Shigella, typhus, viruses, etc.) (EcoPlan Associates, 1996) In the Island Lake watershed, there were high readings at two sample sites. One reading was from water entering Beaver Lake from the Selief Lane drainage. The other reading was at "swimming beach" on Island Lake.

Of special interest are the presence of fresh water clams living in Beaver Lake, Dark Lake, and Island Lake. These clams appear to filter the water. They also provide a food source for muskrat. This is evident by the shell middens found around the lake.

The Island Lake System Watershed can best be examined by breaking it down into separate distinguishable segments. These segments include:

ISLAND LAKE SYSTEM WATERSHED

a. **UPPER WATERSHED** - Upper reaches of Pillar Mt. to the "lower reservoir" dam
b. **UPPER AND LOWER HORSESHOE LAKE**
c. **SELIEF LANE DRAINAGE DITCH** - Horseshoe Lake to Beaver Lake
d. **BEAVER LAKE**
e. **DARK LAKE**
f. **ISLAND LAKE**
g. **ISLAND LAKE CREEK** - Island Lake to Mill Bay Beach

A. Upper Watershed

Area Goal: Monitor development in a manner that prevents off-site impacts.
Greatest Concern: None.
Recommended Actions: Prohibit the development of steep unstable slopes.

This portion of the watershed includes Pillar Mountain and all the runoff from the hillsides that drain into the "lower reservoir." It is relatively undisturbed and consists of natural vegetation. This vegetation is primarily alder and grasses with a naturally invading spruce forest. Water draining from this area is undisturbed. The "lower reservoir" was one of the original drinking water sources for the community. This facility no longer acts as a reservoir in the sense of providing water to the residents of Kodiak. It's water holding capacity has all but been eliminated with the removal of most of the dam's spillway. The spillway has not been completely eliminated though and the dam structure serves to store storm water runoff during high rain or snow melt runoff events.

B Upper Horseshoe Lake

Lake Goal: Aesthetic Improvement / Fish and wildlife habitat.
Greatest Concern: Sedimentation due to removal of vegetation for residential development.
Recommended Action: Deepen lake 6"- 12" to improve aesthetics and habitat.

Upper Horseshoe Lake is that water body south of Selief Lane in the vicinity of the Mormon Church. It is surrounded by residential development. The former Horseshoe Lake was bisected with the construction of Selief Lane in 1970's. Though the Horseshoe Lake segments are still joined together by a culvert, they have essentially become two lakes with varying characteristics. One of the sections called Upper Horseshoe Lake is privately owned. The lake has a limited watershed area of 8.7 acres. It is roughly 2.2 acres in size and has an average depth of 2 feet.

The major problem of the lake is the infilling occurring by mud and silt that runs off adjacent roads and residential areas. The turbidity levels found here during our sampling were some of the highest in the study area. These high levels of silt may adversely affect the fish by decreasing

phytoplankton (microscopic vegetation) fed on by zooplankton (small water oriented animals eventually eaten by salmon fry). In the winter months the oxygen needed for life is largely depleted under the ice cover. The good news is that the lake warms rapidly in the spring, and makes a good nursery for silver salmon. Aesthetically, Upper Horseshoe Lake is extremely shallow and visually unappealing.

C. Lower Horseshoe Lake

Lake goal: Habitat for salmon and waterfowl and other wildlife.
Greatest Concern: Sedimentation from urban development and road building.
Recommended Action: Acquisition of remaining privately owned wetlands.

Lower Horseshoe Lake is on the north side of Selief Lane. The lake is about an acre in size with a mean depth of 1.5 feet. Development occurs on one side of the lake. This development has been somewhat intensive with gravel fill occurring at the margins of the lake. The north side is not developed and remains in native vegetation. The main drainage off of Pillar Mountain enters nearby. Runoff from Selief Lane and the adjacent residential area contributes to the high turbidity levels seen in the lake.

The shallow nature of the lake, where the water warms quickly and the vegetation grows lush, makes it of high habitat value for waterfowl and rearing salmon. In fact, fish trapping for salmon smolt here have resulted in some of the highest counts of juvenile fish in the study area.

D. Reservoir Creek and Selief Lane Drainage

Area Goal: Efficient passage of water/fish habitat.
Greatest Concern: Flooding of adjacent residential area/ High fecal coliform levels.
Recommendation: Preservation of remaining public owned wetlands/ Control of sedimentation along Selief Lane/ Investigation and replacement of sewer services that serve the Selief Lane area homeowners and residents.

