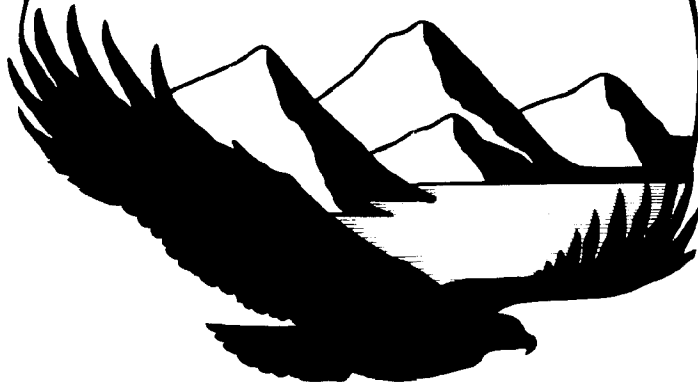


COUNCIL ANNETTE ISLANDS RESERVE



Annette Islands

COASTAL ZONE
INFORMATION CENTER

Coastal Management Program

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1979

PACIFIC RIM PLANNERS, INC.

Alaska Coastal Zone Management Program

COUNCIL ANNETTE ISLANDS RESERVE

SOLOMON ATKINSON, MAYOR
MARGARET MARSDEN, SECRETARY
RONALD MILNE, TREASURER

METLAKATLA INDIAN COMMUNITY
TOWN OF METLAKATLA
P. O. Box 8

METLAKATLA, ALASKA 99926
ESTABLISHED 1887

November 8, 1979

Alaska Coastal Policy Council
Alaska Coastal Management Program
Pouch AD
Juneau, Alaska 99811

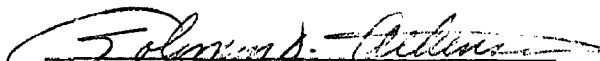
Dear Council Members:

We are pleased to submit the attached Annette Islands Coastal Zone Management Program. This program was granted conceptual approval by the Council of the Metlakatla Indian of the Annette Islands Reservation on September 6, 1979 pursuant to the attached Metlakatla Indian Community Council Resolution No. 79-39.

We appreciate your interest in the management of the resources of the Annette Islands Reservation, and look forward to hearing from you.

Sincerely,

METLAKATLA INDIAN COMMUNITY


Solomon D. Atkinson, Mayor

SDA:me

Tsimpshuan War Canoe

**US Department of Commerce
NOAA Coastal Services Center Library
2234 South Hobson Avenue
Charleston, SC 29405-2413**

Resolution No. 79-39

By the Council Annette Islands Reserve
METLAKATLA INDIAN COMMUNITY

WHEREAS, the Council Annette Islands Reserve is the governing body of the Metlakatla Indian Community, Annette Islands Reserve, Alaska, by authority of the Constitution and By-Laws of the Metlakatla Indian Community as approved on August 23, 1944, by the Assistant Secretary of Interior; and

WHEREAS, the Metlakatla Indian Community is an American Indian Tribe organized pursuant to the provisions of Section 16 of the Federal Indian Reorganization Act, 25 U.S.C. Sec. 476; and

WHEREAS, the Community through a grant from the state of Alaska has been developing a Coastal Management Program for the Annette Islands Reservation; and

WHEREAS, the Community through the Council and through a public hearing held on June 14, 1979 and through other public informational meetings and discussions reviewed and provided input into the June 7, 1979 draft of the Coastal Management Program; and


WHEREAS, the Council is satisfied that the draft program with comments from public hearings represents the issues and goals and objectives of the Metlakatla Indian Community;

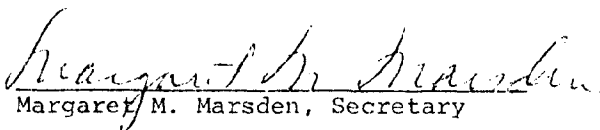
NOW, THEREFORE, BE IT RESOLVED by the Metlakatla Indian Community Council that the Public Hearing Draft of the Coastal Management Program for the Annette Islands Reserve be and hereby is adopted for review and approval by the Alaska Coastal Management Council.

DATED: This 6th day of September, 1979, at Metlakatla, Alaska 99926.

METLAKATLA INDIAN COMMUNITY

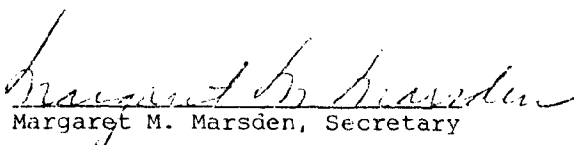
ATTEST:


Solomon D. Atkinson, Mayor


Margaret M. Marsden, Secretary

C E R T I F I C A T I O N

I hereby certify that the foregoing Resolution was duly passed at a meeting held on September 6, 1979 at which a quorum was present by a vote of 8 FOR and 0 AGAINST. The Mayor being authorized to sign the Resolution.


Margaret M. Marsden, Secretary

ANNETTE ISLANDS RESERVE
COASTAL MANAGEMENT PROGRAM

Prepared for the
METLAKATLA INDIAN COMMUNITY

HT393.A42A54 1979

by

PACIFIC RIM PLANNERS, INC.
5606 14th Avenue Northwest
Seattle, Washington 98107

November, 1979

The preparation of this report was financed in part by funds from the Alaska Coastal Management Program and the Office of Coastal Zone Management, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, administered by the Division of Community Planning, Alaska Department of Community and Regional Affairs.

ACKNOWLEDGEMENTS

METLAKATLA INDIAN COMMUNITY

Solomon D. Atkinson, Mayor
Margaret Marsden, Clerk
Ronald Milne, Treasurer

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Henry Leon, Project Manager and Resource Analyst
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CHAPTER 1 BACKGROUND

For centuries the Tsimpshean people lived along the fog-shrouded shores of British Columbia, thriving on the abundance of the coast. From the sea they harvested salmon, halibut, and the oil-rich eulachon. On the beaches they picked clams, crab, and seaweed. In the forest they found berries, game, and that ideal building material, the western redcedar. The Tsimpshean were isolated by the mountains to the east, and the sea to the west. Their culture and economy, based on the resources at hand, reflected that isolation.

The coming of the Europeans ended the isolation of the Northwest Coast, and in the 1800's the Canadian government attempted to change the culture of the coastal Indians. One group of Tsimpshean, wishing to retain their identity and self-determination, resisted the government's efforts. Led by Anglican missionary Father William Duncan, these people migrated north, across Dixon Entrance into Alaska. There, in 1887, they founded the Metlakatla Indian Community on Annette Island. The Community's claim to Annette Island was affirmed in 1891 when Congress formally created the Annette Islands Reserve.

In the ensuing years, the Community created for itself a life that combined the old with the new. Efforts towards self-sufficiency coincided with regular contact with the outside world. The Community built a sawmill and a hydroelectric plant. The cannery, originally built in 1921 has recently been modernized with a new cold-storage facility. Yet individual fishermen continue to pursue the salmon in their small boats, and low tides consistently draw people to the beaches in search of shellfish. Families take to the woods when the berries are ripe, and a jar of eulachon oil is still a highly valued commodity.

Thus, nearly 100 years after the establishment of the Metlakatla Indian Community, its people remain closely dependent on coastal resources. As an Indian reserve, Annette Island's resources have been managed by the Bureau of Indian Affairs in trusteeship for the Community. In recent years, however, aided by the Self-Determination Act, the Community has contracted to manage its own resources, although the Bureau retains ultimate responsibility for the welfare of people and resources.

Management of natural resources is complicated by events and conditions beyond the Community's control. Although the Community has jurisdiction over the lands and waters within the Reserve, economic and political forces on the regional, state, and national levels affect the use and value of the resources. In addition, the resources themselves are governed by the laws of nature, which frequently extend beyond legal boundaries.

To effectively manage its natural resources, then, the Community requires an inventory of those resources. Also needed is a background of the physical and biological processes affecting the resources, and the social and economic phenomena influencing their use.

This plan, the Coastal Zone Management Plan for the Annette Islands Reserve, presents some of this necessary information. Equally important, it enunciates the major issues the Community faces in coastal zone management, and presents goals towards which the Community can strive to resolve those issues. The goals are refined into objectives and policies to guide the Community toward achieving its goals. Specific actions are also presented to implement the policies.

Because obtaining scientific data is often costly and time-consuming, the information in this report is, by necessity, incomplete. A great deal of additional work remains to be done, some of it on a regular ongoing basis, before a complete picture can be drawn of the dynamics of the island's coastal resources. Management decisions are more pressing, however, and require information in the very near future. This report, then, can be viewed in two ways. It is first an effort to deal with some of the immediate issues with a presentation of needed data. More important, it is a framework of policies and actions to be taken in the long-term, augmented when possible by additional information, to guide the Metlakatla Indian Community in promoting wise use, conservation and propagation of its coastal resources for generations to come.

CHAPTER 2 ISSUES, GOALS AND OBJECTIVES

In managing its resources, the Metlakatla Indian Community faces issues important to both the resource users and the resource managers. While each citizen of Metlakatla has specific priorities and emphasizes different issues, there are several areas which include the Community's major issues. The issues and needs are discussed here under the headings of fisheries, forestry, mineral development, land and water development, and economic development. Following the discussion of the issues and needs is a statement of goals which the Community can attain to deal with the issues.

Fisheries Issues

SHORTAGE OF INFORMATION ON FISH STOCKS

One of the most serious problems in the management of the fisheries of the reserve is the scarcity of information on which to make management decisions. This lack is felt most strongly in the salmon fishery in which Community fishermen harvest fish originating both on-island and off-island, and in which escapement has been documented for at least 20 Annette Island streams, but has not been monitored or adequately quantified.

The management of the herring fishery, too, suffers from a shortage of information. Although the Community has recently assumed many management functions in this fishery, a shortage of knowledge about the herring stock size, movement and timing hampers effective management.

Shellfish and bottomfish are two resources which are taken at a subsistence level by Community members, but are untapped at the commercial level. Their utilization will depend on administrative and financial decisions which, in turn, depend on an assessment of the size and condition of the resources.

HARVEST OF FISH STOCKS

Both individual fishermen and the Community-owned packing company depend on high catch levels for their financial survival, and the pressure is great for the Community to set liberal harvest levels. Sustaining the resources, however, requires an adequate spawning escapement, which requires restraint on the part of the fishermen. These conflicting requirements must be resolved by the Community Council which often does not have access to adequate information.

The distribution of the catch among the various gear types further complicates this issue. Traditionally there has been an imbalance of the catch, with the Community-owned traps and large seiners receiving a larger proportion of the catch than do the smaller gillnetters and trollers.

FISHERY ENHANCEMENT

The construction of the Tangas Creek Hatchery places the Metlakatla Indian Community in an important role in enhancement of the salmon fishery, not just on Annette Island, but in Southeast Alaska. Little attention has been paid, however, to maintenance and enhancement of natural stocks of fish. In a Community heavily dependent on the salmon fishery resource, stream enhancement and habitat protection have received little consideration. A small amount of effort, such as clearing log jams or cleaning streambed gravel, might yield impressive results as the stream systems carry out their function in natural production of salmon.

Forestry Issues

NEED FOR FOREST INVENTORY

Since the initiation of large-scale logging on Annette Island in 1966, the management of the island's forest resources has suffered from inadequate information on the extent and character of the resources. Early Bureau of Indian Affairs estimates have resulted in an overharvest of timber which now might necessitate a reduction in the annual allowable cut. At the same time, municipal finances depend in part on stumpage receipts from timber sales. To improve long-term planning for timber use, data is needed on timber volumes, feasibility of access to timber, soil characteristics (particularly soil stability), and fish and wildlife habitat.

TIMBER HARVESTING PRACTICES

Increasing recognition of the environmental impacts of logging and the increasing value placed on non-timber resources have led to the development of new guidelines for timber harvesting practices. Unlogged buffer strips, slope restrictions, well-engineered roads and advanced log-handling methods can minimize some of the adverse effects on soil productivity, water quality, and fish and wildlife habitat.

Changing logging practices to protect other resources often results in lower stumpage receipts in the timber sale. Evaluating the worth of such practices is made difficult by the intangible value of some of the resources protected; however, environmentally sound forest practices can be economically sound as well. The long-term economic return from the forest resource might be increased with improved management and harvesting practices. The high cost of road-building detracts from the value of much of the timber on the island, but improved logging, road planning, engineering and construction as well as advanced yarding techniques can help reduce this cost, increasing the value of the timber and reducing environmental damages.

Mineral Development Issues

At present, there is no commercial mineral development on Annette Island; however, recent surveys reveal a potentially valuable deposit of barite near Driest Point, and deposits of metals of unknown value near Crab Bay. Activities elsewhere in Southeast Alaska (PRPI, 1977a) suggest that the region may become the scene of large scale mining. Should active mineral development take place on Annette Island, the Community should face several closely related issues.

Mineral exploration is an expensive proposition, one which the Community cannot afford to undertake at the present time. Any exploration in the near future would likely require investment by private capital from off the island, but any interests willing to risk such an investment would certainly want a guarantee of the rights to mine any deposits they discover. The Community, on the other hand, would not wish to part with its non-renewable resources without adequate compensation, at a level that reflects the one-time-only nature of mineral extraction.

Any large-scale mining would probably require roads, buildings and other facilities to be constructed at a remote site, and would also require a support population of skilled workers and their families. Since few Community members have experience or skills in mineral extraction, some of the workers would need to be imported to the island, thereby creating an influx of new residents which many Community members may not consider desirable.

Environmental concerns, too, play a part in the question of mineral development. Mining would likely disturb soil, remove timber land from production, and could endanger salmon-producing habitat. Barite, in particular, is of such low value per unit of volume that it can only be mined economically by open pit mining, a method that would create long-lasting scars in full view of Metlakatla.

Land & Water Use Issues

WATERFRONT DEVELOPMENT

The people of Metlakatla have traditionally been water-oriented, and access to the water remains important to the Community. The town is served by several floatplane services, the state ferry system, and barges, as well as by fishing boats and pleasure craft, all of which require waterfront space for operation. Recently a new air taxi float was installed on the waterfront. A new small boat harbor has been funded and is currently under construction to relieve the perennially overcrowded conditions in the existing harbor. Inadequate ferry service, long an issue between the Community and the state ferry system, is compounded by the inconvenient location of the ferry landing outside of the town. The newly dedicated longhouse, and a planned park along the waterfront will draw additional users to the waterfront. The character of Metlakatla's waterfront will undoubtedly change in future years. Whether or not that change will be desirable will depend on decisions made now by the Community.

DEVELOPMENT OF REMOTE AREAS

Several little-used areas of the island have recently been discussed as sites of possible development. Canoe Cove was proposed in 1976 and 1977 as a site for log storage and handling by the Louisiana-Pacific Corporation. The hydroelectric potential of Triangle Lake has led to its consideration as a site for a dam and power plant. The demand for electric power has also resulted in a proposal for raising the dam at Chester Lake. Construction of a large salmon hatchery at the mouth of Tamgas Creek, and the initiation of an aquaculture training program on Annette Island, have spurred discussion of Tamgas Harbor as a site for intensive aquaculture development.

Although these areas are subject to little human use now, they do produce renewable resources, such as timber, fish, and of course, clean water. Consideration of these resources will be important in decisions on whether and how to develop these areas, and guidelines are needed to help maintain the productivity of the resources.

RECREATIONAL USE OF THE RESOURCES

Recreation opportunities abound on Annette Island. Environments range from alpine meadows to rocky shores where many recreation activities presently take place. In many cases, however, these activities degrade the very environmental features which the Community members enjoy and utilize. Properly designed and constructed facilities would reduce the negative impacts of recreational use.

The need for improved recreation facilities is a perennial demand which goes wanting on the island. Facilities are needed not only to satisfy this demand but to protect the natural resources.

Economic Development Issues

Historically, the Community and its members have derived most of their income from natural resources, primarily timber and fish. Heavy dependence on a limited diversity of income sources can lead to two problems.

One difficulty is the severe economic disruptions associated with fluctuations in the supply of the resource (as with fisheries) or demand for the resource (as with timber). The closure of the cannery in 1975 affected virtually every Community member and the Community's government and business as well. More recently, a three-month shutdown of the Annette Hemlock Mill created hardships and disrupted Community life.

A further problem is caused when a great proportion of the jobs in the Community is tied to a sector controlled by outside interests. The phenomenon of the "company town" has been experienced throughout the United States where one corporation controls a large sector of a local economy. Such dominance of the economy allows an outside-controlled corporation (which may, or may not have the best interests of the community in mind) to have an overwhelmingly great influence in local decision-making.

Avoiding such conditions in Metlakatla requires the development of a more diverse economy, one in which no one sector can dominate the Community and in which uncontrollable disruptions in one sector can be offset by more stable conditions in another.

Goals and Objectives

The issues and needs discussed above are varied and far-reaching, and their solutions must be of comparable magnitude. It is evident, for instance, that acquiring data must be a high priority, but the acquisition and use of that information is a means to a larger end.

The goals for the Community are set forth on the following pages as statements of the desired conditions in coastal resource management. In the development of these goals, however, the planning team attempted to make them statements of not only desirable conditions, but also attainable conditions. In order to attain these goals, a set of objectives is included for each goal. Each objective can be viewed as a step toward the goal. The goals and objectives will also serve as a framework for policy development and Community decision-making, as will be described in Chapters 7 and 8. While changing situations may dictate the development of new objectives or policies, the Community can continue to strive for these goals.

The goals and objectives are presented on the following pages in the same five subject areas of coastal resource management as were the issues.

GOAL 1: Management of fisheries resources to maintain or improve and provide income over the long-term to individuals and the Community.

- OBJECTIVE 1.1. Determine the extent and characteristics of stocks of each species.
- OBJECTIVE 1.2. Allow adequate spawning escapement to sustain or improve fish stocks.
- OBJECTIVE 1.3. Develop and adopt equitable method of allocating the harvestable surplus.
- OBJECTIVE 1.4. Improve and implement enforcement capabilities.
- OBJECTIVE 1.5. Protect critical fish habitats.
- OBJECTIVE 1.6. Enhance capabilities of habitats to produce fish.
- OBJECTIVE 1.7. Develop a commercial shellfish industry on Annette Island.

GOAL 2: Management of forests on a multiple-use, sustained yield basis to provide income and employment to the Community.

- OBJECTIVE 2.1. Establish a forest inventory system to store, classify and retrieve forest resource information.
- OBJECTIVE 2.2. Revise long-term timber operating plans to reflect new information and values, and to respond to changing market conditions.
- OBJECTIVE 2.3. Exercise greater Community self-determination over forest management.
- OBJECTIVE 2.4. Maintain soil productivity.
- OBJECTIVE 2.5. Maintain water quality.
- OBJECTIVE 2.6. Retain critical wildlife habitat.

GOAL 3: Development of non-renewable mineral resources in a manner that will maintain the productivity of renewable resources and will provide long-term economic benefit to the Community.

- OBJECTIVE 3.1. Establish a relationship between the Community and a mineral development firm for exploration and development.
- OBJECTIVE 3.2. Determine potential of known mineral deposits.
- OBJECTIVE 3.3. Specify extraction methods that will not impact upon the water quality or soil productivity of surrounding areas.
- OBJECTIVE 3.4. Establish a permanent fund with proceeds from mineral development.

GOAL 4: Land and water development to provide opportunities for the Community, enhancing the qualities for which an area is developed, while maintaining the productivity of renewable resources and the character of the island.

OBJECTIVE 4.1. Develop Metlakatla waterfront to promote water-oriented use and access, while maintaining the quality of the environment.

OBJECTIVE 4.2. Provide new roads or docking facilities to undeveloped areas when needed and feasible.

OBJECTIVE 4.3. Provide recreation facilities to satisfy the needs of Community members on Annette Island.

GOAL 5: Development of a productive, diversified, stable economy, providing meaningful employment for Community members.

OBJECTIVE 5.1. Diversify the island's economy to provide protection against any one activity or industry exercising undue impact on the Community.

OBJECTIVE 5.2. Achieve economic development which strikes a reasonable balance between environmental and economic values.

CHAPTER 3 THE SETTING

Annette Island lies near the southern end of the Alexander Archipelago, a chain of hundreds of rugged, glacially carved islands interwoven with deep fjords and protected passages. The island is located approximately midway in the Inside Passage between Seattle, Washington, about 600 miles to the south, and Skagway, Alaska, about 600 miles to the north (Figure 1).

Revillagigedo Channel separates Annette Island from the southeast Alaskan mainland to the east, and from Ketchikan on Revillagigedo Island to the northeast. To the west is Nichols Passage, and farther west are the more open waters of Clarence Strait, the broad channel that cuts through the southern half of Southeast Alaska. Duke Island is visible to the south, and, beyond that, Dixon Entrance, which opens to the Pacific Ocean (Figure 1).

Although Annette Island covers approximately 136 square miles, the mountainous terrain of most of the island, rising from sea level to over 3,500 feet, limits settlements to the Metlakatla Peninsula, a low-lying southwest arm of the island, 24 square miles in size. On the peninsula, the topography is comparatively gentle, seldom exceeding 100 feet in elevation, with the exception of Yellow Hill. The town of Metlakatla is located at the north end of the peninsula, on the shore of Port Chester. Farther south on the peninsula is the residential area of Annette, and the former Coast Guard Air Station and adjoining facilities.