This drainage includes the undeveloped area below the former "Lower Reservoir" dam and waters from the Upper and Lower Horseshoe Lake streams. These waters have been channeled into the Selief Lane drainage ditch. This drainage ditch is parallel to the road and is approximately 12 feet wide and 10 feet deep.

The wetland complex that formerly existed between Horseshoe Lake and Beaver Lake has been filled in to a large extent and developed into a residential subdivision. The stream that flowed

through the area and the water retained in the former wetland complex has been channelized into a road drainage ditch located along front lot lines of the residential development. This elimination of the wetland and its water retention characteristic has caused the flooding of yards and sometimes homes in the area. The high water level also has some affect on Selief Lane itself, saturating the road prism.

It is important to retain the remaining wetlands in this area. These wetlands are mainly located on Kodiak Island Borough land and have been identified to be retained as open space.

Selief Lane ditch also serves as the drainage way for Selief Lane. Because the road has not been paved, large amounts of sediment in the form of dust or direct runoff from this dirt roads occurs. Selief Lane is a major neighborhood collector road as it connects the Safeway node of commercial development with neighborhoods in Aleutian Homes, Madsen, Larch, Purtov and Selief Lane. On occasion, there are high fecal coliform readings at stations along the ditch. The origin of the fecal coliform is unknown, but possibly from leaking sewer lines that serve the residential neighborhood. There is an ongoing study to look at paving Selief Lane and improving the utility lines. This work should improve the system.

E. Beaver Lake

Lake Goal: Fish, waterfowl and wildlife habitat.
Greatest Concern: Sedimentation from urban development (dirt roads).
Recommended Action: Retain existing characteristics.

Beaver Lake is approximately 14.34 acres in size with the average depth of 4.0 feet. Historically, the lake has seen a number of fluctuations in its water level depending on whether or not a beaver dam was built at the outlet of the lake. These beaver have been trapped and the dams destroyed when homeowners in the area noticed the lake levels rising.

Looking at historic air photos of the lake, it is clear that Beaver Lake is filling in with sediment. Heavy sediment loads brought into the lake by the Selief Lane drainage are carried and deposited into the lake. Looking at the inlet of Beaver Lake, one cannot help but see the succession of vegetation in the former lake bed. Upland woody plant have colonized the former lake bed. The transition continues from woody plants to upland grasses to emergent grasses and sedges, and finally to open water.

F. Dark Lake

Lake Goal: Contact recreation.
Greatest Concern: Sedimentation from Selief Land Drainage.
Recommended Action: Limit off site impacts

Dark Lake is separated from Beaver Lake by a small stream. It is in this stream that the beavers build their dam. It is also this area that ADF&G has identified has high value for silver salmon habitat. Dark lake is 14.36 acres in size with a average depth of 8.9 feet. Dark Lake is surrounded by residential lots. The north portion of the lake is virtually undeveloped due to the lack of road access to the area. These residential parcels are served by public utility systems that negates concerns of failing septic systems. It is this limited development that keeps Dark lake in it's natural state. The quality of the water in Dark Lake is good.

G. Island Lake

Lake Goal: Contact Recreation.
Greatest Concern: High Fecal Coliform levels.
Recommended Action: Monitoring program to determine levels of fecal coliform.

Island Lake is the largest and deepest of the lakes in this study. It is 39 acres in size with a average depth of 13 feet and a maximum depth of 30 feet. The lake is heavily used by the public for recreational purposes. These uses include fishing, swimming, water skiing, jet boating, rafting, kayaking. and canoeing. These activities are called contact recreation sports (those where skin comes in contact with the water or water is ingested by the individual). The water quality for contact recreation activities must be high.

Island Lake's size, depth, and location is of significant importance to the overall health of the lake. Its size and volume of water help to disperse any negative impacts entering the lake. Its location as the third and last lake in a system of lakes also helps to mitigate impacts that have occurred upstream.

The greatest concern CLK studies have found in Island Lake is high fecal coliform counts at one of the sampling stations. These high counts occur adjacent to a popular recreational beach along the lake called the "swimming beach." This beach is adjacent to a waterway that drains the former Smokey's dump, Safeway, Brechan Enterprises yard and the Shahafka Acres Subdivision.

Impacts to the lake also occur from adjacent lands. Residential development practices and road building create substantial sediment but similar to coliform, the problem is dispersed quickly and has no long term impact on the lake.