Coastal Management Boundaries

The area covered by this program is the Annette Islands Reserve. This reserve, created by Congress in 1891 and expanded by Presidential Proclamation in 1916, includes not only Annette Island but also Walker Island, Spire Island, Ham

Figure 1

Vicinity

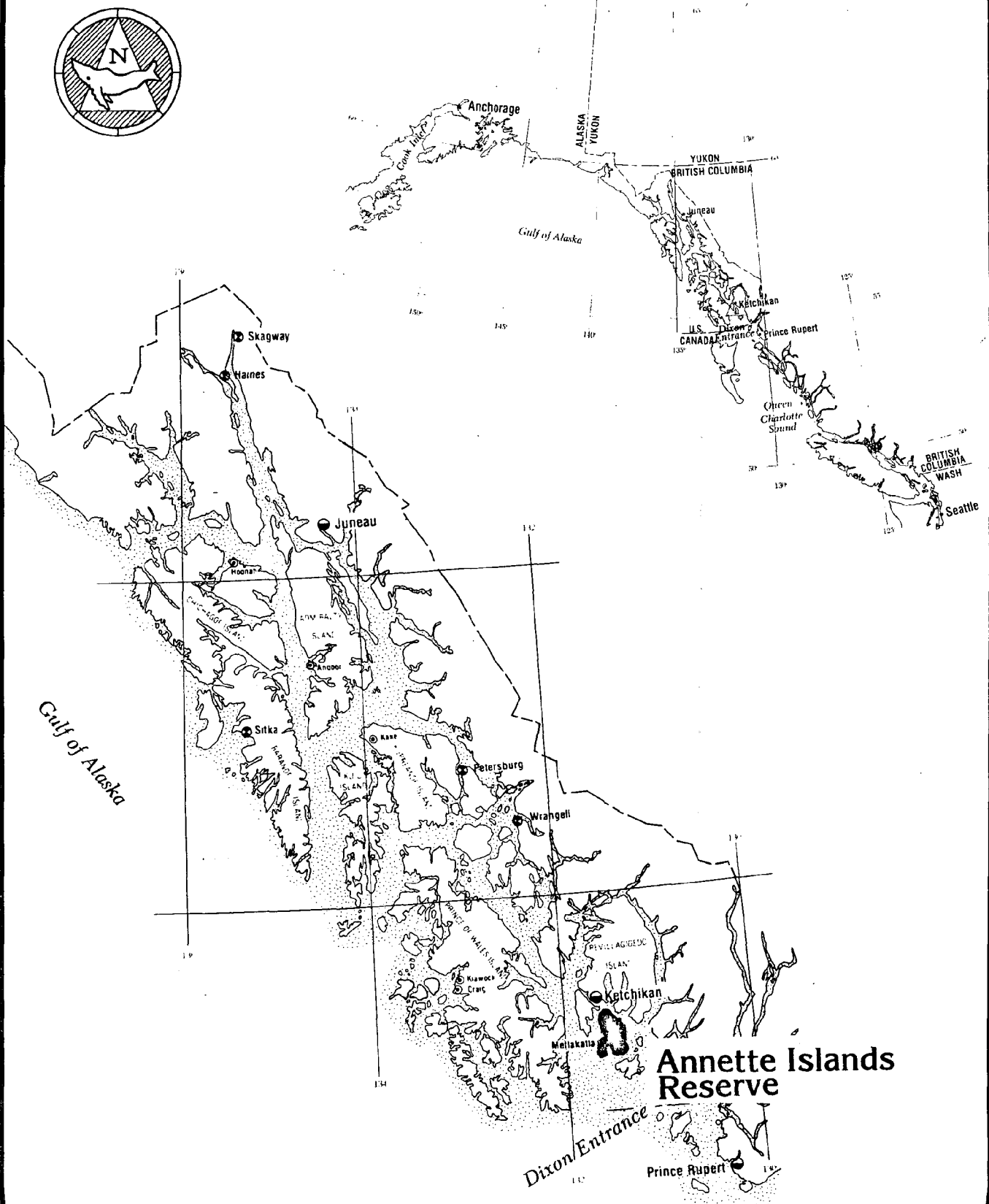
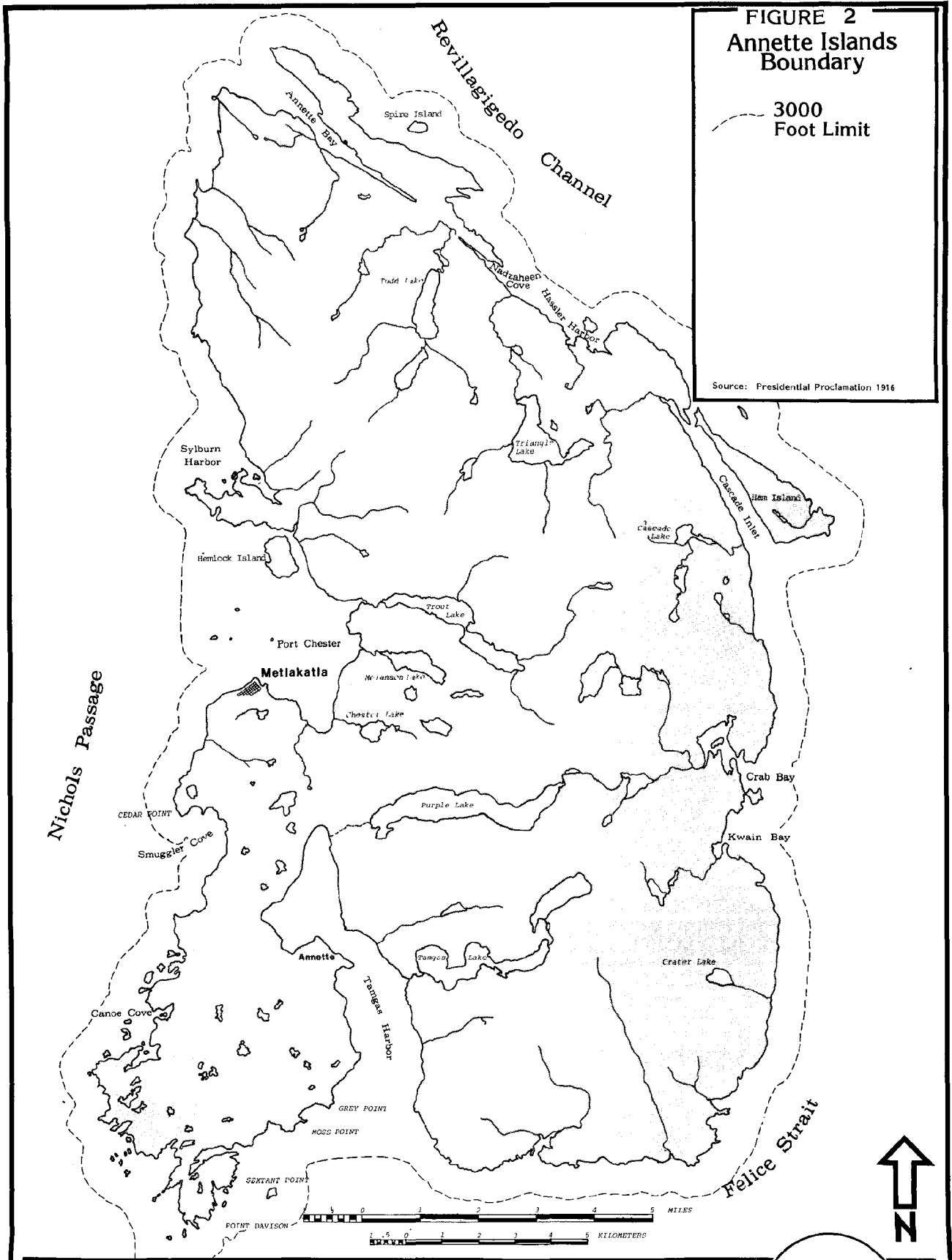


FIGURE 2
Annette Islands
Boundary

3000
 Foot Limit

Source: Presidential Proclamation 1916



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Coastal Zone Management Program



Island, adjoining small islands, and the waters 3000 feet offshore from the line of mean low water of these islands (Figure 2).

These boundaries allow the program to include all land and water areas managed by or for the Metlakatla Indian Community, and therefore facilitate implementation of the program. They also include the Zone of Direct Inter-action and the Zone of Direct Influence as mapped by the Alaska Department of Fish and Game (1978) inside the reserve.

Watersheds and Drainage Patterns

Annette Island is divided into four major watersheds, mapped and coded in Figure 3 for the receiving waters into which they drain. The watersheds are further divided into 34 sub-basins, which are generally topographically distinct areas draining into an easily definable stream. Because of the dynamic nature of streamflow, the effects of actions upstream and upslope within a drainage are transmitted downstream; therefore, the watersheds determine where the downstream effects of an action will be felt. The areas are also important in the dynamics of the estuarine waters into which they flow, as will be described later. Figure 3 maps the four major watersheds, and their sub-basins, and Table 1 shows the acreage of each major watershed and sub-basin.



The two largest watersheds, Nichols Passage (1) and Felice Strait (3) divide the island roughly in half, draining west and east respectively. The Trout Lake sub-basin, draining west into Port Chester, is the largest within the Nichols Passage watershed. The Purple Lake/Crab Bay sub-basin, the largest sub-drainage in the Felice Strait watershed, drains naturally to the east, into Crab Bay; however, this pattern is complicated by the fact that Purple Lake supplies water to the power plant at the head of Tamgas Harbor. A portion of the lake's water, therefore, drains west. Physiographically, however, Purple Lake must be designated as part of the Felice Strait watershed.

The smaller two watersheds, Tamgas Harbor (4) and Revillagigedo Channel (2) are located at opposite ends of the island. The Tamgas Lake sub-basin is the major drainage of the Tamgas Harbor Watershed. Tamgas Harbor itself constitutes the island's largest estuary, with considerable runoff traveling downslope east of the harbor to contribute to the circulation and dynamics of the estuary. The Revillagigedo Watershed is well defined by two large sub-basins, Todd Lake and Triangle Lake, draining northeast into Nadzaheen Cove.

Because of the relatively flat terrain of the Metlakatla Peninsula, more generalized assumptions need be made in defining its drainage patterns. In general, the peninsula displays a pattern of east and west drainage. The north-south road, running from the town of Metlakatla south to the airport and Point Davison appears to follow the gentle crest along the length of the peninsula. The east side drains into Tamgas Harbor, the west into Nichols Passage.

FIGURE 3

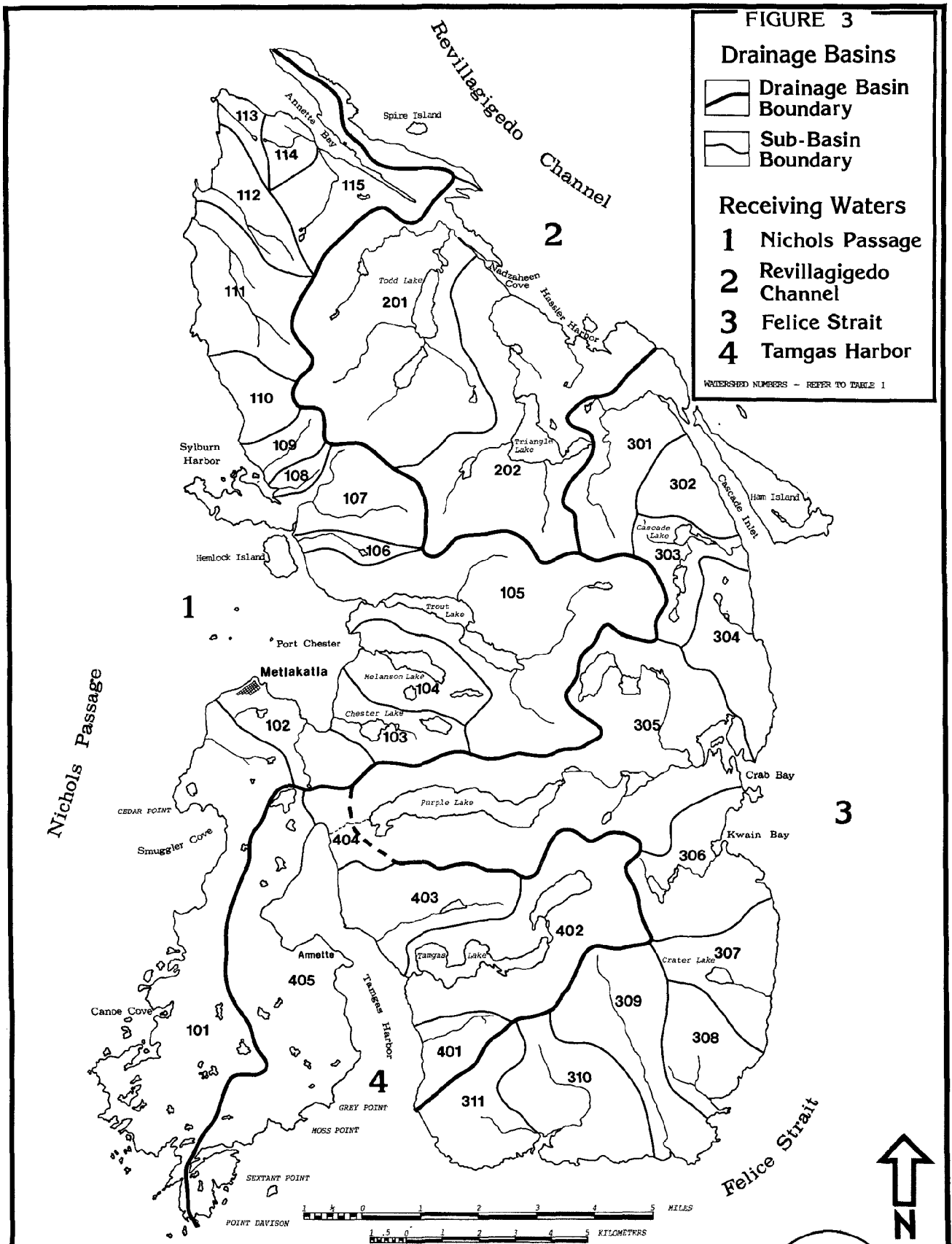
Drainage Basins

-  Drainage Basin Boundary
-  Sub-Basin Boundary

Receiving Waters

- 1 Nichols Passage
- 2 Revillagigedo Channel
- 3 Felice Strait
- 4 Tamgas Harbor

WATERSHED NUMBERS - REFER TO TABLE 1



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Table 1
EXTENT OF
ANNETTE ISLAND WATERSHEDS

Receiving Water	Drainage Basin	Area in Acres	Percent of Total Land Area
1.	NICHOLS PASSAGE	29,465	33.9%
	101. Metlakatla Peninsula West	6,120	
	102. Metlakatla	1,432	
	103. Chester Lake	1,280	
	104. Melanson Lake	1,752	
	105. Trout Lake	7,536	
	106. Totem Creek	400	
	107. Hemlock Creek	2,224	
	108. Japan Bay	400	
	109. Sylburn Harbor	576	
	110. Unnamed	872	
	111. Unnamed	2,520	
	112. Cowboy Creek	1,200	
	113. Walden Point	400	
	114. Outer Annette Bay	552	
	115. Inner Annette Bay	2,096	
2.	REVILLAGIGEDO CHANNEL	14,592	16.7%
	201. Todd Lake	7,368	
	202. Triangle Lake	6,552	
	203. Race Point	576	
3.	FELICE STRAIT	29,299	33.4%
	301. Narrows	2,736	
	302. Cascade Inlet	1,040	
	303. Cascade Lakes	1,336	
	304. Blunt Mountain	1,816	
	305. Purple Lake/Crab Bay	9,208	
	306. Kwain Bay	2,336	
	307. Crater Lake	1,800	
	308. Unnamed	1,960	
	309. Annette Point	2,960	
	310. Unnamed	2,720	
	311. Davison Mountain	1,744	
4.	TAMGAS HARBOR	14,105	16.1%
	401. Unnamed	744	
	402. Tamgas Creek	4,864	
	403. Tent Creek	2,208	
	404. Head of Tamgas Harbor	648	
	405. Metlakatla Peninsula East	5,520	

Source: Pacific Rim Planners, Inc, planimetric measurements

Climate

Much of the development of renewable resources on Annette Island is influenced by the area's climate. As will be described in subsequent sections, the climate enhances the productivity of marine waters and limits that of the forests. It also has a profound effect on human settlement patterns, lifestyles, and livelihoods.

The National Weather Service has collected climatological data at the Annette Airport since 1941. That data, published by the National Oceanic and Atmospheric Administration (1977), provides some insight into the weather patterns on Annette Island, and is summarized in this section.

Precipitation is the dominant force in the local climate. As warm moist air masses are drawn in from the ocean by low pressure systems, they encounter the colder land masses of Southeast Alaska's mainland and islands. Upon cooling, these air masses cannot retain the moisture. The resulting precipitation averages 114 inches annually at Annette. Topography apparently plays a major role in determining precipitation patterns, as evidenced by the level of precipitation in Ketchikan, where, only 20 miles to the north, the precipitation is approximately 50 percent higher. At sea level, most of the precipitation is in the form of rainfall; in the mountains it falls as snow during the colder months.

Seasonally, the precipitation falls most heavily in the fall with October storms raising the peak monthly average to over 17 inches (43 cm.). June and July are the driest months, averaging slightly over 5 inches (13 cm.) of rain per month. The prevailing winds are from the southeast. Wind speeds average over 12 mph in the autumn, with storms frequently exceeding 30 mph and occasionally peaking over 50 mph. In the summer, although clear skies and high pressure systems are accompanied by light north winds, the south-south-easterlies still prevail, usually in the 8 to 9 mph range (Figure 4).

The marine air masses that bring the heavy precipitation also moderate the temperature on the island. While the temperature occasionally drops below freezing, the coldest mean monthly temperature is in the lower 30's Fahrenheit (near zero Celsius) in January. In July and August the mean monthly temperature reaches its highs in the upper 50's (13 to 15 C.). Extremes, of course, extend far beyond these mean ranges, from near zero to 90 degrees (-18 to 32 C.), but the normal readings usually remain in the 30's to 50's, a much narrower range than is experienced in interior regions of Alaska or British Columbia.

Figure 4
Mean Monthly Temperature

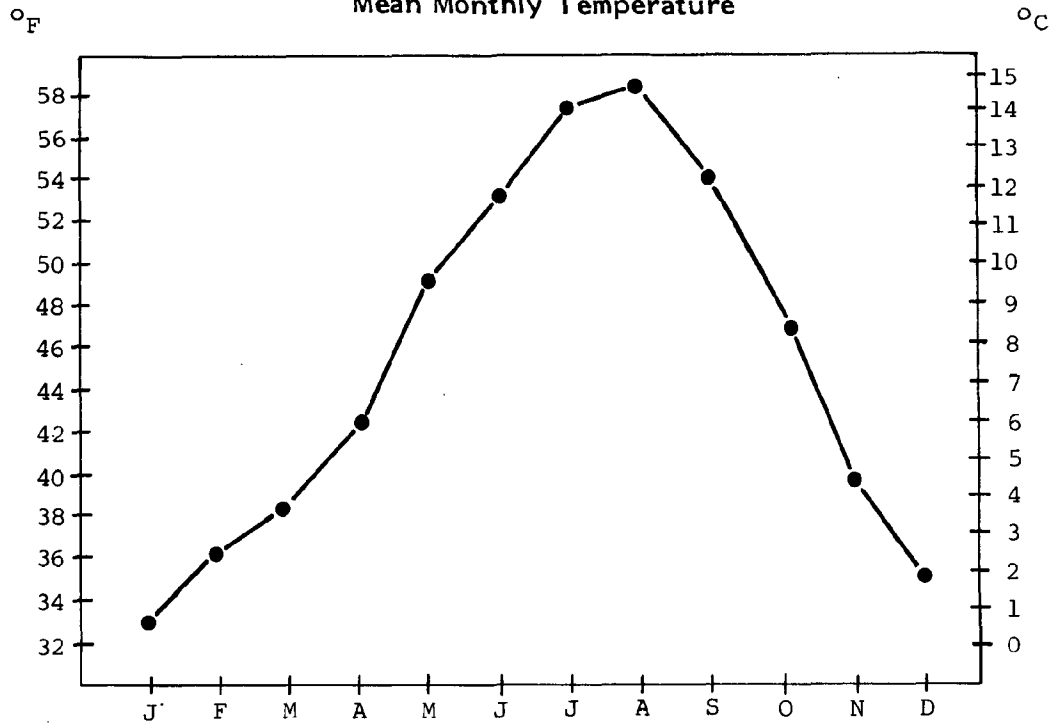
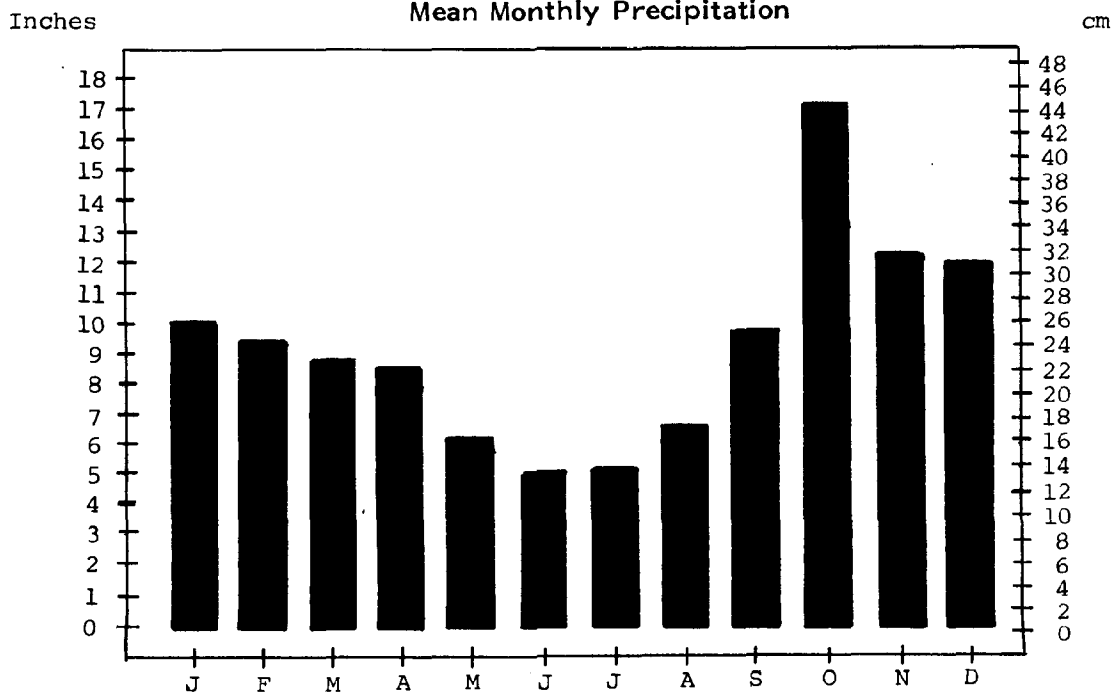


Figure 5
Mean Monthly Precipitation



Source: NOAA, Environmental Data Service, 1977.