H. Island Lake Creek

Creek Goal: Preservation of greenbelt and fish and wildlife habitat.
Greatest Concern: Encroaching development on the green belt.
Recommended Action: Retain natural vegetation and retain buffer adjacent to the creek.

This creek is the last stretch of the watershed. It leaves Island Lake and travels through the greenbelt as it meanders down to the ocean. Included within this creek is a pond.

Impacts here occur due to adjacent development. Most of this development includes the removal of trees from these adjacent residential lots. Removal of the trees results in the blow down of the remaining trees in the greenbelt during high winds.

This greenbelt with its stream is the route that Coho salmon travel to get to the remainder of the watershed. A trail system through the greenbelt has enhanced it and will make the preservation of the greenbelt more of a community issue.

II. LILLY/POTATO PATCH LAKE WATERSHED

This watershed is located in the heart of the populated area of Kodiak. It covers almost 300 acres. The majority of the watershed is developed to include large residential areas and the City's business strip along Mill Bay Road. This watershed contains Lilly Lake and Potato Patch Lake. Many of the watershed's former wetland complexes have been filled in and developed. A former City of Kodiak land fill located in the watershed is now known as Baranof Park and includes a track, tennis courts and soccer and baseball fields. Another wetland in the watershed has also been converted. This former wetland complex is now East Addition Park, an urban park with basketball court, baseball diamond, volleyball, children play area and fitness trail.

A. Lilly Lake

Lake Goal: Municipal float plane facility.
Greatest Concern: Urban development and encroachment on float plane facility.
Recommended Action: Retain for float plane facility.

Lilly Lake is 16.53 acres in size and is completely surrounded by development. The exception to this development is a small area at the west end of the lake that is reserved as the approach path for the community's float plane facility. This municipal facility consists of the fresh water lake and adjacent runway. The facility is used by private and commercial planes since the late 50' and 60's. This use of the lake has remained stable, but indications are that float plane activity at the lake will increase with the growth of tourism.

The lake is important to float plane operators because it is a freshwater body. Float plane operators generally conduct their business in saltwater. The fresh water of Lilly Lake reduces the detrimental influences of saltwater on planes. It is an important facility to retain because of this value.

The lake has had some negative aesthetic impacts occurring. These include the accumulation of commercial trash, including empty 55 gallon drums. The lake has also been filled at different sites to accommodate additional parking for the number of businesses adjacent to the lake. This indiscriminate filling is a concern to pilots who have seen the lake shorten and narrow due to private development on the margins of the lake.

B. Potato Patch Lake

Lake goal: Fish and Wildlife Habitat, winter recreation.
Greatest Concern: Urban Development, impacts of former landfill at Baranof park
Recommended Action: Fish and Waterfowl habitat.

Potato Patch Lake is a tidewater lake. It is 12.72 acres in size and is shallow in depth with a mean depth of 2.5 feet. It is separated from the sea by Mission Road. It joins the ocean by a perched culvert. Salt water can only enter the lake during higher high tides or storm surges. The lake was breached during the 1964 Good Friday earthquake and remained a lagoon until the reconstruction of Mission Road. The outlet of the lake was relocated to the culvert that now serves as its outlet.

Potato Patch Lake, along with Mission Lake, are stocked by the Alaska Department of Fish and Game (ADF&G) with coho salmon. These salmon are part of a popular terminal sport fishery providing sport fishermen a site close to town to catch fish. At one point, Mill Bay Beach was second to the Buskin River as the most popular sport fishing area on the road system..

Water entering the lake from the upper watershed keeps a portion of the lake ice free during most of the winter. When not frozen, large numbers of resident mallards utilize this site. On occasion, rare migrating waterfowl visit the site as a resting area.

Concerns expressed about the condition of Potato Patch Lake by lake residents have been for the most part aesthetic. The color of the lake water is caused by sediments entering the lakes from the watershed above. Another cause is the suspension of bottom sediments that are again suspended during windy periods. Residents are equally concerned about frequent oiling of the lake due to heating oil spills also occurring in the upper watershed. Some of these spills have been substantial. Another concern expressed by citizens is the condition of the water coming from the former city landfill, now Baronof Park. This old landfill may be the source of the iron levels seen in the water collected from this site. Additional work to determine the impacts from this landfill is needed.

III. Mission Lake Watershed

Lake Goal: Fish and Wildlife Habitat
Greatest Concern: Failure of Tide gate due to age.
Lake Goal: Fish and Waterfowl habitat and recreation.

The Mission Lake watershed is the smallest watershed in the study area. It is 281 acres in size. It is the other tideland lake in the study area. It too was breached during the 1964 earthquake becoming a lagoon and filling up at high tide and emptying at low tide. The lake was reestablished by adjacent landowners who constructed a driveway between the lake and the ocean to gain access to their homes.

Rip rap and other fill was used to plug the gap between the ocean and the lake. An elaborate culvert system with multiple flapper valves was installed to allow freshwater to drain out during the lower tides and to prevent saltwater from entering the lake during high tides.

A thriving run of coho salmon at Mission lake has been established by ADF&G to provide a sport fishery close to town. To perpetuate the run and maintain fishing opportunities, fish are transplanted in the lake on a yearly basis. therefore no escapement goals are set to perpetuate the run. The lake is also heavily utilized during the winter for recreation. It is one of the first lakes to freeze during the winter providing the earliest place to ice skate. It is common to see large numbers of ice skaters and hockey goals on the lake during these periods. The lake is also used float planes owned by residents owning property on the lake.

Mission Lake sits at the bottom of a developing watershed. The water quality in the lake becomes and an indicator of the changes that are occurring upstream in it's watershed. These impacts generally have been due to community growth. The installation of a municipal sewage line in 1973 has almost eliminated septic systems around the lake and has improved greatly water quality. Unfortunately, in the early 1990's, a major break in line occurred. Large quantities of raw sewage emptied into the lake. Though this at first seemed like a serious impact, the lake soon flushed itself out. The only ramification of this event may have been the bloom in lake vegetation during the summer of 1995. Pond vegetation that summer was unusually dense. The vegetation was curiously missing in the summer of 1996 even though the summer of 1996 was much much dryer and warmer than the exceptionally foggy summer of 1995.

Conclusion

Like maintaining the quality of our lives, we must maintain the quality of our urban lakes. To do this will take citizen participation. While local government priorities change with the political winds. it will be the citizens who must maintain this vigil. Good regulation is difficult to achieve and more difficult to enforce. Impacts from development on the lakes should not only be the concern of planners but of every citizen.

An education program that will raise the understanding of the citizens about the lakes is the approach taken by CLK. Only through the education of individuals will this effort be successful because it is the actions of individuals that create impacts. Downstream land owners and users will be the parties injured by inaction. They have a more vested interest in what occurs upstream.

There is no denying the fact that by limiting development, the water quality of lakes and streams remains good. Roof tops, roads and driveways, are impervious surfaces so the water that would be absorbed by the natural ground cover now flows quicker and at in greater volumes into lakes and streams carrying dirt, dust. oily residues etc. But we can not stop the progress of a developing community. We all depend on this community to grow and thrive. What we can do though is manage development. steer development to places that are capable of sustaining the impacts of development and limit this same development in places where the land is not capable of sustaining impacts. Those sensitive areas should be left as green space, open space, or buffers. In places where vegetation has been removed, landscaping should be encouraged such as the planting of trees and shrubs.

We should control all activities that generate abnormal levels of sediment as well as limit the removal of vegetation. This is especially the case along streams and lakes where impacts to fish and wildlife resources occur and where aesthetic considerations are important to the community. Setbacks from lakes and streams should be encouraged. A buffer of natural vegetation should be left on the lake borders to act as a filter. The most efficient mechanism of sediment control, wetlands. should be preserved so they can do their job.

The remaining wetland areas should be looked at individually to determine their function and value to the community. High value wetlands should be preserved and protected. In the urban area of the community, high value wetlands are those that trap sediment and pollution, store storm water runoff during heavy rains. and release water to the streams needed for rearing salmon.

The effort of the group calling itself CLEAN LAKES FOR KODIAK, hopes to start the ball rolling in a way that alert the community into action. This document hopes to set a direction to make consideration of water quality a priority. It also hopes to have aligned enough people to this position and

GLOSSARY

BASELINE DATA - The collection of data at a point in time that describes the physical and chemical nature of watersheds and water bodies that can and will change over time. The future collection of data can be compared against the baseline data to make conclusions about changes in the water bodies. Baseline data can be used to develop a more intensive approach to acquire more specific information .

COLOR - Water can be colored by the breakdown of organic matter staining the water similar to a tea bag staining hot water. Colored water can interrupt sun penetration.

DISSOLVED OXYGEN - Known as DO, dissolved oxygen is microscopic bubbles of oxygen gas in the water used by fish or other animals deriving oxygen from the water. Oxygen is also used in some chemical reactions. Dissolve Oxygen concentrations change dramatically throughout a lake. Oxygen production occurs at the top portions of a lake and is consumed the greatest near the bottom of a lake during decomposition of organic matter.