CHAPTER 4 THE PEOPLE

History of Metlakatla

The Metlakatla Indian Community is composed primarily of Alaskan Natives. The first settlers of Metlakatla were members of all tribes (or clans) of the Tsimpshian Nation. Later, other Alaskan Natives joined the settlers; as a result Metlakatla now includes Tsimpshian, Tlingit, Haida, Eskimo Aleut, and other Alaskan Natives, and people of European backgrounds.

The first settlers of Metlakatla originally lived in the area of present day Fort Simpson, British Columbia. It was here that Father William Duncan, a lay Anglican missionary from London, came to teach the Natives. Father Duncan learned the Tsimpshian language and used it in his services.

At that time, the Tsimpshian clans in the area underwent a series of often-violent conflicts. One reason for these conflicts, Duncan believed, stemmed from the introduction of liquor to the natives by white traders. Duncan sought to remove his followers from these conflicts by establishing a new community at Metlakatla, B.C. The new location gave the community a temporary reprieve from the inter-clan warfare of Fort Simpson, but the old problems were soon replaced by another type of conflict. Duncan sharply disagreed with established policies and rituals of the church of England, such as the use of wine in communion services. Duncan refused to conform to this and other church policies and formed a new church, the Independent Church of Metlakatla, B.C. To counter this move, the Church of England confiscated the land of the new church and ordered the church building destroyed.

Father Duncan and the church elders decided to set out once again to find a new home. An exploratory group was sent to locate a new home site. Along the way, Chief Johnson of the Tlingits joined the party. The group arrived at Port Chester on Annette Island, site of a long-abandoned winter camp of the Taku Tlingits. On March 25, 1887, the party chose Annette Island as the site of their new home. Father Duncan dedicated the Community on August 7, 1887.

The new Metlakatla grew rapidly. Duncan drew up a plan for streets, homes and public buildings, and designed his home, the schools and all other public buildings as well. In 1889, the first permanent public building was dedicated, to house the day-school and the church.

The U.S. Congress formally recognized the new Community in 1891 by creating the Annette Islands Reserve, a federal Indian reservation. This action set aside the island for the exclusive use and occupancy by "Metlakatla Indians and other Natives of Alaska." In 1916, the Reserve was enlarged by Presidential Proclamation to include the waters surrounding Annette Island for a distance of 3,000 feet. The Community constitution, originally drawn up by Duncan, was re-written to take advantage of greater opportunity for Community self-determination provided by Congressional enactments in 1934 and 1936.

Population

Analysis and projection of past, present and future levels of population is an important element of any plan, for it enables the plan to adjust to varying conditions facing the Community. This section analyzes trends in some of the most important characteristics of the population of Annette Island.¹

SIZE OF POPULATION

Until the founding of the Metlakatla Indian Community, there was no permanent or year-round population on any of the islands of the reservation. The founding of the Community in 1887 brought rapid growth; in 1890 the population was 823. During the next 40 years, the size of the Community's population fluctuated, reflecting somewhat uneven success in establishing a stable social and economic base.

As in many other parts of Southeast Alaska, much of the early population growth of the Community can be traced to the development of the commercial salmon fishery. In more recent years, however, the Community's economy has diversified and grown to the point where salmon no longer solely determine size and success of the Community where other predominantly Native communities have declined as many Natives moved to urban areas of the state, Metlakatla has continued to grow, roughly paralleling total Native population in the region. As Southeast Alaska has grown and diversified, so has Metlakatla. Figure 6 depicts these trends.

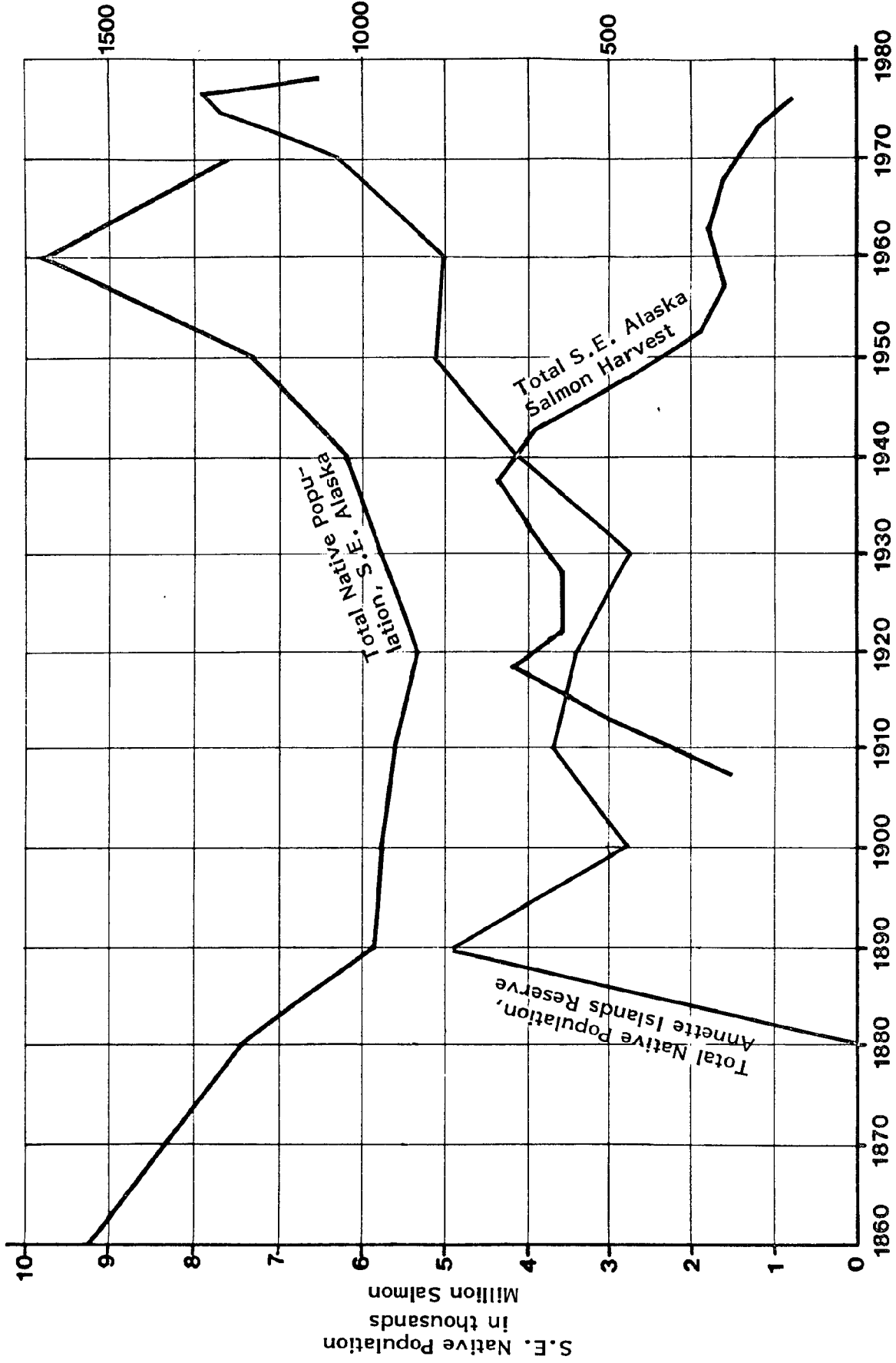
Since 1930 the level of population has shown fairly steady increases, the sole exception being a small decline in the 1950's. A 1976 Community Census estimated the population in Metlakatla alone at 1,291 while another report estimated a total community population of 1,320 in 1977. (Pacific Rim Planners, Inc., 1977)

Until the 1940's there was no appreciable population on any other parts of Annette Island outside Metlakatla, or on any of the other islands of Annette Islands Reserve. In 1942, the U.S. Army established an Air Force base on the southern end of the Metlakatla Peninsula at the present site of the Annette Airport. The Army was attracted by the island's strategic position midway between Washington State and interior Alaska, by the relative ease of navigation to and from the island, and by the availability of low-lying, flat land at the site.

1. For additional detail, please refer to the "Annette Islands Land Use and Housing Plan", (Pacific Rim Planners, Inc., 1977)

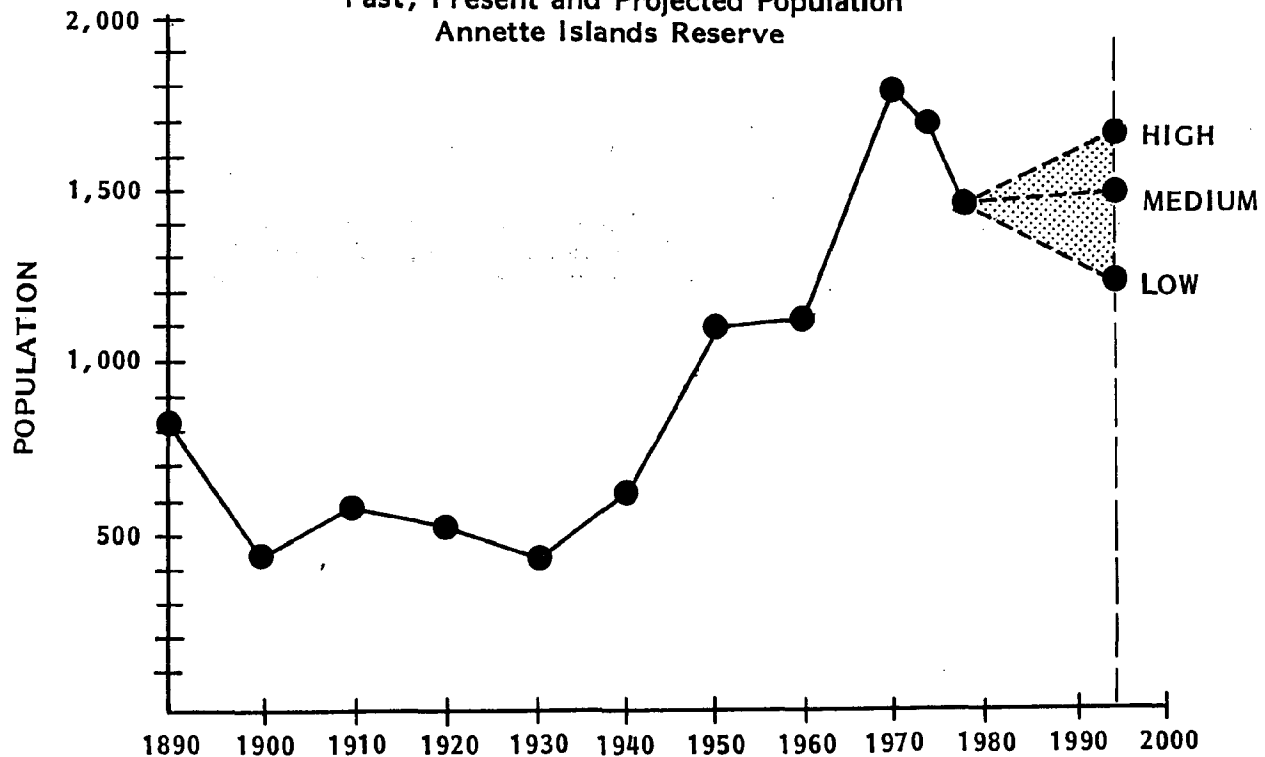
Annette Island Native Population

Figure 6
Trends in Native Population and Salmon Harvest



Sources: U.S. Bureau of the Census, and Rogers, 1978

Figure 7
Past, Present and Projected Population
Annette Islands Reserve



Source: Pacific Rim Planners, Inc., 1977.

The base was developed rapidly with as many as 10,000 uniformed personnel stationed there at a given time. The close of World War II brought a rapid decline in personnel, with a total population recorded at 302 persons in 1950. As Air Force functions declined, the facility came to be used as a Coast Guard Air Station and a civilian airport for the Ketchikan area. Population of the Annette area began to increase again, reaching 317 in 1960 and 750 in 1970.

Relocation of civilian airport activities to the new Ketchikan Airport in 1973 and of Coast Guard Air Station activities to Sitka in 1977 have now reduced population in the areas outside of Metlakatla to about 80 persons. About half of this number are located at the former FAA family housing area at Annette, although a few homes remain at the Annette Airport, near Point Davison, and at the RCA Alascom Station next to the Annette-Metlakatla Highway.

With the closure of the Annette Coast Guard Air Station, however, Annette area multi-family housing units which had formerly been occupied by Coast Guard personnel became available to other Community residents. As a result, many former residents of Metlakatla have moved to the Annette area, reducing somewhat the population of Metlakatla proper. No permanent year-round population resides on any other part of Annette Island or any of the other islands of Annette Islands Reservation. These trends are summarized in Table 4-1.

Table 4-1
 Past and Present Annette Islands Population
 1890 to 1979

Year	Metlakatla		Other Annette Islands		Total for Reserve	
	Number	Percent Change	Number	Percent Change	Number	Percent Change
1890	823	-- --	--	--	823	----
1900	465	- 43.5%	--	--	465	- 43.5%
1910	602	+ 29.5	--	--	602	+ 29.5
1920	574	- 4.7	--	--	574	- 4.7
1930	466	- 18.8	--	--	466	- 18.8
1939	674	+ 44.6	--	--	674	+ 44.6
1950	817	+ 21.2	302	--	1,110	+ 66.0
1960	798	- 2.3	337	+ 11.6	1,135	+ 1.4
1970	1,050	+ 31.6	750	+ 122.6	1,800	+ 58.6
1976	1,291	+ 23.0	360	- 52.6	1,651	- 8.3
1977 (est)	1,320	+ 2.2	80	- 77.8	1,400	- 15.2
1979 (est)	<u>1,210</u>	<u>- 8.3</u>	<u>130</u>	<u>+ 62.5</u>	<u>1,340</u>	<u>- 4.3</u>

Sources: U.S. Bureau of the Census, various; Environmental Concern, Inc., 1972; Metlakatla Indian Community, undated; Alaska Consultants, Inc. Metlakatla Indian Community, 1979

DEMOGRAPHIC CHARACTERISTICS

Perhaps the most notable characteristic of the Reserve's population is that it is predominantly Alaskan Native. The 1976 Community Census found that 86 percent, or about six out of seven, of Metlakatla's population is Alaskan Native or American Indian. Since most of the population elsewhere on Annette Island is non-Native, the overall percentage for the Reserve is somewhat lower—approximately 81 percent.

Metlakatla's population has approximately the same distribution among ages and sexes as does that of the state of Alaska, but is quite different from that of the population of the nation as a whole. In 1970, males outnumbered females by approximately 55 to 45 percent. The balance was reversed nationally, with females outnumbering males by 51 to 49 percent.

Metlakatla's population is also quite young; the Community's 1970 median age of 20.7 years is substantially lower than the nationwide median of 28.0 years. These differences in ages and sexes can probably be attributed to three major factors; (1) death rates from some age groups are much higher in Alaska; (2) some young adults settle elsewhere in search of employment or other opportunities which Metlakatla does not offer; and (3) birth rates are higher. The result is that family sizes are larger, and the population of young persons is increased proportionately.

Comparison of vital statistics with population estimates, however, indicates that the Reserve recently experienced a phenomenon common to many Native communities or reservations in Alaska. Former residents, enticed by improved local housing, employment and cultural opportunities, have returned to live in the community. As a result, during the period 1970 to 1977, total Native population within the Reserve grew at a rate three times faster than that which could be attributed to natural factors (excess of births over deaths) alone. The recent period of high unemployment precipitated by the decline of Annette Airport activities has slowed and even reversed this growth, but it is likely that any significant improvement in the local employment opportunities will cause population to begin increasing once again.

Population projections prepared in the 1977 Annette Islands Land Use and Housing Plan assume a strong relationship between changes in employment opportunities and changes in population; however, increasing labor force participation will probably diminish the number of residents supported by each full time job. As such, a 54 percent increase in employment opportunities (high growth scenario) would lead to a 31 percent increase in population, a 27 percent job increase (medium growth scenario) would lead to an 8 percent increase in population, and a 0.5 percent decrease in employment (low growth scenario) would lead to a 13 percent drop in population. Table 4-2 summarizes these projections.

Table 4-2

Projected Population and Employment,
Annette Islands Reserve

	Total Employment ¹		Total Population ²	
	Number	Percent Change 1977 to 1995	Number	Percent Change 1977 to 1995
1977 (est)	425	--	1,400	--
1995				
Low Growth Scenario	423	+ 1.8%	1,212	- 0.5%
Medium Growth Scenario	540	+ 27.1%	1,512	+ 8.0%
High Growth Scenario	<u>654</u>	<u>+ 53.9%</u>	<u>1,831</u>	<u>+ 30.8%</u>

Source: Pacific Rim Planners, Inc., 1977.

1) Average Annual Full-Time Employment
2) Year-Round Residents

Economy

Stated simply, the economy of Annette Islands Reserve is comprised of income-producing activities within the Reserve. In this section, Annette Island's economy is described in terms of major economic activities, including the history, products, nature, size and future outlook of those activities. These descriptions are provided as an introduction to later discussions of coastal zone resources and their use in the following chapter.

Since the founding of the Community, Annette Island's economy has been based, in large part, on the natural resources of Annette Island. Fisheries and forestry resources are abundant, and have historically supported a major part of the island's work force. Other employers have been important to Metlakatla's economy; however, the largest of these, the federal government, has recently terminated most activities on the island, and its remaining activities are relatively minor.

The community's economy has been the subject of a number of recent studies.¹ Since these studies contain much information describing the structure and outlook of Annette Island's economy, this discussion will attempt merely to summarize their most important findings, particularly as they relate to coastal management.

¹These studies include the Annette Islands Housing and Land Use Plan, (Pacific Rim Planners, Inc., 1977), Annette Airport Master Plan, (Stevens, Thompson and Runyan, Inc., undated), Annette Islands Economic Readjustment Strategy (PAI, 1978), Annette Islands Shellfish and Mineral Harvesting Feasibility Studies (Pacific Rim Planners, Inc., 1978), and Recreation and Tourism Potential of Annette Island and the Metlakatla Community, Alaska (U.S. Bureau of Outdoor Recreation, 1975).

The 1977 Annette Islands Housing and Land Use Plan includes an analysis of Annette Island's economic base (primary sources of Community employment and income), spending patterns and employment projections (upon which population projections are based). The economic base analysis in the report incorporates estimates adjusting for the likely effects of the Coast Guard relocation and as such presents a fairly valid picture of Annette Island's economy and economic base.

Table 4-3 presents the economic base analysis contained in that study. Essentially, the table divides employment estimates into the sources to which jobs can be attributed. For example, the 82 jobs associated with forestry and the forest products industry are almost completely attributed to demand by off-island private businesses (such as exports to Japan). A very small fraction is due to local demand for wood and wood products produced locally. Thus, about 99 percent of employment in forestry and the forest products industry is due to off-island demand. Other industries and government employment are distributed in a like manner.

The totals at the bottom of the table point out several important characteristics about the economy of Annette Islands. First, sales to the off-island private sector are the most important source of employment, with 43.4 percent (nearly half) of Annette Islands employment directly attributable to this source. Employment directly or indirectly attributable to the federal sector (this includes both purchases by federal agencies and purchases by federal employees and their families), is also quite important, accounting for 38.7 percent (or nearly two-fifths) of total employment. Finally, the overall ratio of basic, or off-island attributed, employment to secondary employment is very high -- about 1.00 to 0.15 -- indicating that most employment on Annette Island is attributable to export or basic rather than locally-oriented activities. In essence, the table demonstrates that most local income is spent off-island rather than being respent in the local economy. By contrast, many larger cities have basic to secondary employment ratios of 1.0 to 2.5 or more.

Two major factors can be identified as being primarily responsible for this lack of respending and secondary employment. One major factor is certainly the proximity of Ketchikan, with its larger population and more varied services. Ketchikan siphons a good deal of spending by Annette Island residents away from Metlakatla.

The second major factor is that during the peak summer season, many transients or non-resident workers are employed in logging, fishing and fish processing activities. Most of these activities are relatively self-contained (i.e., provide housing and food directly to workers) and much of the workers' earnings leave with them at the end of the season.

Specific projections for each of the employment categories listed in Table 4-3 are shown in Table 4-4. Three different sets of projections were prepared, because of the wide range of possibilities in the Reserve's future economic development, and the uncertainty surrounding those possibilities.

The low forecast assumes little economic development activity during the planning period, other than maintenance of existing activities. It assumes no development at the Annette Airport, and generally stagnant levels of activity among Annette Island's major employers.