DRAINAGE NETWORKS - Unique leaf like patterns created with the intersection of tributaries

EUTROPHICATION - The natural aging process in a lake which is based on increased growth and productivity leading to the eventual filling of a lake. Eutrophic lakes have a vigorous food chain and can produce a lot of fish. They are also attractive to waterfowl.

FECAL COLIFORM BACTERIA - Fecal coliform are microscopic animals that live in the intestines of warm blooded animals. They also live in the waste material or feces of animals. Though not necessary agents of disease, the presence of the bacteria indicate the potential of disease carrying organisms. Because they are animals themselves, they multiply quickly.

FLUSHING - The length of time, usually in days, weeks, months, and even years that it takes a drop of water entering a lake to leave.

GROUNDWATER - Water that does not flow on the surface but within the maze of cracks and faults found in bedrock

HABITAT - The place where a plant or animal naturally or normal lives and grows.

HYDROLOGY - The science that is concerned with the distribution and movement as well as the effects of water on the land.

IRON - Water contains iron when it flows over or through bedrock (or buried metals)containing iron. Rainwater is low in iron and groundwater contains high concentrations of iron. High iron concentrations in lakes and streams is a good indicator of groundwater entering the system

LAKES - body of water important in determining water quality. Eroded sediments, debris, and other pollutants are deposited by in flowing streams so that out flowing streams so that out flowing streams often carry less of these pollutants. Eventually lakes fill in with the material carried to them by streams. Over time it will become a pond, then a marsh and finally a forest.

MESOTROPHIC, - A middle aged lake. A lake that is between Eutrophic and Oligotrophic

NON-POINT SOURCE POLLUTION - Pollution that enters any waters of the watershed from any dispersed land-based activities, including but not limited to surface runoff form urban areas, forest lands, subsurface or underground sources, or agricultural lands.

OLIGOTROPHIC - A relatively young lake with low productivity. These lakes are generally cold with little food available for fish and wildlife.

pH - is a measure of the concentration of hydrogen ions that determines the acidity or alkalinity of water. A pH of 7 is considered neutral. Substances with a pH less than 7 are acidic and substances with a pH greater than 7 are considered basic.

PHYTOPLANKTON - Microscopic algae produced in an aquatic system through the photosynthesis of sunlight. They are the bottom of the food chain

POINT SOURCE POLLUTION - Pollution originating from a definable source such as a culvert, out falls.

RIPARIAN ZONE - The area of a river or lake that is part upland part channel at different stages of water flow.

STEWARDSHIP - The management of property entrusted to others; caring for the land for both short and long term needs within the capacity of the environment to provide those needs.

STREAM DISCHARGE - The total volume of water in a stream

TOTAL SUSPENDED SOLIDS and TURBIDITY - TSS and Turbidity measure the amount of solids suspended in the water (cloudiness) Turbidity can be caused by soil particles or organic matter. TSS measures t he weight of the material while turbidity measures light that passes (or is scattered) in a sample. High concentrations of material in the water prevent light from penetrating into the water and affect productivity

TRIBUTARIES - Channel that connect surface flow with channel flow

WATER QUALITY PARAMETERS - Physical and chemical parameters of a lake that are used to discuss water quality. These include lake size, depth, reservoir capacity, number of stream entering and leaving a lake. Type of fish and vegetation. Chemically they include: temperature,

dissolved oxygen. pH. total suspended solids, turbidity. fecal coliform bacteria

WATERSHED - An area of land usually from ridge to ridge which drains water, sediment and dissolved materials into the channel of a creek. Other names for watershed include river basin or drainage basin

WATER TEMPERATURE - Temperature exerts a major influence on the biological activity growth. The higher the temperature the greater the biological activity. Temperature also affects the kinds of organisms that can live in a lake.
Temperature determines the rate of chemical reactions. Warm water holds less oxygen that cool water. Temperature changes hourly, daily and seasonally

WETLANDS. Wetlands generally include swamps, marshes. bogs, and similar areas that function to provide habitat, absorb storm water.

ZOOPLANKTON - Microscopic animals found in the water. An important part of a food chain in an aquatic system. Zooplankton eat small microscopic plants called phytoplankton and are eaten by small fish. insects etc. Zooplankton are the major food source for sockeye salmon. High zooplankton numbers is an indication of high phytoplankton.