TABLE 4-3

ANNETTE ISLANDS RESERVE ECONOMIC BASE

1977

Employment Category	SIC	Average Annual Employment by Demand Sector							Total Employment
		Basic Sectors			Secondary Sectors				
		Federal Gov't	Federal Employees & Dependents	Off-Island Private	State (Schools)	Residents All Other	Local Private	Local Gov't	
I Lumber & Wood Products	24	--	--	81.3	--	0.6	--	--	82.0
II Fisheries & Fish Products	09,20	--	--	111.7	--	1.6	0.6	--	113.8
III Other Manufacturing	21-23, 25-39	--	--	.4	--	0.3	0.3	0.5	1.4
IV Contract Construction	15-17	--	--	--	--	0.1	0.1	9.4	9.6
V Transportation & Communications	40-49	0.3	0.5	42.0	1.1	2.1	0.9	0.9	48.8
VI Trade	50-59	0.4	3.4	0.4	--	14.7	1.6	0.8	21.3
VII Finance, Ins. & Real Estate	60-69	--	0.4	0.1	--	3.3	0.3	0.2	4.1
VIII Services	70-89, 01-08	0.1	2.1	1.5	--	8.0	0.8	1.1	13.7
IX (A) Federal Government	--	18.3	0.9	0.1	--	1.7	0.4	0.7	22.1
(B) State Government	--	--	--	--	26.0	--	--	--	26.0
(C) Local Government	--	50.5	3.8	10.1	0.6	6.9	9.2	0.6	81.8
TOTALS		69.6	11.1	247.6	27.7	39.3	14.2	14.2	423.7
Percent of Totals		16.4%	2.6%	58.5%	6.5%	9.3%	3.4%	3.3%	100.00%

Source: Pacific Rim Planners, Inc., 1977

Table 4-4
 Estimated Present and Future Employment
 Annette Islands Reserve
 1977 and 1995

Employment Category	SIC	Total Employment in 1977		Low Activity Level		Medium Activity Level		High Activity Level	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
Mining	10-14	0	0%	--	0%	5	0.9%	15	2.3%
Lumber & Wood Products	24	82	9.3%	82	18.9	139	25.7	180	27.5
Fisheries & Fish Products	09,20	114	26.8	119	27.5	130	24.1	157	24.0
Other									
Manufacturing	21-23,25-39	1	0.2	1	0.2	1	0.2	2	0.3
Contract Construction	15-17	10	2.4	10	2.3	13	2.4	19	2.9
Transportation & Communication	40-49	49	11.5	50	11.5	57	10.6	65	9.9
Trade	50-59	21	4.9	21	4.8	27	5.0	35	5.4
Finance, Insurance & Real Estate	60-69	4	0.9	4	0.9	5	0.9	7	1.1
Services	70-89,01-08	14	3.3	16	3.7	22	4.1	28	4.3
Federal Government	-	22	5.2	22	5.1	23	4.2	24	3.7
State Government	-	26	6.1	26	6.0	27	5.0	29	4.4
Local Government	-	82	19.3	82	18.9	91	16.9	93	14.2
TOTALS		425	100.0%	433	100.0%	540	100.0%	654	100.0%

Source: Figures taken from Table 4-3, reflecting estimated employment levels following relocation of Annette Coast Guard
 Note: Percentage figures may not add due to rounding.

The medium forecast assumes:

1. Full-scale development of small log processing operations and expansion of the Annette Hemlock Mill by Louisiana-Pacific, Inc.
2. Increased employment in fishing due to completion of the new salmon hatchery on Tangas Harbor, or expansion of the Community's fishing fleet, and some additional entry into other year-round fisheries. (bottomfish)
3. Increased employment in fish processing due to increased harvest and expansion of the cold storage plant.
4. Small increases in forestry employment due to local management and enhancement efforts.
5. Small increases in transportation and communications employment.
6. Small scale exploratory development of barite and other mineral deposits.

By contrast, the high forecast assumes perhaps the highest possible alternative in terms of employment projections. Among the assumptions are full-scale development by Louisiana-Pacific of the airport site, including log storage, debarking, merchandising, and other secondary wood processing activity (such as a veneer plant mill). It also represents large increases in fisheries activities, and establishment of small tourism and mineral enterprises. Making such development a reality would require a major Community effort in terms of time and investment of funds.

When dealing with an area of small population such as the Annette Islands Reserve, population forecasts are subject to considerable error, particularly when the local economy appears to be sensitive to major dislocations. With a small population and a long forecast period, the chance for error is great. One major unanticipated public or private action can affect future population levels dramatically. For this reason, these forecasts should be considered the best estimates that can be made at this time, but should be reviewed, updated and revised as necessary as new information becomes available.

Social and Cultural Resources

At the time of the founding of the Community, many of the major aspects of Tsimpshean culture had been abandoned in favor of religious values and practises stressed by William Duncan.

However, the tribal background of the Community continues to assert itself in daily life. Families play an important role in the Community, and the town's elders command a greater respect than they do in most American towns. Not only are family ties strong, they are also far-reaching; it is difficult to find two Metlakatla residents who are not somehow related. In making decisions, Community leaders must therefore relate to the citizens as individuals with whom they are acquainted and to whom they are probably related.

Another carryover from the tribal beginnings is the Community ownership of land. All the land and water in the reserve is held in federal trust status for all Community members. Thus, the Community does not experience the pressures usually associated with private ownership, and the issue of taking which frequently accompanies land use controls.

Historical and Archeological Resources

Prior to the founding of the Community in 1887, Annette Islands were used only sporadically by Tlingit and Haida Indians for seasonal fishing camps and fishing sites. No permanent (winter) settlements of Tlingit or Haidas are known to have existed on the island. As a result, there are no known historic archaeological artifacts located on the islands associated with earlier Native presence.

Since the founding of the Community in 1887, several structures and sites on Annette Island have played important roles in Community development. These sites, all of which are in the town of Metlakatla and under the control of the Community, include the Duncan Memorial Church, located at the head of Church Street; the house of William Duncan, now the Duncan Museum on Atkinson Street; and the Community cemetery at the southwest end of Western Avenue.

The Community manages these sites to preserve their original configuration and condition. The Duncan Cottage was restored in 1974, and the cemetery is maintained by the Community.

CHAPTER 5

MARINE RESOURCES AND HABITATS

Annette Island is located amid some of the most productive waters in the world. The region's characteristic geologic history, climate, oceanographic and biological conditions combine to make the inside waters of the north-west coast of North America, including those of Annette Island, a highly productive, self-sustaining system that is exceptional among the world's marine ecosystems. The system retains nutrients where they can be used most efficiently, and produces prodigious quantities of food for fish, shellfish, waterfowl, marine mammals and people. This chapter reviews the processes that contribute to the production of marine resources, analyzes the characteristics of those resources, and discusses their use and management.

Oceanography and Productivity

Where rivers and streams enter the marine environment, they form an estuary. An estuary, as defined by Pritchard (1967) is a semi-enclosed body of water, strongly affected by tidal action, having a free connection with the open sea, in which seawater is measurably diluted by freshwater derived from up-land runoff. Annette Island has seven readily definable estuaries, distinct from the more open waters, but even the waters of Clarence Strait and Revillagigedo Channel are estuarine in the natural definition. They are partially isolated from the open sea and are diluted by freshwater runoff. Most important, they tend to be more productive than does the open ocean.

The foundation of most marine food chains is based on phytoplankton. These microscopic, drifting plants convert inorganic nutrients, solar energy, carbon dioxide and water into organic material which is available for use by animals. The phytoplankton become food for zooplankton (microscopic drifting animals), which in turn feed large marine animals.

The phytoplankton, however, are limited in their food-producing activity to water shallow enough to allow sunlight to penetrate.

In the open ocean, decaying plants and animals tend to settle into the depths where sunlight does not penetrate. The nutrients resulting from their decomposition cannot be used by the phytoplankton. Biologically, then, the open sea with its clear blue waters is not very productive. The murky green waters of the bays of the glaciated coast, on the other hand, teem with life. The green color of the water is caused by the rich growth of phytoplankton, which supports an abundance of other forms of life.

The exceptional productivity of the estuarine waters is enhanced by a process that draws the nutrients into the estuaries at a depth at which they can be used by phytoplankton and other marine vegetation. This process is driven in part by the large volume of freshwater flowing into the estuaries from the upland drainage basins.

For example, if all the rainwater that falls directly into Tangas Harbor in an average year were piled up in one layer, it would exceed nine feet in depth. Actually, Tangas Harbor receives a good deal more freshwater than that nine feet each year, because most of the precipitation falling into its 22-square mile (14,105 acre) watershed is unable to percolate into the impermeable igneous and metamorphic bedrock beneath. Allowing for an annual loss of 20 inches by evaporation and transpiration, 94 of the 114 inches of average annual precipitation can be expected to run off into the streams and be carried into Tangas Harbor. Because the drainage basin is 14,105 acres and the harbor is 3336 acres, this runoff, added to the precipitation that falls directly into the harbor, would form a layer 41 feet deep if retained in the harbor for a year.

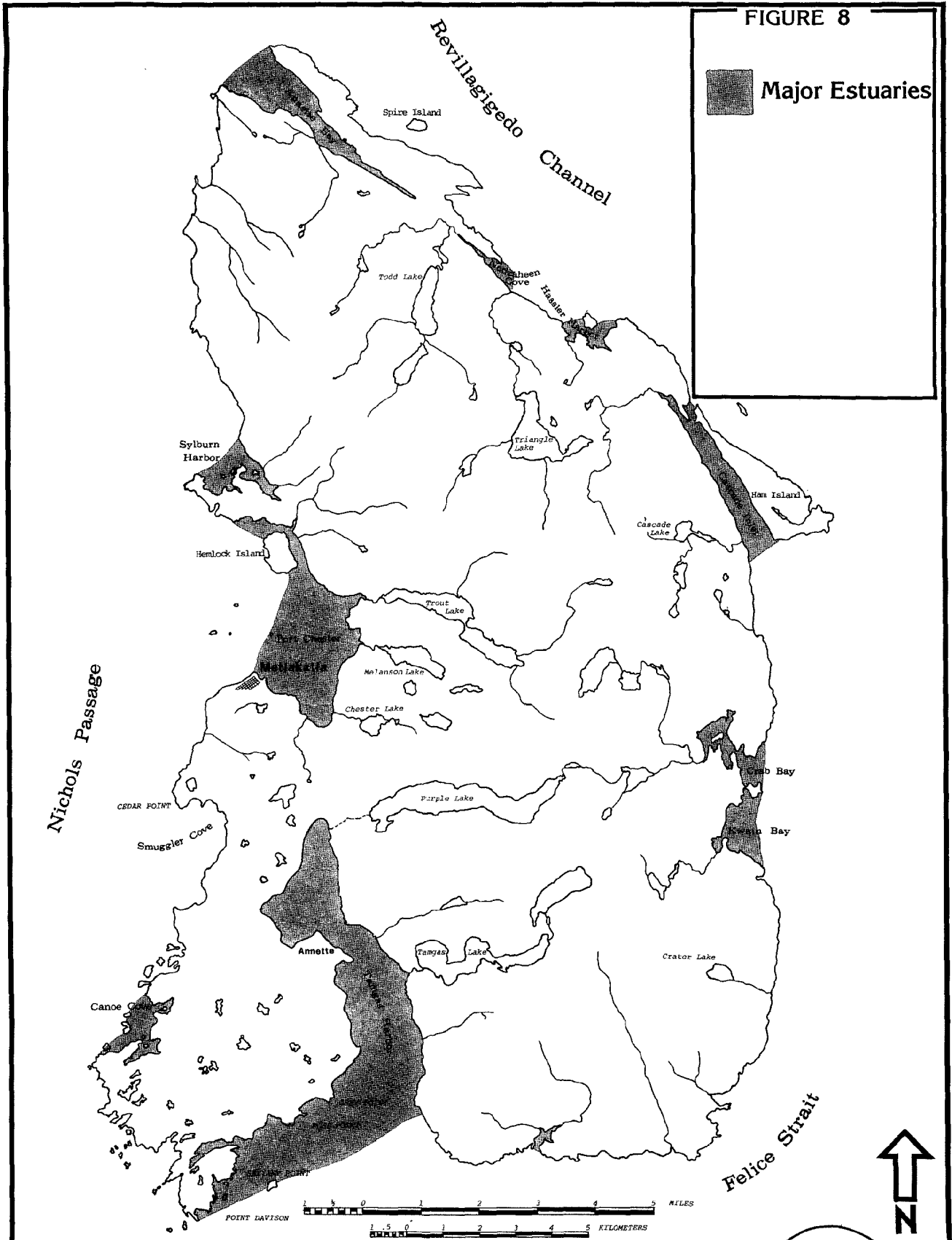
The freshwater does not, of course, pile up into a layer 41 feet deep, but neither does it completely mix with the seawater. Being less dense the freshwater tends to remain in a somewhat discrete layer of lower salinity water floating on top of the more dense seawater. Being near the surface, this water receives sunlight, which encourages phytoplankton growth. Before all this runoff can go out to the open sea, the phytoplankton have the opportunity to use its nutrients and produce food.

As it flows out of the estuary, the lower salinity water leaves at the surface. Since the outflow is at the surface, inflowing water must enter the estuary at depth. In the warmer months, this inflow-at-depth coincides with a coastwide process of upwelling in which deep, nutrient-rich, oceanic water is carried to the shore. This upwelled water probably provides a substantial amount of nutrients to the estuary. (Figure 9).

When it enters the estuary, the nutrient-rich water passes over the shallow sill. The constriction of this entrance causes the deep water to mix with the surface water. The nutrients then become available for use by phytoplankton, which convert it to food for fish, shellfish and other marine organisms. When they leave the estuary the nutrients are incorporated into living organisms, which contribute to the productivity of the offshore waters.

FIGURE 8

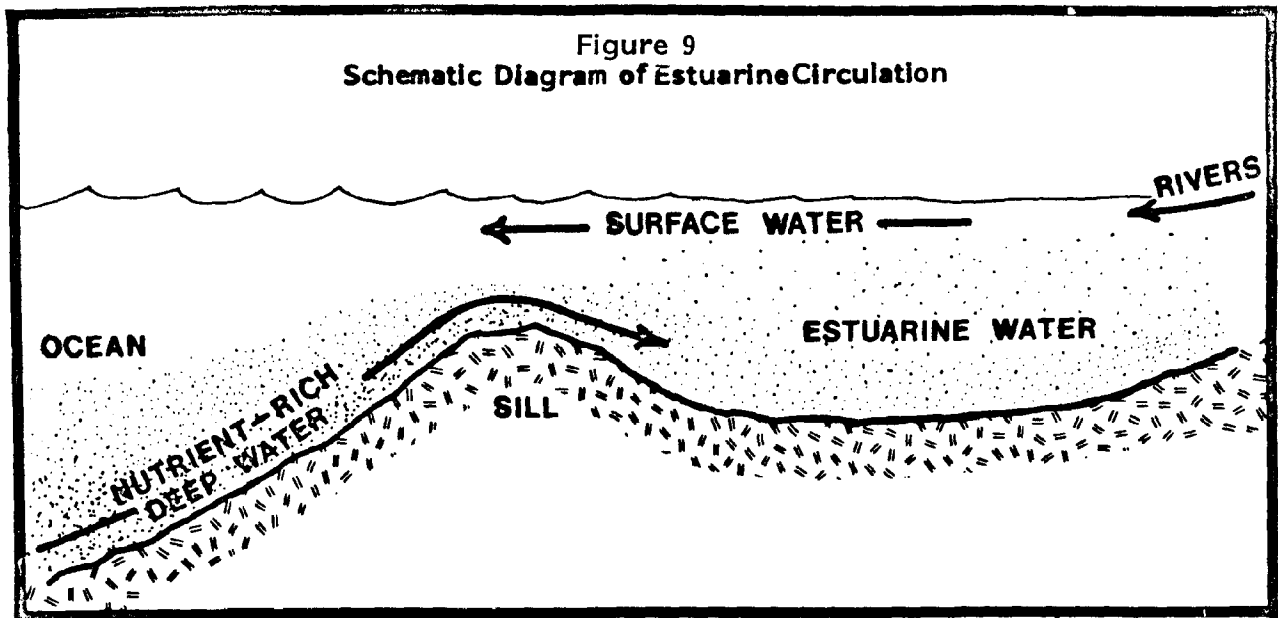
Major Estuaries



PACIFIC RIM
PLANNERS, INC.
5000 4th Avenue NW
Seattle, WA 98107
(206) 739-2300

Annette Islands Coastal Zone Management Program





Shoreline Habitats




The repeated advances and retreats of glaciers on Annette Island have endowed it with over a hundred miles of intricately carved shoreline. The shoreline is diverse, ranging from steep, hard rock cliffs on the island's east side to broad, soft mudflats in its protected estuaries. Most of the shoreline, however, is between these two extremes, composed of a mixture of sand, gravel, cobbles and boulders. Each of these habitats has its own physical and biological characteristics. Some produce great quantities of clams, possibly suitable for commercial harvest, while others support mussels, crabs, or a variety of other organisms. This section will examine the shoreline habitats of Annette Island in terms of their general physical and biological characteristics. The extent of these habitats is mapped in Figures 10 and 11, and is quantified in Table 5-1 below;

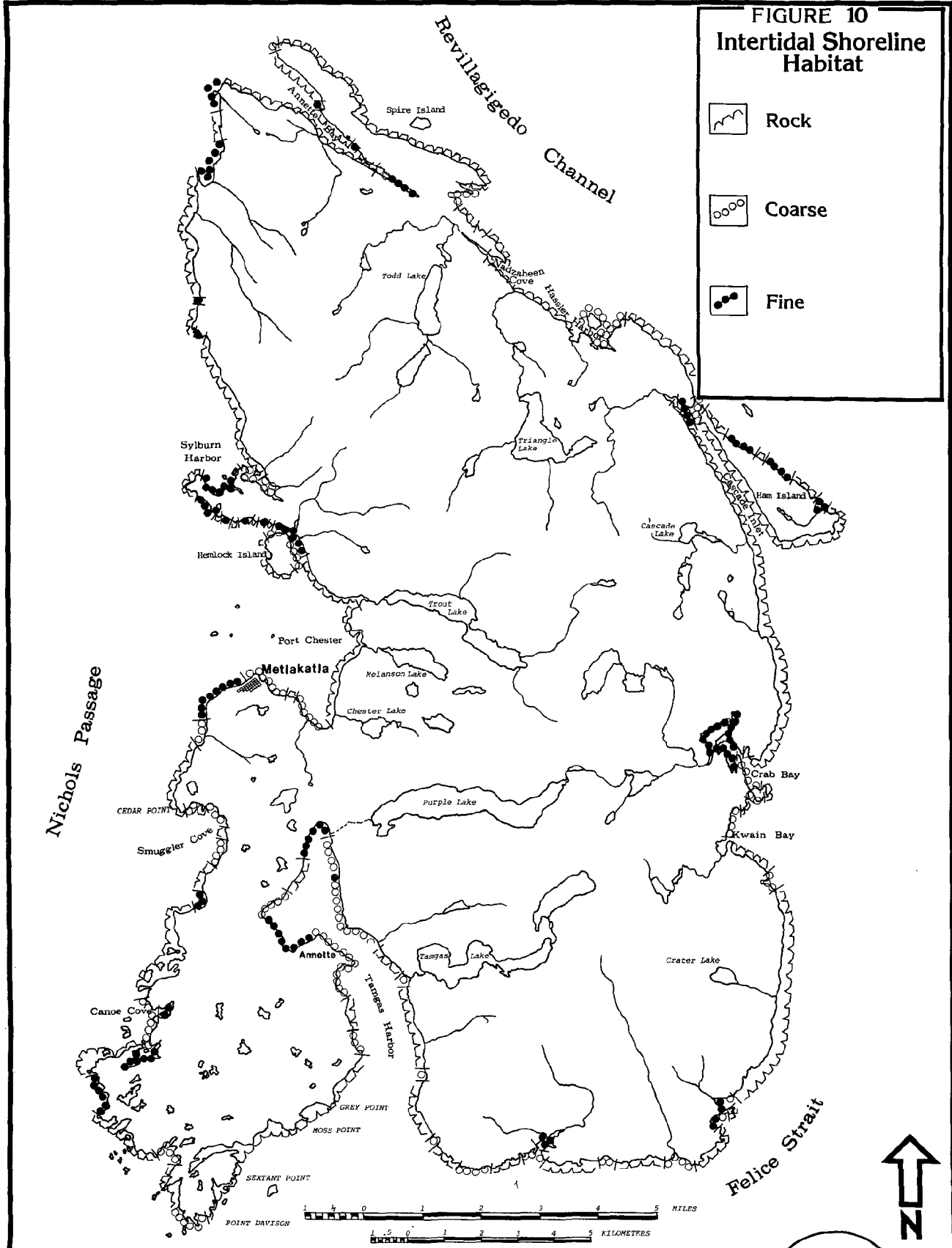
Table 5-1
Extent of Shoreline Habitats (in miles)

Type	All-Island Subtidal	All-Island Lower Intertidal
Rock	53.0	64.5
Coarse	28.0	25.0
Fine	24.0	15.5

Source: Pacific Rim Planners, Inc., 1978a. Measured to nearest of mile.

FIGURE 10
Intertidal Shoreline
Habitat

-  Rock
-  Coarse
-  Fine






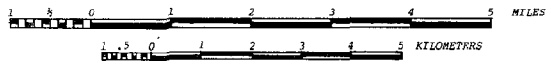
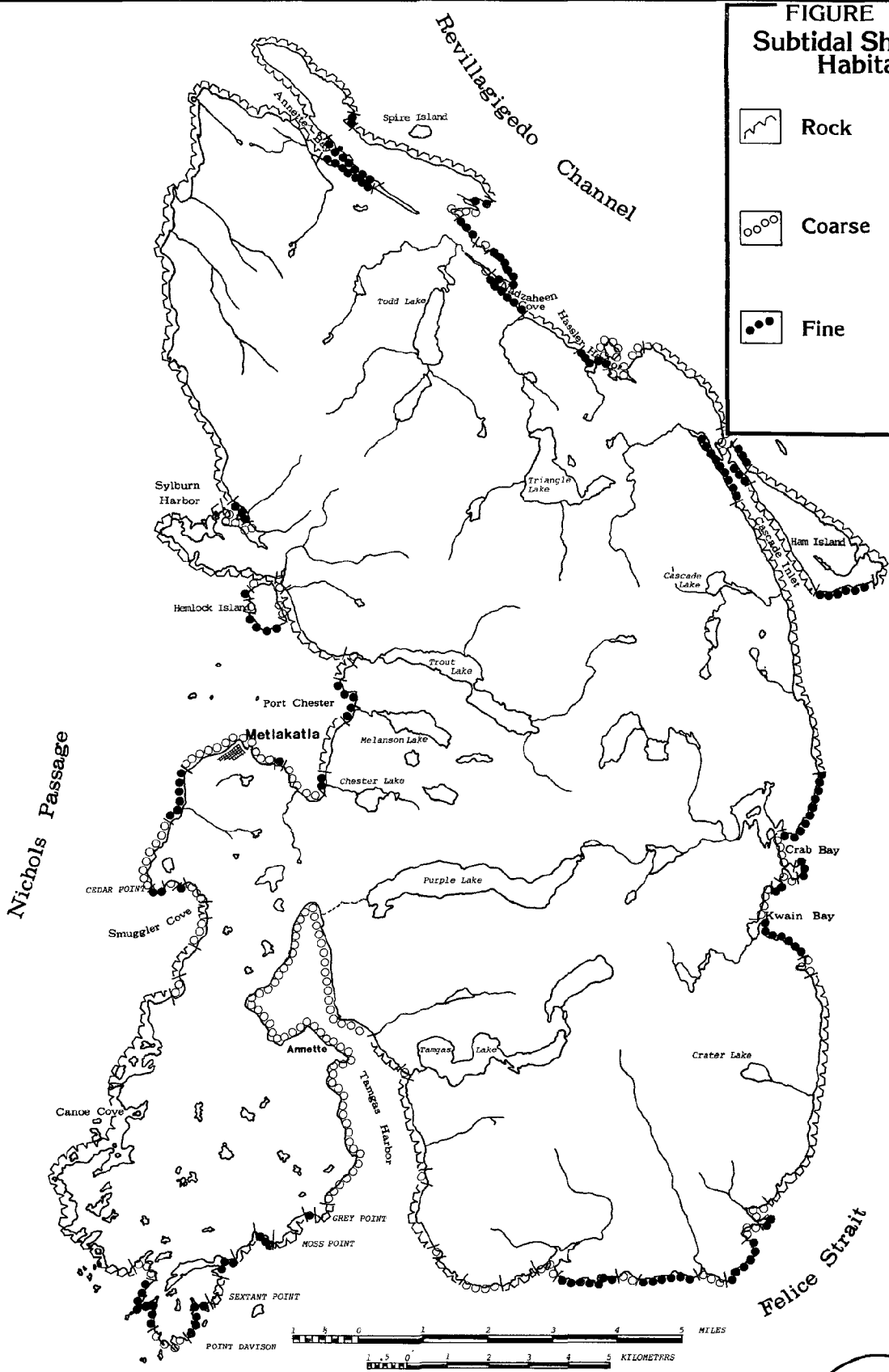
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FIGURE 11
Subtidal Shoreline
Habitat

-  Rock
-  Coarse
-  Fine



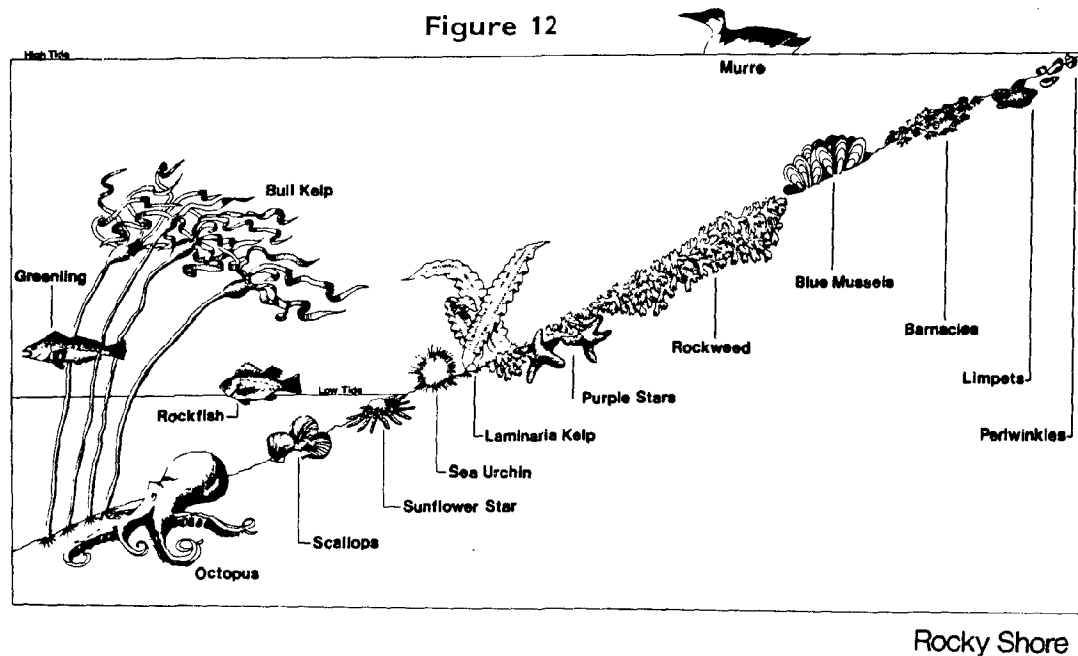
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ROCKY SHORES

In exposed waters, particularly on the shorelines exposed to southeast winds, storm waves pound the beaches, scouring away any sand, gravel or other unconsolidated material. Solid bedrock remains, and, while even this material is eroded over geologic time, it remains stable on the shoreline long enough to develop a community of plants and animals adapted to the hard, solid surfaces. (Figure 10 shows the location of the rocky shores, which include rocky islands and sea cliffs.) One characteristic common to most of these organisms is their ability to attach themselves to the rock, to withstand the action of both waves and predators. They distribute themselves in vertical zones on the rock according to their tolerance of, and adaptation to, the physical and biological changes related to the exposure and inundation by the tides. (Figure 12 shows the distribution of representative plants and animals on the rocky shore.)



Near the high tide line barnacles attach themselves to the rock. Not permanently attached, but clinging tightly, are small snails, the periwinkles and limpets.

Larger snails, such as the wrinkled purple snail, appear farther down on the rocks, where tidal coverage is greater and exposure to air is reduced. These are joined by chitons, or gumboots, which have a powerful foot for clinging to the rock, and by mussels, which produce strong threads with which to attach themselves to the rock. Algae is also prominent in the mid-tide levels, with rockweed the most abundant at this level.

The lower intertidal zone of rocky shores is populated by many species which are also found in deeper water, and may be taken as a partial indicator of the near-shore subtidal marine life. Most apparent here is the lush growth of algae. Several species of large brown kelp live here, attached to the rock with holdfasts, rootlike structures at the base of the plant. Not so impressive in size, but nonetheless important in the functioning of the marine ecosystem, are the smaller brown and red algae which grow in the lower intertidal and shallow subtidal zones.

Starfish are common on the lower rocky intertidal and shallow subtidal bottom. At high water they migrate to the high tide levels to feed on barnacles and mussels. Octopuses inhabit the crevices in the rocks, crawling and swimming in search of crabs or other shellfish.

MIXED-SEDIMENT SHORES

About a third of the island's shoreline is composed of mixed sediments, mostly sand, gravel, and cobbles. The proportion of these materials on a beach varies with exposure to wave action. Protected shorelines, such as those found in Canoe Cove, in Hemlock Bay, and near the head of Tangas Harbor are made up of fine materials, such as sand and gravel. Shorelines exposed to more wave action, such as along Metlakatla's waterfront, have a greater proportion of boulders and cobbles, since the waves wash away the finer sediments. Where calm water lets sand and mud settle out, it allows organic detritus to accumulate. This decomposing plant and animal material collects in the sediments, and is a food source for many marine animals.

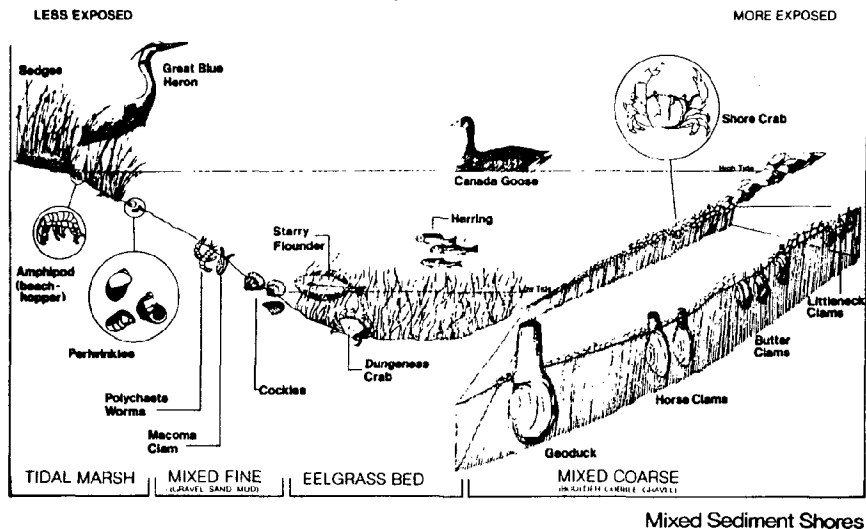
The spaces between the particles are important habitat for many animals, which burrowing to protect themselves from predators, and from exposure to air at low tide. While these mixed-sediment beaches may not appear on the surface to be as well-populated as a rocky shore, the hidden burrowers often form diverse and productive communities.

Clams are abundant in gravel and cobbles. Littlenecks are found a few feet above zero tide level, butter clams somewhat lower, horse clams at the minus tide levels, and geoducks at the extreme low intertidal and in the subtidal zone.

Dungeness crabs, red rock crabs, and small purple shore crabs, frequent these shores, moving about to feed on detritus at high tide, then burrowing in the sediment or under boulders at low tide. Other small animals burrowing into mixed-sediment beaches and consuming detritus include small crustaceans, polychaete worms and small clams. These animals are often fed upon by bottomfish and by some species of waterfowl.

Among the seaweeds and brown rockweed, sea lettuce are common in the midtide levels. Brown and red algae, generally smaller than the kelps of the rocky shores, grow at lower tide levels.

Figure 13



EELGRASS BEDS

Of special importance among the habitats of gravel, sand and silt beds are the eelgrass beds. Occasionally found in patches in the exposed shores, eelgrass grows abundantly in the lower intertidal and shallow subtidal in areas of reduced wave action and fine sediments, such as Smuggler Cove and the inner part of Tamgas Harbor.

Once established, the eelgrass plants reduce the force of the waves with their blades, and stabilize loose sediment with their roots and rhizomes. The sheltered environment they create resembles an underwater meadow, and provides a habitat for a diversity of organisms.

Research on the community of plants and animals associated with eelgrass has found it to be an extremely valuable one in the marine environment (Phillips, 1974). The eelgrass itself has a very high rate of biological productivity. Its annual production of organic matter is higher, in fact, than that of many cultivated crops which require extensive inputs of energy and nutrients. While some of that productivity is contributed to the rest of marine environment through grazing by small invertebrates, much is used in a fragmented or partially decomposed form, as organic detritus. The eelgrass blades also provides a surface for attachment for many small animals and plants. Migrating waterfowl, particularly geese, feed heavily on eelgrass. Dungeness crabs use eelgrass beds as a nursery area.

The eelgrass serves another important function as a spawning substrate for herring around Annette Island. In 1978, for instance, even though the spawning areas had large quantities of *Laminaria* kelp, hair kelp and other seaweeds commonly used by herring as spawning substrate, approximately 55 percent of the island's documented herring spawn was deposited on eelgrass (PRPI, 1978). In this capacity, the eelgrass appears vital to the herring fishery, as well as to the salmon, sea birds and other organisms which feed on herring.

Direct human interaction with eelgrass beds is generally limited to subsistence hunting of waterfowl, clamming or crabbing. In some areas of the country, dredging for navigation channels has destroyed productive eelgrass beds, but none have been dredged, or are likely to be, around Annette Island.

TIDAL MARSHES

Another area of special importance, the tidal marsh occupies the high intertidal areas, and thus serves as a transition community between the marine environment and the terrestrial environment (Figure 13). Often represented by a narrow fringe of vegetation along the upper edge of a beach, the tidal marshes are more extensive on the small deltas at stream mouths, and inside bays and coves where fine sediment accumulates for them to root in, and where they are protected from wave action. The largest tidal marsh on Annette Island is one of approximately 38 acres widening along the sinuous channels inside Crab Bay. Canoe Cove, Kwain Bay, and some of the smaller coves on the island also have fairly extensive tidal marshes.

These marshes are dominated by Lyngbye sedge, but are generally bordered on their seaward side by a fringe of stunted rockweed, and on their landward side by tufted hairgrass, beach ryegrass, and Pacific silverweed.

Although tidal marshes occupy a comparatively small area on the island, they have been found to be important as a food source for wildlife in winter (Meehan 1974). Sitka blacktailed deer rely on it in the winter when their feeding grounds in the mountains are frozen over, but can be seen grazing in the marshes at almost any time of the year. Mink also use this habitat in the winter, feeding on the clams, mussels, sea urchins and crabs which they catch in the intertidal zone.

The Canada geese, which are hunted on the island feed and rear their young in these tidal marshes, utilizing small marine animals for food. Among the birds which feed in the tidal marshes are several species of dabbling ducks, gulls, shorebirds (sandpipers, etc.) black brant and great blue herons. Swallows feed on insects flying over the grasses, and bald eagles frequently use the marshes to feed on fish they have caught offshore.

Equally important, although perhaps less apparent, is the role that the tidal marshes play in the overall productivity of the marine and estuarine waters. Tidal marsh plants have been found to have a high rate of productivity of organic matter which, if not grazed upon by mammals and birds, is largely converted to organic detritus which the tides export to the marine waters (Odum, 1961). (The importance of detritus as a food source to some animals has been described above in the discussion of mixed-sediment beaches.) The contribution of the tidal marshes takes on added value as its material is usually exported to the marine environment during the winter, when the marsh plants die and winter storms and high tides wash plant material from the marshes. At this time of year the productivity of the marine environment is generally diminished due to low sunlight levels, and the consequently reduced production of plankton. The material from the tidal marshes is therefore likely to be an important food source when it is available.

Tidal marshes have historically been viewed with less regard to their importance as a natural resources and more to their value as real estate. In areas such as Southeast Alaska, with many miles of steep rugged shoreline, tidal marshes look attractive as potential low bank waterfront land. The resultant filling destroys the tidal marsh as a functioning part of the marine environment and eliminates its value to wildlife. More recently, realization of the value of the tidal marsh is leading to laws and policies protecting these wetland habitats.

Fishery Resources

Since the founding of the Community, fishing has been its life-blood, and its rhythms pulse, day-to-day and year-to-year with the surges of activity in the fisheries. After a sleepy winter, the town awakens in the spring to the scraping, painting, tinkering of pre-season boat maintenance. Fishing boats are bought and sold, permits change hands, and new boats arrive from down south. The cold storage plant begins to stir, and soon its refrigeration units whirl into action.

The net fishermen start the year with herring fishing, while the trollers set out in pursuit of the returning king salmon. Halibut fishing opens in May, occupying many fishermen until the larger runs of sockeye, pink and chum salmon return. The fish traps are installed, and open in July. Then the cannery and cold storage are at the peak of their activity, and each delivery to the packing company dock infuses new life into the already bustling enterprises.

Later in the summer, and into the early fall, after the local salmon runs have entered the streams, the fishermen move north, following new runs up as far as Lynn Canal. The cannery slows down, and prepares to close for the winter. As the storms pick up, some boats head south, a few are pulled out of the water, but most remain tied up for the winter in the quiet boat basin. Only a few fishermen, perhaps the most industrious, fish red snapper through the winter, until the fishing fleet once again awakens in the spring.

In many ways, this pattern recurs in towns all over the region. The characteristic that most sets the reserve apart from the rest of Southeast Alaska is the exclusive fishery zone. Extending 3000 feet offshore, this zone may be fished by Community members only. The fishery within this zone is managed by the Bureau of Indian Affairs, acting on resolutions from the Community's Council (although the State acts in an advisory capacity, as described in Chapter 8). Within the reserve the Community can request fishery openings and closings, can license fishermen, and can enhance its fishery resource.

The remainder of this chapter discusses the fishery resources of the Annette Islands Reserve, and analyzes the uses of those resources. Issues and conflicts are raised here, and then addressed with specific policies and actions in Chapter 9.

SALMON

The salmon fishery remains important to the people of Metlakatla today, as it was to their ancestors for centuries. The Annette Islands Reserve is ideally situated for the Community to take advantage of the salmon resources. While many of the streams on the island are salmon producers (see Chapter 6), this resource is supplemented by the salmon runs which use Clarence Strait and Nichols Passage as a migratory route and pass within the Community's fishing reserve. In spite of years of management efforts by State and federal agencies, quantitative data on the salmon resource and its use is mostly limited to the past few years; nevertheless, there are several characteristics of the reserve's salmon fishery which are important considerations in developing management policies.

The Community's 3000 foot fishing reserve gives it two opportunities which are not available outside the reserve. First, Community members without Alaska Limited Entry Permits can receive a permit to fish salmon within the waters of the reserve. Second, the Community retains the right to use fish traps, which are not permitted in State waters. Both these opportunities allow more Community members to be involved in fishing and fish processing. A 1977 estimate counted 114 persons or over one-quarter of the labor force in the reserve as employed in these pursuits.

Since 1975 the expanding fleet has included an increasing number of gillnet fishermen who can buy a boat, but cannot afford an Alaska Limited Entry Permit, and must confine their fishing to the waters within 3000 feet of the islands. This additional fishing effort is probably not significant on the west side of the island, along the major migration routes. It may, however, impact the local runs using streams on the east side of the islands, where the seiners and gillnetters fish when the traps are open on the west side. Unfortunately, there is not enough escapement data for local streams to determine whether or not there is a significant impact on local runs.

Extent of the Resource

Although there is little data documenting the extent of the reserve's salmon resource, the catch per unit of effort can be taken as an indicator of the relative increases and decreases in the stocks. Probably the most reliable data comes from the Annette Island Packing Company's trap catch tabulations. Table 5-2 below, presenting the catch per trap per day shows a gradual increase in the catch per unit effort during that 14-year period.

Table 5-2 AVERAGE CATCH PER TRAP PER DAY (in number of fish)			
Lower Pink Returns Odd years		Higher Pink Returns Even years	
	Fish		Fish
1963	1,078	1964	2,721
1965	897	1966	4,599
1967	448	1968	1,877
1969	965	1970	734
1971	(no traps)	1972	3,182
1973	1,356	1974	2,019
1975	4,605	1976	5,467
1977	2,999		

Although this data is not conclusive, it suggests a general improvement in the condition of the stocks during this period. (A good deal of caution is needed in interpreting this data. In 1977, for instance there was a good return of pink salmon but due to an exceptionally dry summer most of the pinks migrated offshore and thereby avoided the traps.)

Allocation Among Gear Types

It is typical in Southeast Alaska, the fishing fleet around Annette Island includes trollers, seiners and gillnetters (although the gillnetters were not permitted until this decade.) The amount of the catch taken by each gear type is an issue of concern to some fishermen who believe they are competing for fish not only among each other, but also with the Community's fish traps. The Table 5-3 compares the proportion of the catch taken by each gear type in the reserve with that in all of Southeast Alaska.

Table 5-3

SALMON CATCH DISTRIBUTION AMONG GEAR TYPES
Percent of Total Catch, by Weight

Gear	SE Alaska ¹	Annette ²
Trap	6.5	27.6
Seine	50.1	45.6
Gillnet	18.6	19.0
Troll	<u>24.8</u>	<u>7.8</u>
TOTAL	100.0	100.0

Sources: 1. Alaska Department of Fish and Game
2. Annette Natural Resource Center (includes fish caught outside the reserve but landed at Metlakatla).

The table shows that, both in and out of reserve waters, purse seiners take the largest share of the fish, although they get a somewhat higher proportion in State waters. Gillnetters receive a nearly equal share in both jurisdictions. Trollers, however, account for much smaller percentage on the reserve than they do in all of southeastern. (Probably due to the relative ease of entering the handtroll fishery in State waters). On the reserve, the remainder, over one-fourth of the landings come from the traps.

Salmon Fishery Management

To a large extent the salmon fishery on the reserve is managed to conform with the State-managed fishery outside. Fishery openings for gillnetting and seining coincide with the State's openings; even the trap openings were set to coincide with State openings until a few years ago. (Now the Community negotiates with the BIA for specific trap opening days).

On the west side of Annette Island, consistency with State openings may be appropriate, since many of the fish caught there originate off-island. On the east side, however, openings might be according to the timing of the returns of local salmon runs. If sufficient data were available on timing and levels of escapement, the Community could manage terminal fisheries near mouths of selected streams, allowing for adequate escapement and subsistence fishing.

Probably the most pressing need in management of this resource is for data. Spawning escapement data is required on an annual basis for the island's larger streams. The Annette hatchery staff has been collecting escapement data from the island's two most productive streams. These efforts must be continued and expanded if the Community is to have good perspective on its locally produced salmon resource. Fish tagging or other analyses would also help provide data on the origins on the Annette Island catch and help determine to what extent the Community would benefit from more intensive fishery management or enhancement efforts.

Economic Aspects

Even though other activities have now become important, salmon fishing is still an important component of community income. On an annual average, fishing and fish processing employs about one-fifth of the community's labor force. On a seasonal basis, however, fishing employment varies from a low of 28 in winter to a high of 280 in summer (Pacific Rim Planners, Inc., 1977).

This seasonality creates a significant economic issue. Since activity is concentrated into a few short months during the year, workers must usually be imported to work in fishing and fish processing during peak periods. Weather and biology of salmon probably would limit the community's ability to spread out the season, but reserve openings could be timed to better even out flows at the AIPC plant. In addition, hatchery releases of salmon fry could be timed to return at off-peak periods.

HERRING

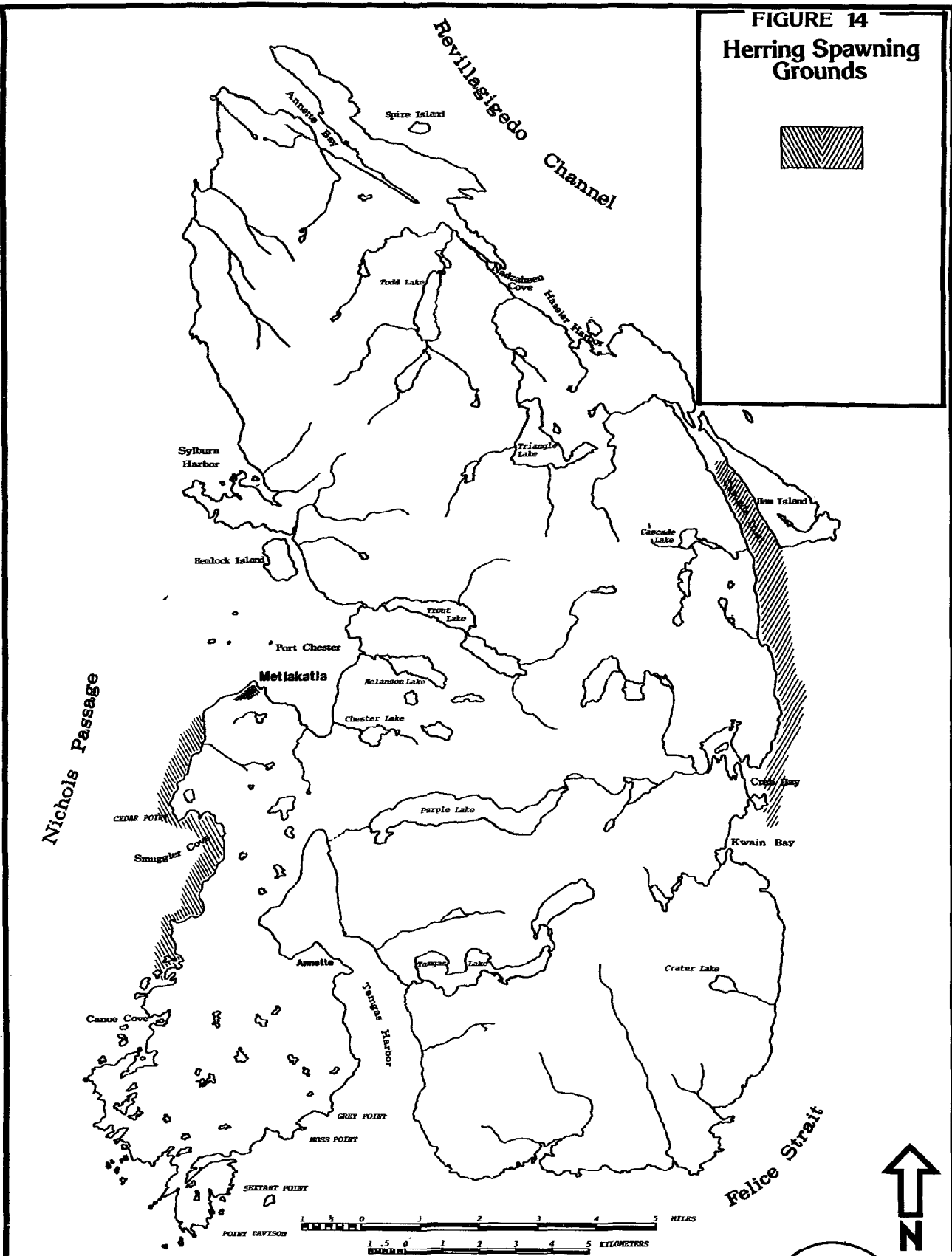
Pacific herring spawn along the shores of Annette Island in the spring. The herring have historically been fished for food and for their oil, but more recently have been harvested for bait and for the roe which is shipped to Japanese markets. The uncertain herring population dynamics and behavior, coupled with heavy fishing pressure in recent years, have led to wildly fluctuating population levels, and consequently to an unstable fishery.

The usual spawning grounds for herring are located on the east side of the island from Cascade Inlet south to Crab Bay, and on the west side from an area north of Cedar Point to south of Smuggler Cove (Figure 14). The herring typically spawn on eelgrass, kelp, rockweed and other marine vegetation, although occasionally they use rocks or shells as substrate as well (PRPI, 1978). In some areas, herring population is limited by the extent of spawning substrate, but on Annette Island, where the spawn is of light to medium intensity and most of the vegetation is not used, the herring populations apparently have other limitations.

Their position near the low end of marine food chains, in which they feed largely upon plankton and other small organisms, makes herring particularly vulnerable to environmental changes (Hart, 1973; Reid, 1972; Taylor, 1964). Factors such as changes in sunlight levels, water temperature, or nutrient content of the water can cause changes in the plant plankton's primary productivity. These changes can be reflected rapidly in herring populations. Predation by birds and larger fish is also an important limiting factor, particularly for juvenile herring.

The pressure of commercial fishing cannot be ignored, however. The herring stocks have been fished for bait in the winter and for roe in the spring around Annette Island alone. In addition, it appears that these fish are part of the stock which is fished for bait in a state-managed fishery in George Inlet, Carroll Inlet, and Tongass Narrows, on Revillagigedo Island. Since 1973, when roe fishing began, the bait fishery in those inlets has taken an average of 29.2% of this assessed stock per year, while the roe fishery has averaged 2.3% of the assessed stock. Thus, nearly a third of the herring population has been fished out per year, on average. (Rules-of-thumb for harvest quotas range from 10% to 20%). This intense fishing pressure adds to an unstable, but probably fairly high, natural mortality and has led to a serious decline in herring populations levels, as shown in Figure 15.

FIGURE 14
Herring Spawning Grounds



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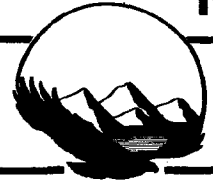
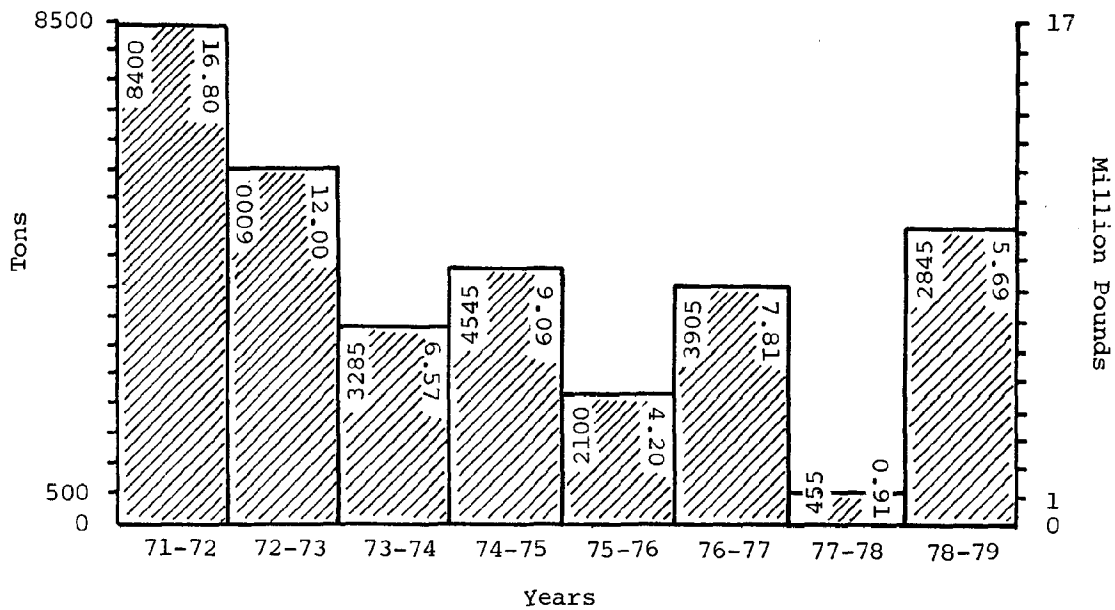


Figure 15
Hydroacoustic Estimates of Herring Populations
 (Tongass Narrows, George Inlet, Carroll Inlet, Cascade Inlet)



Source: ADF&G Technical Data Report #38

Since the roe fishing was initiated in the Ketchikan area in 1973, and around Annette Island in 1976, the herring populations have declined to seriously low levels. Hydroacoustic estimates by the Alaska Department of Fish and Game (Blankenbeckler, 1978) show a drop from 8500 tons in the 1971-72 season to 455 tons in the 1977-78 season. (Figure 15) The decline in spawning stock was most noticeable in 1978, when a drastically reduced spawning, changes in spawning grounds, and unusual timing and location of spawning led to a disappointingly low catch level -- less than 10% of the planned quota stock.

The herring fishery gained considerable attention in 1979 as the price of roe herring climbed to \$2000 a ton and higher. In light of the high value of roe herring and the depleted condition of the stocks, a rearrangement of priorities in allocating catches between bait and roe fisheries would certainly be desirable for the Community's fishermen and cold storage operation.

If the herring fishery is to be sustained its future management will also have to allow more spawning escapement. Because this resource is managed by both the Community and the State, the future of the herring fishery will depend on whether the Community and ADF&G can reach an agreement on cooperative herring management policies.

SHELLFISH

Annette Island 105 miles of diverse shoreline habitat supports several species of shellfish which, given the proper economic and legal climates, could probably support a commercial shellfish industry. The shellfish resource is discussed here briefly; more detailed information is available in the report, Annette Island Shellfish Feasibility Study (PRPI, 1978b).

The species which appear most promising are the hardshell clams (littlenecks and butter clams), horse clams and geoducks. These species inhabit mixed-coarse and mixed-fine sediment, which comprises some 39% of the island's shoreline intertidally, and about 50% of the shoreline subtidally. An estimated 2234 acres of intertidal and subtidal land could support clams, of which at least 385 acres would be likely to be harvestable. The extent and distribution of this habitat is shown in Table 9 and Figures 10 and 11.

Table 5-4 Extent of Shellfish Beds By General Substrate Type (Area in Acres)		
Type	Subtidal (To 30 Feet Below MLLW)	Intertidal
Mixed Coarse	1697	152
Mixed Fine	291	94
Source: PRPI, 1978a.		

The extent of the shellfish populations has not been measured. If the subtidal beds have clam densities approaching some of the commonly dug recreational beaches, however, the resource would certainly be extensive enough to support a commercial clam fishery. Since a hydraulic escalator clam harvester can operate in a well-populated shallow subtidal tract of 40 acres without exhausting the supply, depletion of the clam resource would be unlikely with just a few harvesters.

The main obstacle to the establishment of a commercial clam fishery are not biological but legal and economic. Shellfish sold in interstate commerce must be certified under a joint Federal-State program, the National Shellfish Sanitation Program. In Southeast Alaska, several incidents of paralytic shellfish poisoning (PSP) have led to the adoption of strict guidelines for certification of shellfish beds. The guidelines require 18 months of monitoring of shellfish beds for PSP, and call for frequent patrol of the beaches by State inspectors. As a result, there is no commercial clam fishery in Southeast Alaska. The frequency of personal-use clam harvesting without ill effects suggests that the guidelines applied to commercial clam harvesting might be excessively strict.

A different approach has been proposed, designed to allow a commercial harvest yet still protect the public health. This approach, being implemented experimentally with Bering Sea surf clams, involves batch harvesting, with each batch of clams being labeled with its point of origin and time of harvest, and then held in cold storage for testing and later release to market. The adoption

by the State DNR of this approach, if the island's clams are safe, would remove a major roadblock from the development of a commercial clam fishery.

The other obstacle is economic. Harvesting and processing equipment is costly (see PRPI, 1978b for costs). Whether established by an individual or by the Community, a shellfish enterprise would require a capital outlay ranging from \$25,000 (for small portable harvester) to over half a million dollars (for full-scale processing plant). The prices the fishermen or processor would receive for the product do not appear as attractive as they do for salmon, but increased demand from East Coast and Japanese markets is gradually raising the price. In addition, the capabilities of year-round harvesting, the promise of additional employment, and the diversification of the Community's economic base all point toward shellfish as a resource worth developing.

BOTTOMFISH

The variable fortunes of the salmon fishery have recently led many in the commercial fishing industry to redirect their attention to bottomfish. Fishery managers hope that Southeast Alaska's fishery can be revitalized with an infusion of bottomfish to diversify the fishing effort and relieve the intense pressure on the salmon stocks. Seafood companies see bottomfish as a means to extend the now seasonal operation of their processing plants. Many fishermen, too, look to bottomfish as a resource to tap during the off-season. For those without limited entry permits, it might be a means to enter the commercial fishery.

Bottomfish include many otherwise unrelated species which inhabit waters near the sea bottom. Among the families represented are the flatfish (flounder, sole, and halibut), the cod (Pacific cod, tomcod, pollock, hake and blackcod, and the scorpionfish (rockfish, red snapper, and Pacific ocean perch). These species vary greatly in their life histories, their habitat requirements, and their commercial value. Their classification as bottomfish reflects only their bottom-dwelling habits and, more recently, the fact that they are not members of the heavily exploited salmon family.

Although they are currently being publicized as a new resource, bottomfish have been exploited commercially in the Gulf of Alaska for over 50 years. In the 1920's longlining for halibut began in the Gulf, and other species were taken only as incidentals in this and the shrimp trawl fishery. When the factory ships of Japan, Korea, the U.S.S.R. and Poland entered the fishery in the 1960's all the groundfish species except halibut were still in relatively abundant, virgin states.

Since that time it has become apparent that bottomfish cannot be regarded as an unlimited resource, but must be carefully managed. The three species which have been fished extensively--halibut, blackcod and Pacific ocean perch--have undergone serious population declines. Many of the other species remain in an essentially virgin state, but their condition may be more an indicator of their relatively low market value (and hence lack of incentive to commercially harvest) than of careful management. The groundfish resource clearly presents limitations as well as opportunities.

Conflicts between different fisheries have also arisen. Large trawlers interfere with longline gear and preempt fishing grounds for halibut fishing. In addition, shrimp boats and trawlers pursuing relatively low-value fish, such as

blackcod, sometimes take a significant number of high-value fish such as chinook salmon. Other fisheries conflict when species with similar habits and habitats such as halibut and flounder are taken in incidental catches. Future development of the groundfish fishery will certainly have to resolve these conflicts.

The new interest in bottomfish coincides with the establishment of the 200-mile Fishery Conservation Zone (FCZ) and the development of a Fishery Management Council (NPFMC). In addition, the Southeast Alaska bottomfish fishery operates under the management of the Alaska Department of Fish and Game, the International Pacific Halibut Commission, and the National Marine Fisheries Service. It therefore appears that any new intensive exploitation of the bottomfish resource will proceed under a number of watchful eyes.

The NPFMC has taken a number of actions to take advantage of the opportunities of the groundfish fishery while resolving some of its limitations. Fishery regulations have been established by the NPFMC to ease conflicts between users of mobile fishing gear and those of stationary gear. Additional measures apply specifically to foreign pre-emption of domestic fishing grounds. Other restrictions are area closures and incidental catch limitations. Those of special regional importance include the closure of the area east of 140° W. (Yakutat) to foreign incidental catch of halibut, shrimp, and herring. Once a foreign nation exceeds allocation of any species within a statistical area (including Southeast), that the area is closed to all fishermen of that nation for the remainder of the year. Responsibility is thus placed on foreign fishermen to develop fishing gear that is more selective of species taken.

Limited entry to domestic fishermen is being considered within State waters. A concentration of domestic fishing effort within these boundaries, due to foreign fishing offshore has led to concern over stock depletion there. Further study of the effects of domestic fishing is needed to determine the compatibility of the State regulations with those established by the NPFMC within the conservation zone.

With at least four agencies managing the bottomfish fishery, outside the reserve, and no major known concentrations of bottomfish in the reserve, it would be either redundant or conflicting for this coastal management program to develop bottomfish management policies. The Community can, however, adopt policies to take advantage of the resource, and use it to expand and diversify the local economy. Since Metlakatla already has a large, well-equipped cold storage facility, and since nearly 99 percent of the bottomfish is processed into the fresh-frozen form, it would be logical for Metlakatla to attempt to attract more of the expanding domestic groundfish fleet to use its cold storage plant as a home port. Such a venture, initiated in Petersburg in 1976, now processes pollock in the winter and flounder in the spring.

CHAPTER 6 LAND RESOURCES AND HABITATS

The Metlakatla Indian Community has a wide spectrum of resources to manage on Annette Island. Some, such as timber, produce a direct financial return to the Community. Others, such as wildlife, support hunting and trapping for individual Community members. Still others, such as soil, are not directly harvested, but are essential to the production of harvestable resources. Managing any one of these resources effectively requires that all be given consideration. Harvesting timber or extracting minerals without regard for the effects on other resources can jeopardize the future productivity of the affected resources. This chapter discusses the resources of the uplands, their interactions with each other, and their implications for future management.

Geology and Mineral Resources

The development of the resources of Annette Island, as well as the patterns of human settlement, are strongly influenced by its geology. Events of hundreds of millions of years ago formed the foundation of Annette Island, but some geologic processes continue today and must be regarded in plans for resource use.

Under its thin blanket of vegetation and soil, Annette Island is composed of bedrock formations ranging in age from 62 million to 350 or more million years old (Berg, 1972). Most of the mountains of the island were formed as molten lava solidified slowly underground as igneous intrusive rock. These intrusive rocks are common throughout the Coast Range and some of the islands of Southeast Alaska. In time, they were slowly, gradually lifted up above sea level in large blocks.

During the last two million years, most of North America underwent several advances and retreats of continental glaciers. In addition to continental glaciation, Southeast Alaska was also subjected to alpine glaciation originating in the mountains. At its maximum extent, the glacial ice was over a mile thick on Annette Island. The glaciers moved slowly and imperceptibly, breaking off and carrying along rocks in their path, using them to carve the

valleys, lakes, inlets and coves characteristic of Southeast Alaska. Annette Island's high ridges, long, narrow, mountain lakes, U-shaped valleys and rugged shoreline are products of glaciers' erosive sculpture. When they retreated, about 10,000 years ago, the glaciers left behind the remnants of the rock they had collected during their advance. These can be seen as the boulders along the shoreline. Many scars gouged out by the glaciers are visible today on the rock slopes of Leadville Mountain and Purple Mountain, above the town of Metlakatla.

The Metlakatla Peninsula, however, is formed of a different type of rock. Subjected to pressure from overlying rocks some 200 to 300 million years ago, this rock structure was changed, and became the partially metamorphosed rock visible today in outcroppings along the shoreline but underlying most of the peninsula. This metamorphosed rock is characterized by foliation, or distinct planes of rock which make it less strong than the massive intrusive rocks of the mountains.

Because the peninsula is composed of less resistant rock than the remainder of the island, and this softer rock is cut by horizontal thrust faults, it was more eroded by the advancing glaciers than were the mountains. Instead of carving the metamorphosed rock, the glaciers sheared it off flat, much like a gigantic snowplow passing across the peninsula. Thus, while the rest of the island exhibits dramatic topography, the Metlakatla Peninsula is relatively smooth, with its low, rolling hills seldom exceeding 100 feet above sea level.

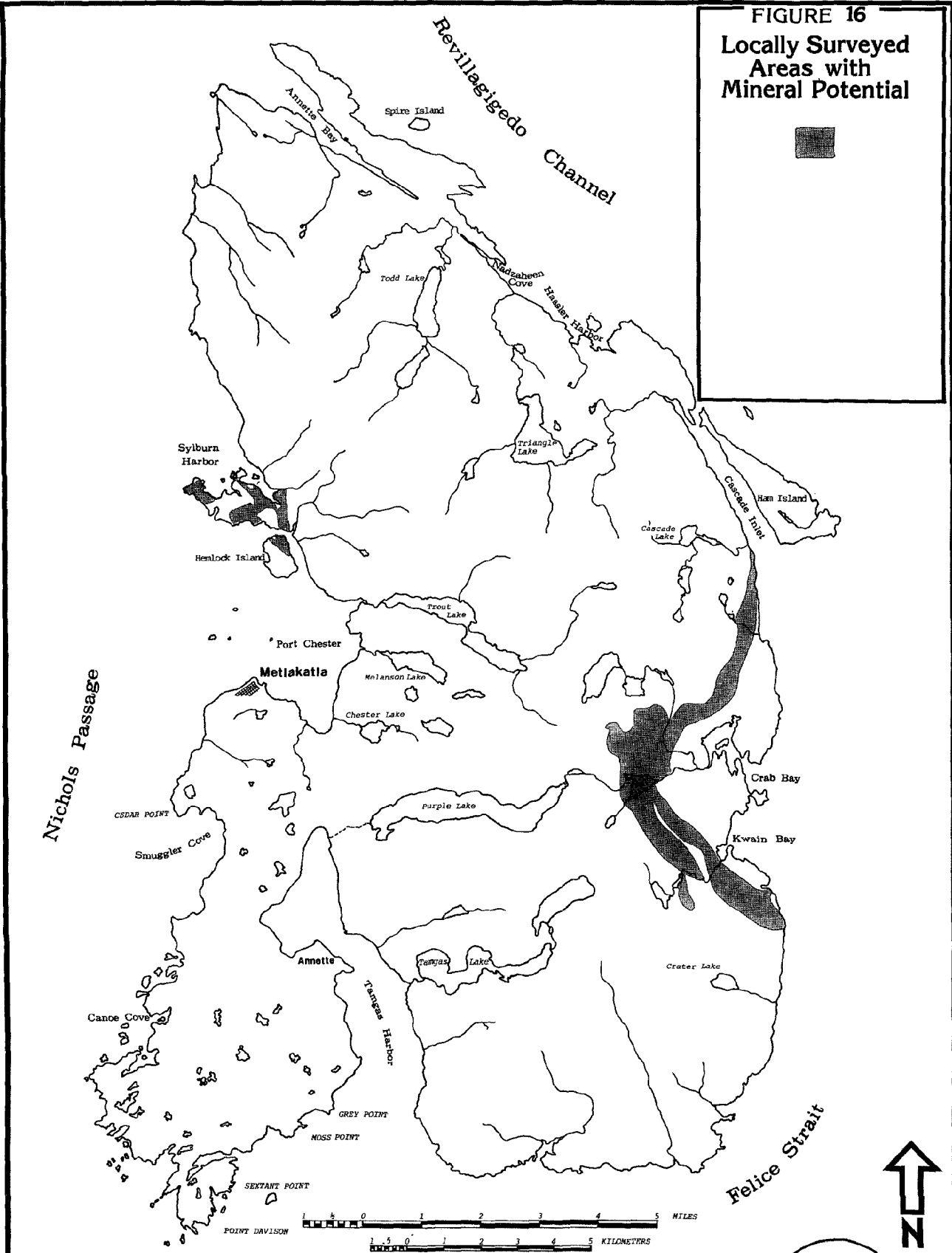
The one exception to the flat topography of the peninsula is Yellow Hill, a formation of dense, tough dunite rock. The strength of the dunite that allowed it to resist glacial erosion now makes it valuable as a road building material, and it is quarried several miles south of Metlakatla.

Just inland from the shoreline, the Metlakatla Peninsula is rimmed with deposits of gravel and sand, of up to 1,000 feet in width. These deposits are described by Marcher (1971b) as ancient beaches whose sediments had been reworked by waves, tidal currents and glaciers before the beaches themselves rose above sea level. This uplift, which appears to be widespread throughout Southeast Alaska, can happen rapidly, as in an earthquake, but usually the land rises slowly and imperceptibly, in an uplifting process that is believed to continue today.

These raised beach deposits, because they are composed of sand and gravel, are much more structurally sound than the thick organic peat deposits overlying the bedrock elsewhere on the peninsula, and the early construction in Metlakatla was sited on these raised beach deposits. Now that the town is expanding out over the muskeg, the raised beach deposits are extracted in a gravel pit to be used as fill and aggregate material in construction projects.

The raised beach deposits, which have been measured at up to 33 feet in thickness, have been proposed by Marcher (1971b) as a potential source of groundwater. While the igneous and metamorphic rock underlying most of the island is impermeable and a poor source of groundwater, the permeability of the raised beach deposits and the high rainfall on Annette Island make these deposits a likely source of groundwater. Their proximity to the surface, however, makes them vulnerable to contamination from landfills and sewage, and their development as a water supply would require adequate sanitary precautions.

FIGURE 16
Locally Surveyed
Areas with
Mineral Potential



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An aspect of Annette Island's geology that may prove important as a resource in the future is the mineral deposits recently located in geologic investigations of the island (Figure 16). Commercially valuable deposits of the mineral barite have been found on the Sylburn Peninsula, north across Port Chester from Metlakatla. In the area of Crab Bay, on the east shore of the island, lead and zinc deposits have been found in the limestone and rhyolite bedrock near Sink Lake and Cave Creek, the main tributary of Crab Bay. Gold also appears here in several small veins. The relatively small size and widely spaced distribution of most of these veins may make mining unfeasible, but further exploration will be required before the value of these deposits can be assessed.

Soils

Besides serving as an underlying foundation for any construction on the island, the soil is important in dictating the potential productivity of the upland ecosystems. The soil supports green plants in capturing the sun's radiant energy and converting it to the organic material that is the foundation of the upland ecosystems.

Annette Island's soils are an outgrowth of its geology, climate and vegetation. Together, these three factors have created soils that, although not identical throughout the island, have many characteristics in common. These characteristics affect the soil's ability to support structures, to grow timber, and to withstand disturbance by excavation or other operations.

Because of the climate, the soils are nearly always cold and wet. The coldness slows the decomposition of organic material to the point at which it accumulates faster than it can be decomposed. Thus, the soil has a relatively thick surface organic layer, but is poor in inorganic nutrients and minerals.

In spite of the relatively thick organic layer, the total thickness of the soil is less than it is in more moderate climates. In many areas, the soil is so thin that outcrops of bedrock are exposed at the surface. In other places, the steep terrain and the weak structure of the soil have caused slides, with large masses of soil moving downhill and exposing bedrock or glacial subsoil.

Only small areas of the island have had soils analyzed and mapped in detail. More detailed information has been collected on nearby Prince of Wales Island for the U.S. Forest Service by Gass, et. al. (1967). Much of that information applies to Annette Island as well. The soils will be discussed here under the general headings of forested soils and muskeg soils.

FORESTED SOILS

The more well-drained of the soils on the island allow the growth of coniferous forest. From the standpoint of geologic time, these soils and their landforms are very youthful. The glaciers which covered the island only 15,000 years ago left only bare bedrock in their wake. Even today much of the mountainous terrain on Annette Island is bare rock, or very shallow, poorly developed soil. In the years that followed glacial retreat, the cold, wet climate,

and limited activity of soil bacteria slowed the soil development. Only the shallow upper layers of soil have sufficient nutrient content to support any substantial growth of timber. If these layers are lost through such natural processes as landslides, or through man-caused earth moving or excavation, the disturbed site does not immediately regenerate a coniferous forest, but instead reverts to early successional species such as horsetails and alder, which can subsist on low nutrient levels.

The youthfulness of soils is accented by the landforms. The steep topography coupled with the ever-present moisture, make the soils unstable, and can lead to landslides of other mass soil movements as the soil and underlying bedrock settle into a "more comfortable" position. Swanston (1974) noted that logging and road building are important causes of soil movements in mountainous areas with high rainfall.

Although the weak structure can cause mass slides, erosion of the surface soil is not usually a problem on undisturbed soils. The lush growth of vegetation has, over the years, built up an organic mat in the top layer of the soil. This organic material absorbs rain, protecting the soil from surface erosion during the rainy season, and reducing surface runoff to a minimum.

The upper layers of the soil have a rapid permeability to water, and because of the climate they are perpetually moist. The heavy rainfall leaches nutrients out of the soil, and the cold climate slows down the activity of soil microorganisms which would otherwise add nutrients to the soil. Thus, since the soil is poor in inorganic nutrients, the vegetation and the decomposing twigs, leaves, etc., which incorporate the nutrients in organic form, are important as a nutrient reservoir, storing nitrogen, phosphorus and other nutrients critical to the functioning of the forest ecosystem. The nutrients cannot be used, however, until bacteria break them down further, a slow process in Southeast Alaska.

In an undisturbed condition, then, the forested soils of Annette Island play an important role in the growth, however slow, of timber and other vegetation. Maintaining that undisturbed condition of the soil, however, is critical to continued productivity of the forest. Harvesting the timber without destroying the productivity of the soils is difficult, particularly on steep slopes, and may require foregoing the opportunity to log otherwise attractive timber in order to retain the integrity of the soil and watershed.





MUSKEG SOILS

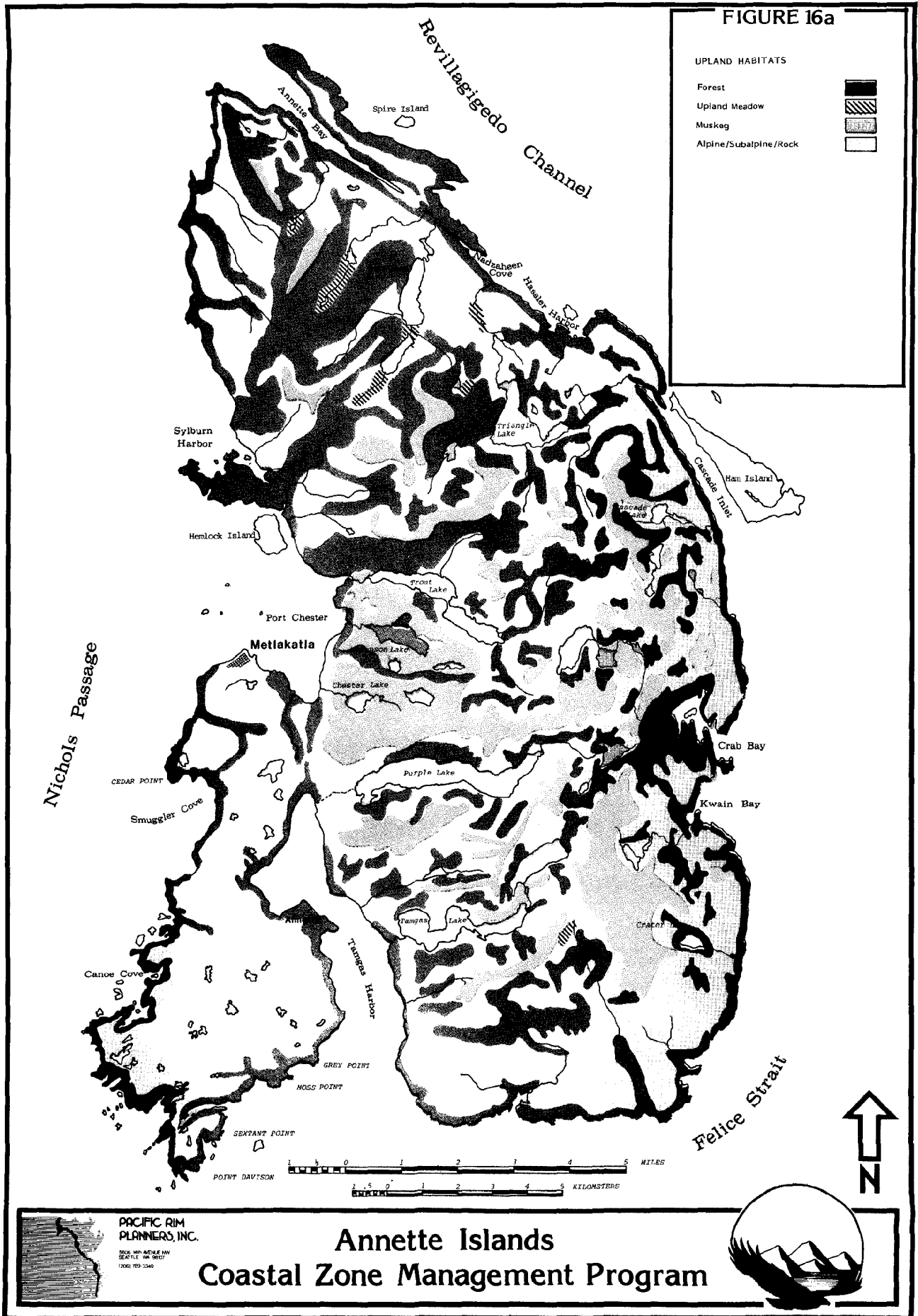
Muskeg soils cover most of the Metlakatla Peninsula and are present in large areas elsewhere on the island where the drainage is perched or the terrain is insufficient gradient for drainage. Although formed on top of igneous and metamorphic rock, the muskeg soils have developed thick layers of fibrous organic peat with poor structural characteristics. The impermeable rock underneath limits drainage, further reducing these soils' suitability for development and retarding the growth of timber.

Muskeg soils range from thick deposits of sedge or sphagnum peat (up to 50 feet in depth) to relatively shallow layers (3 to 5 feet) overlying the bedrock. The shallower muskeg soils can be recognized by the presence of shrubs

FIGURE 16a

UPLAND HABITATS

- Forest 
- Upland Meadow 
- Muskeg 
- Alpine/Subalpine/Rock 



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FIGURE 16b

WILDLIFE HABITAT USE

Terrestrial

Sitka Black-tailed Deer

Winter Range

Summer Range



Timber Wolf

Denning Sites

Beaver

Active Dams



Bird

Vancouver Canada Goose

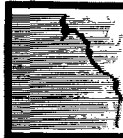
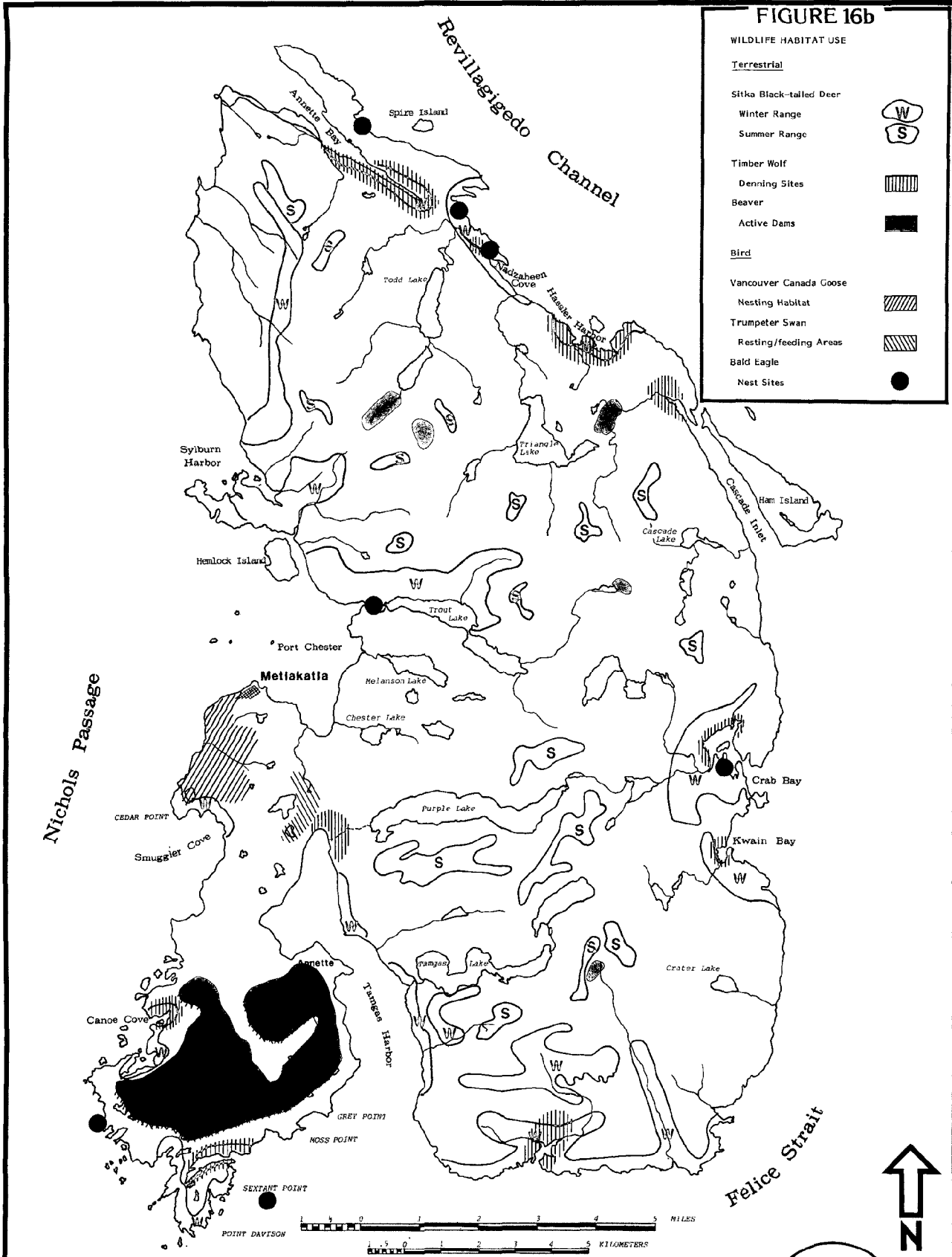
Nesting Habitat

Trumpeter Swan

Resting/feeding Areas

Bald Eagle

Nest Sites



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and some trees, as opposed to the sedges and sphagnum moss which dominate the landscape in the deeper muskeg soils. While the deeper muskeg soils are unsuitable for development of any kind, the shallower peat soils can be used as sites for a limited amount of construction if sufficient structural fill material is placed on top. They can be used for roads, for instance, but are extremely expensive (and sometimes hazardous) to prepare for buildings.

The recent development of a synthetic support fabric may facilitate road construction on muskeg soils. This fabric, when unrolled on the soil and covered with aggregate, greatly increases the soil's ability to support weight, and minimizes the amount of aggregate required.

Upland Habitats

Just as the island's geology and climate control the development of the soils, the soils affect the development of communities of vegetation and wildlife. Although detailed examination reveals many discrete communities, the level of detail needed for resource management allows the classification of several major habitat types. In the uplands, these habitats include forests, muskegs, alpine meadows and exposed rock. Each of these has characteristic soils, vegetation and wildlife. Each presents opportunities and limitations for resource use. The habitats will be discussed here briefly in terms of their vegetation and wildlife.

MUSKEGS

The high water table on Annette Island, caused by the impermeable bedrock combined with high levels of precipitation and impeded drainage, has led to the formation of large areas of muskeg. Although there are several communities of muskeg, it can be generally defined as an open habitat, vegetated by sedges, mosses, herbs, and shrubs, and scattered clumps of trees, growing in poorly-drained soil that is wet during most of the year.

Muskegs are present in large areas in much of the island, and dominate vast areas of the landscape on the low, flat Metlakatla Peninsula. Even areas which are largely forested contain pockets of poorly drained soil which have developed into muskegs. The sedge muskeg is vegetated exclusively by sedges, with a water table near, and sometimes above, the surface. Sphagnum muskeg is dominated by sphagnum moss, with shrubs including crowberry, Labrador tea, bog rosemary and swamp laurel, and a scattering of stunted trees including mountain hemlock, Alaska cedar and shore pine. Transitional muskeg retains both the sedges and sphagnum moss in dominance with shrubs similar to those of sphagnum muskeg, and a somewhat greater coverage of stunted trees. The demarcation between forest and transitional muskeg is not well defined, but is related to minor changes in the soil's drainage characteristics.

Muskeg Wildlife

The fairly open terrain and limited cover of the muskeg restricts its value as habitat for big game, the one exception being the Sitka black-tailed deer, which enters the open environment to graze on the sedges and shrubs. Muskeg does harbor mammals that are small enough to find cover in the low-growing vegetation. The long-tailed meadow mouse finds suitable burrowing

habitat among the herbaceous vegetation and low shrubs, where they eat succulent plants. The dusky shrew feeds on insects in the muskeg. In the summer, minks use the muskeg as one area in which to feed on aquatic animals and possibly on the mice.

Besides the mammals, birds are also limited in muskeg by the shortage of cover. Only a few species reside here throughout the year: the greater yellowlegs, northern shrike, Oregon junco, Lincoln's sparrow, pine siskin and pine grosbeak, the latter two probably attracted by the seeds of the stunted pines and other coniferous trees. Sparrow hawks have been seen on the island, and probably feed on mice in the muskeg. Ravens and crows are also common in the muskeg. Canada geese and trumpeter swans utilize the small shallow muskeg lakes during their migrations; both species feed heavily on the sedges and other aquatic vegetation, and the geese nest in the sedges as well. Blue grouse also use this habitat.

Because muskeg soils have poor drainage and structural characteristics, they impose severe limitations on human uses in these areas. The poor drainage also inhibits the growth of trees, and makes the muskeg of little value as timber-growing land.

Possible uses of muskeg land which might be explored on an experimental basis include grazing of ungulates (e.g., goats or Scottish highlander cattle), and ditching, draining, and planting for agriculture.

ALPINE MEADOWS

In the areas above 1500 feet in elevation, tree growth is stunted by the cold climate and poorly-developed soils. At even higher elevations the vegetation is limited to low shrubs, such as the heathers and blueberry, club mosses, and herbaceous species such as Nootka lupine, deer cabbage, sedges and grasses.

As with the underlying bedrock, the alpine soils are poorly-drained. The slowly decomposing vegetation gradually accumulates into peat. In this habitat, the cold temperatures slow the decomposition of vegetation, and result in thin, poorly developed soil. The soil structure, drainage and steep slopes all combine to make alpine meadows unsuitable sites for construction of buildings or roads.

Alpine Wildlife

While the low alpine plants provide cover for only the smaller mammals, the herbaceous vegetation and shrubs produce food for deer in the summer. Wolves also use the alpine habitat occasionally. Although mountain goats are not native to Annette Island, they have been successfully introduced into the alpine habitat on Baranof Island. Such an introduction might be successful on Annette Island if additional big game is desired.

In the winter, birds using the alpine meadows are limited to the rock ptarmigan. During warmer weather, the ptarmigan is joined in this habitat by the rufous hummingbird, raven, robin and golden-crowned sparrow.

The forest just below the alpine meadows is an especially critical habitat for wildlife using the meadows. The two major elements of any wildlife habitat are food and cover. While the alpine meadow is an important source

of food, its low-growing plants are not suitable as cover for any but the smallest animals. While larger animals feed in the open meadow, they retreat into the nearby forests for cover. This forest adjacent to the alpine meadows, while it may be similar to other forests in vegetation, plays a greater role than the others as habitat for wildlife.

EXPOSED ROCK

Like the alpine meadows, the exposed rock habitat is found at high elevations. A view of Annette Island from a distance shows the bare rock to be a dominant feature of the mountains, more so than in most of the islands of Southeast Alaska. Purple Mountain, Bald Ridge and Tangas Mountain all stand out with their vast rock outcroppings.

Closer inspection reveals that these areas are not truly barren, although their vegetative cover is quite limited. Mosses and lichens grow on some of the rock, with heather, mountain hemlock, and occasional herbaceous plants inhabiting cracks in the rock. These areas have no value for timber production.

The sparse vegetation provides little in the way of food or cover for wildlife, although some of the species using alpine meadows also venture onto the bare rock. The steep slopes, lack of soil, cold climate and access problems limit human use of these areas to hiking and climbing.

FORESTS

Extending along the coast from northern California through Southeast Alaska, the coastal moist temperate coniferous forests are among the most impressive in the world. Commonly called rainforests, they are dominated by several coniferous species which reach epic proportions in terms of height, diameter, age, and most importantly, productivity (Franklin and Dyrness, 1973). All along the coast they produce valuable timber, supporting the forest products industry. When properly managed, they also provide habitat for wildlife, protection for watersheds, and recreation for people.

Forest Vegetation

On Annette Island, as elsewhere in southern Southeast Alaska, the dominant tree species are Sitka spruce, western hemlock, and, on wetter sites, western red cedar. Annette Island's forests are typical of the region in their understory species as well. Blueberry, red huckleberry, devil's club and salal are common shrubs, while the ground cover is usually dominated by mosses, grasses, bunchberry dogwood, and skunk cabbage. Mosses, lichens and fungi also grow in profusion on tree trunks, rock outcroppings, and fallen logs. These epiphytes and the accompanying bacteria are important in decomposing the logs and recycling nutrients into the soil for use by new trees.

Forest Wildlife

At lower elevations, the forests provide year-round habitat for red squirrels, deer mice, and red-backed mice, which feed on the seeds of the coniferous trees. Among the insect-eating mammals are the dusky shrew near stream beds and the common shrew in the more well-drained forests along the shoreline and

on steeper slopes. Flying squirrels inhabit the hollows of the old-growth conifers, although their nocturnal habits make them inconspicuous to the observer. Mink utilize the forest near the shoreline in the winter, when they require cover after feeding on the beaches. River otter possibly use the forests near larger streams and estuaries for the same purpose.

Another mammal using the forests is the Sitka black-tailed deer. During the warmer months, deer can utilize most habitats of Annette Island, from the alpine meadows to the beachgrass along the shoreline. In the winter, however, scarce food supplies, especially when accompanied by heavy snowfall, force the deer into elevations below 500 feet. Even at these elevations, the food supply is variable, and shortages of winter browse lead to mortalities which control the deer population (Klein and Olson, 1960). Although open clearcuts and muskegs have plenty of browse plants, they can be buried by winter snow. Young, even-aged forests provide shelter from the snow, but do not produce sufficient browse to maintain deer populations. Mature, old-growth forests, however, provide both an abundance of browse (largely huckleberry and blueberry) and protection from snow, and appear to be critical to deer survival in the winter (Bloom, 1978).

Although deer hunting on Annette Island is quite common, there is no effective management program currently underway. Extensive hunting apparently reduced deer populations in past years, particularly when the Coast Guard was using the island. Since that time the deer population has begun to rebound, but its status in the future will probably be closely linked to the extent of low elevation, old-growth forest available as winter feeding habitat.

Among the game birds using Annette Island's forest as habitat, the blue grouse is most evident. Bald eagles nest in the old-growth conifers near the beaches, with the close proximity to saltwater making this habitat available as a staging ground for the eagle's fishing forays. Other raptors (largely predatory birds) appear to be very limited on Annette Island. These raptors include the redtailed hawk, sparrow hawk, short-eared owl and snowy owl.

Songbirds are most abundant where the forest understory is dense, such as along streambanks. In this habitat, the birds are attracted by the cover, the berries on the shrubs and the insects. Among the most abundant species are the black-capped chickadee, Oregon junco, and winterwren. Summer visitors include the yellow warbler and the orange-crowned warbler. As with the deer-feeding habitat, this old-growth forest, with its partially open canopy and growth of brush, is critical to maintaining the populations of songbirds.

Forest Productivity

Productivity is an important consideration in determining management policies in light of the high cost of timber harvesting and processing in Southeast Alaska. Although the coastal rainforests are among the most productive in the world, the forests of Southeast Alaska are less productive than their counterparts along the Washington, Oregon, or British Columbia coasts.

The climate of the region plays a strong role in limiting the productivity of the forests. The heavy rainfall leaches inorganic nutrients from the soil, leaving organic material (leaves, twigs, etc.) as the main form of nutrients in the forest soil. The cool climate also retards bacterial decomposition of the organic material, slowing the recycling of nutrients into a form usable by the trees.¹ The soil therefore is poor in nutrients and the trees grow more slowly. The cool climate also directly affects tree growth slowing the growth significantly below that in more moderate climates. (Owston and Kozlowski, 1976).

Timber Resources

Like many communities of Southeast Alaska, Metlakatla depends on logging and wood products processing for a large part of its livelihood. The Reserve's natural timber resources are, however, fairly limited. Consequently, much of Metlakatla's future well-being depends on its ability to manage its limited timber stands and maintain and enhance its rather tenuous position in wood products processing.

To aid in understanding the many factors which impinge on Metlakatla's timber and timber-utilizing activities, this section is organized into two subsections. The first describes the Reserve's timber stands, including extent, location, utilization and management considerations. The second subsection describes Metlakatla's wood products processing activities, focusing particularly on significant regional, national or worldwide trends likely to influence Metlakatla's future.

Timber Extent and Location

Like most of the region, Annette Island appears from a distance to have more valuable timber than is actually present. A comparison with the rest of Southeast Alaska, however, shows that the island averages even less timber per acre than does Southeast Alaska.

Of the entire land area on Annette Island, only 24%, or 21,172 acres is classified as commercial forest land. (The remaining 76% includes non-commercial forest, muskeg, lakes and exposed rock.) This figure is substantially less than the 33% of the surrounding Tongass National Forest which is classified as commercial forest land (USFS Landtype-Timber Task Force, 1978).

Of the commercial forest land, however, 8062 acres are unloggable due to steep slopes and access problems. Another 2388 acres could be logged but their low volumes of timber (less than 1.5 million board feet per mile of needed access road) make logging economically infeasible.

¹The slow decomposition of organic material is demonstrated dramatically at a site near Todd Lake that was logged in 1973. Five years later, the chips thrown by the chainsaws remained intact.

An additional 6274 acres has been set aside as "Reserved" to protect critical fish and wildlife habitats and recreation areas. Included among this land are buffer strips along streams, lakes and estuaries, the timber in the Tangas Lake watershed, and small quantities of timber in the Crab Bay and Kwain Bay watersheds.

The remaining 4348 acres (about 5% of the land area of the island) constitute the reserve's inventory of operable commercial forest land. Most of this land lies in the northern half of the island, to the north of Trout Lake. Fairly large blocks of timber remain in the areas of Trout Lake, Triangle Lake, Nubbins Mountain, Bingo Mountain and Driest Point. Over half of the operable forest, or 2190 acres, has already been logged or is involved in the current Trout Lake timber sale. Thus, the Community now has 2150 acres, only 2.5% of the island's area, with operable marketable timber remaining on it.*

Table 6-1, below, compares the extent of forest land of the Annette Islands Reserve with that of the surrounding Tongass National Forest.

Table 6-1
Extent of Forest Land






	Annette Islands Reserve ¹		Tongass National Forest ²	
	acres	(%)	acres	(%)
Commercial Forest Land	21,172	24.4	5,036,753	32.9
Loggable	4,348	5.0	4,079,358 ³	26.7
Loggable, but uneconomic	2,488	2.9	Undetermined ³	
Reserved	6,274	7.2	Undetermined ⁴	
Unloggable	8,062	9.3	956,868	6.3
Non-commercial Forest and non-forest	<u>65,569</u>	<u>75.6</u>	<u>10,283,282</u>	<u>67.1</u>
TOTAL AREA	86,741	100.0	15,284,227	100.0

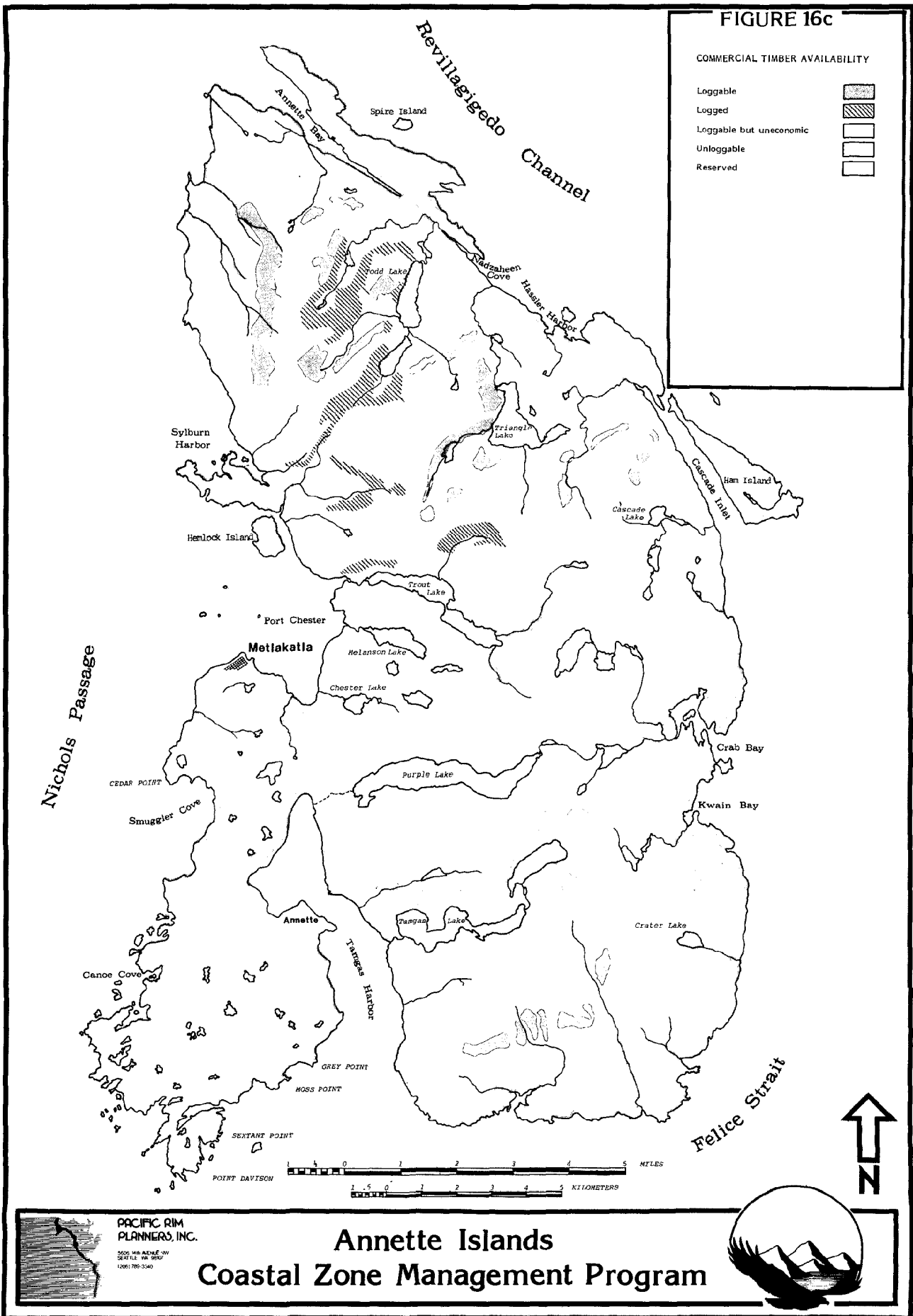
¹From: Annette Island Timber Operating Plan, 1979.
²From: USFS Landtype-Timber Task Force, 1978.
³"Loggable" in national forest, includes areas which require non-standard harvesting methods.
⁴Reserved areas pending decisions on TLMP, RARE II and (d) (2).

* Presently, not enough data are available to calculate estimated volumes for stands of timber. Consequently, quantities presented here are by acre rather than volume.

FIGURE 16c

COMMERCIAL TIMBER AVAILABILITY

- Loggable 
- Logged 
- Loggable but uneconomic 
- Unglodable 
- Reserved 



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Timber Management

Prior to 1966, the only timber harvesting on the island was small-scale, Community-operated cutting. In that year, however, the Community persuaded the BIA to initiate a program of forest management on the island and to allow commercial timber harvesting. The BIA prepared a Timber Operating Plan, required by federal law before timber could be harvested, but the plan was never ratified by the Community Council.

The Operating Plan made some assumptions about timber values and logging costs which are now considered by the Community's Natural Resources Center to be imprudent and unwise. It assumed that almost all acreage with sizeable timber would someday be economical to log, and should be included in the annual cut calculations. This assumption led to determination that the annual cut on Annette Island should be 265 acres. The plan failed to provide sufficient protection for fish and wildlife resources, gave little mention to such timber stand improvement activities as thinning and reforestation, and did not address harvest, production and marketing strategies which would increase Community income and employment.

In 1976, the BIA forester on Annette Island worked with the Annette Natural Resources Center to recompute the annual allowable harvest and rectify some of the original plan's shortcomings. They redefined the commercial forest land into three categories: loggable; unloggable, and reserved. By their methods, the annual cut was computed to be 116 acres. This effort laid the groundwork for the Annette Island Timber Operating Plan (now completed).

The present operating plan was written by the Annette Natural Resources Center staff in 1978 and 1979. It further divided the land base into five categories, adding the classification of "loggable but non-economic." A long-range logging and land-use map was prepared for the whole island, whereby Timber Management Areas were delineated from Special Use and Multiple Use Areas, and potential logging roads were located.

The new plan was even more conservative than the 1976 effort in determining loggability (using economic feasibility criteria) of the island's forests. A recovery rate of 1.5 million board feet per mile of road construction was established as the minimum volume necessary to produce an economically feasible logging operation.

The other major change in this plan was the deletion of the Crab and Kwain Bay Logging Units. A number of tentative logging plans were considered, but none was found which could adequately protect the fish and wildlife resource and still be economic. With these deletions and logging criteria, the annual cut was calculated to be 53 acres.

Because 2190 acres were harvested in the first 13 years of the cutting cycle, the annual harvest for the remainder of the cycle (until the year 2046) will be reduced to an average of 33 acres. If economic conditions and logging technology should change sufficiently to allow harvest of the "loggable but uneconomic" land, this allowable harvest would nearly double.

The new Timber Operating Plan is more inclusive than past plans, and being locally prepared more accurately reflects the interest of the Community as well as those of sound forest management. It discusses all major forestry

issues, ranging from timber harvesting and road building to forest products processing and marketing, from timber stand improvement to beach salvage and forest technician training. An extensive review and critique process is now underway. Further modifications and updates will help keep the plan current and viable.

Enhancement and Timber Stand Improvement

Most of the timber on Annette Island is in old-growth spruce-hemlock forests. Growth in these stands is slow, and, in some cases blowdown and decay exceed growth. Most of the mature trees are infested by dwarf mistletoe, a parasitic plant which slows growth and can directly or indirectly cause tree mortality. Disease and insects also impair the productivity of the forest. Leaving decadent trees unharvested can result in a loss of timber and can lower the eventual stumpage rates for that timber. The defects and loss of timber in old-growth forests suggest that, to strictly maximize timber yields over the next few years, a policy of accelerating the harvest might be desirable; however, as mentioned above, the extent of the commercial forest resource is not great, and policy decisions must include consideration of the amount of available timber.

Improvement of the timber stands, therefore, will likely revolve around practices other than merely reducing the inventory of old-growth forest, as is done elsewhere in the region. Among the activities being explored are thinning and planting. While these activities might not be economically feasible in much of Southeast Alaska, BIA assistance is supporting them on Annette Island in hopes of developing a more productive forest resource.

A stocking survey of a 1972 clearcut revealed that natural regeneration was inadequate. Spruce cones were collected for nursery seeding, and 35,000 seedlings were planted in this clearcut in the fall of 1979.

The forestry program will also conduct a thinning experiment on 24 acres of Hemlock Island. Growth response will be recorded and aimed at developing management prescriptions.

USE OF RESERVE TIMBER RESOURCES

Until 1967, there was little commercial harvesting of the Reserve's timber. Some timber was harvested and processed in a small Community-operated sawmill to provide materials to build the town, but large-scale commercial logging did not begin until 1967. In that year the BIA sponsored the first of four timber sales the last of which was completed in 1976. These sales accounted for the logging of about 1,701 acres of forest land. An additional 340 acres are currently being logged in the Trout Lake sale. The four completed sales yielded total receipts of \$2,112,910, of which at least 90 percent is returned to the Community by the BIA. (The remainder is used by BIA for management.) These figures are summarized in Table 6-2.

Much of the timber harvested on the reserve has been sold as round logs to Japanese buyers. Timber cut on the reserve is not subject to an administratively imposed restriction on export of unprocessed round logs which is applicable to timber harvested in Tongas National Forest. Due to Japanese preference, round logs typically fetch a much higher price per unit of volume than do cants; hence, much of the reserve's cut is exported "in the round". Lower grade logs unsuitable for export are typically sold to Ketchikan Pulp Company (now Louisiana-Pacific, Inc.) for processing into pulp.

Table 6-2

Annette Islands Timber Sales
Past, Present and Future

Calendar Year	Logging Unit	Acres	Years	Acres Per Year	Volume (MMBF)	Volume Per Year (MMBF)
POST AND PRESENT SALES						
1967 - 1971	Hemlock Creek & Todd Lake	687	5	137	25	5
1972 - 1974	Annette Bay	955	3	328	29	9.7
1976 - 1977	Chenango Mtn.	208	3	104	7	3.5
1979 - 1982	Trout Lake	340	4	85	13*	3.3*
TOTALS TO DATE		2,190		137**	74	5.4
FUTURE SALES						
	Triangle Lake & Annette Bay	895	NA	NA	NA	NA
	Red Mountain	765	NA	NA	NA	NA
	Cascade Lake	166	NA	NA	NA	NA
	Davison	278	NA	NA	NA	NA
TOTAL FUTURE SALES		2,104	65	32.4	69.4*	1.07*

* Estimates ** Average

NA - Data not available

Source: Annette Natural Resources Center, 1979

Wood Products Processing

One of the major economic activities in Metlakatla, as in several other southeastern communities, is wood products processing. This section describes local and regional aspects of this activity.

Regional Perspective

Although Southeast Alaska has a major timber industry, it supplies only a small fraction of wood products in the Pacific Rim area. The industry's development has been strongly influenced by state and federal policies, and is heavily dependent on Japanese purchases for its economic well-being.

The region's commercial timber industry began with the building of the Russian colony at Sitka in the early 1800's. Local timber was used to provide materials and fuel for local shipbuilding, a foundry and building construction. The first sawmill in the region began operations in 1833.

With the purchase of Russian claims to Alaska in 1865, control over southeast Alaska's timber resources shifted to the U.S. government. The commercial lumber and wood products industry continued to grow, although timber cutting for commercial purposes was then illegal.

In 1902, the U.S. Congress established the Alexander Archipelago Forest Reserve (now the Tongass National Forest) (Harris, 1974). The U.S. Department of Agriculture (USDA) was given a mandate to manage the forests to maximize a broad range of national objectives related to employment, price stability, economic efficiency, foreign relations, small business, economic growth and development, community stability and national security. (Darr, 1977).

In 1926, the U.S. Congress passed legislation giving the USDA discretionary power over export of timber from the national forests of Alaska. Harris (1974) noted:

The department's position was clarified in 1928 and remains generally in effect today that primary manufacture of timber from National Forest lands in Alaska is required so as to insure the development of a stable, year-round industry. (Emphasis added)

This policy has substantially determined the development of Southeast Alaska's timber industry. The U.S. Forest Service, (USFS, and agency of USDA) has determined that "primary manufacture" means that round logs must be cut into lumber with a maximum thickness of 8 3/4 inches. (There are no length or width maximums.) Typically, the lumber is processed on two sides, leaving the "wane" on the edges of the lumber. Wane lumber, commonly called cants, may then be sold to foreign or export markets.

Prior to distribution of lands to village and regional Native corporations under terms of the Alaska Native Claims Settlement Act, the Tongass National Forest encompassed about 90 percent of all timber inventory in Southeast Alaska, so nearly all the timber was subject to the primary manufacture rules.

Under USFS encouragement, pulp and paper mills were built in Ketchikan (1954) and Sitka (1960) to provide a market for low grade timber. Fifty year allotments of USFS timber were set aside to provide a steady source of supply to the two mills.

The Southeast Alaskan timber industry is presently dominated by two firms (Louisiana Pacific, Inc. and Alaska Pulp Company) which control directly or indirectly about 90% of the timber harvested in the region. Further, these two firms depend heavily on exports to Japan to sell much of their output.

Other USFS timber is sold on a competitive bid basis, but the two firms exercise defacto control over this source of supply, also. Slightly under two-thirds of the timber purchased by these two firms in 1974 came from the USFS long term sales allotments. The remainder of the logs purchased came from independent (primarily USFS) timber sales. Overall, these two firms purchased over 96% of available timber supplies in 1974. (See Table 6-3) (Darr, 1977).

By controlling the source of supply, these two companies also have discretion over how timber is used. Normally, higher quality timber is routed to Cantmills (some of which are owned or operated by these same companies), while lower quality timber goes to the two pulpmills. In 1974, slightly over half of the harvest controlled by the two firms went to the two pulp mills, while the remainder went to cant mills. (Darr, 1977).

Table 6-3
Log Flows in Timber Market of Southeast Alaska
1974

Purchaser/Use	Quantity (1,000 MMB)	Percent of Amount Harvested
Louisiana Pacific, Inc.	1,162.4	50.5
Volume used for pulp	672.7	29.2
Volume used for cants	489.7	21.3
Alaska Pulp Company	1,055.1	45.9
Volume used for pulp	510.5	22.2
Volume used for cants	544.6	23.7
Volume in Other Uses	82.4	3.6
(Unused Volume (Not Harvested))	<u>(1,324.1)</u>	<u>-</u>
Total Volume Available	3,624.0	-
Total Volume Harvested	2,299.9	100.00%

Source: Darr, 1977.

Much of Louisiana Pacific's pulp production has gone to U.S. domestic markets, while Alaska Lumber and Pulp Company's production has been sold to Japan. Practically all cant production, in addition to a small volume of unprocessed round logs from non-USFS lands, is sold to Japan. (Darr, 1977).

After arrival in Japan, almost all the cants are processed further into lumber. Ultimately much of the lumber is then used for construction, packaging and manufacture of furniture and fixtures. The US, USSR, Canada and New Zealand are the primary suppliers of Japan's log imports. Alaskan cants, however, supplied only about one percent of total lumber consumed in Japan in 1977. (Darr, 1977).

Another reason why the USFS primary manufacturing rule is important is that Japanese purchasers of wood products have a decided preference for round logs as opposed to cants. Under current conditions, owners of timber stands can realize an average of 15 to 25 percent more revenue for a given volume of timber which can be sold as round logs as compared to a similar volume which must be processed prior to export. This differential presents a powerful incentive to private landowners. Based on this incentive, if the USFS policy were changed or significant stands of timber were exempted from the primary processing requirement, the shape of southeast Alaska's timber industry could be substantially changed. Table 6-4 summarizes likely timber ownership patterns following conveyances pursuant to the Alaska Native Claims Settlement Act and Alaska Statehood Act. As the table indicates, roughly 10 percent of the productive forest lands will soon be under private control.

Local Perspective

The largest single employer on Annette Island is Annette Hemlock Mills, operated by Louisiana-Pacific, Inc. The company has leased this Community-owned sawmill since 1971, which was rebuilt in 1969 to replace an earlier mill destroyed by fire. Presently, the mill cuts hemlock cants for shipment to Japan and sends chips to the Ketchikan Pulp Mill, another Louisiana-Pacific subsidiary. The mill usually operates on two shifts, and in 1973 employed an annual average of 120 persons to process 71 million board feet of timber and about 26,000 tons of wood chips. The mill is supplied by logs harvested by Louisiana Pacific from national forest land on Prince of Wales Island under the 50-year timber sale. Logs are rafted to the mill from Louisiana Pacific's logging camp at Thorne Bay on the east side of Prince of Wales Island.

In Metlakatla, as elsewhere, wood processing is extremely sensitive to domestic and Japanese demand for forest products, which themselves vary greatly from year to year. For example, between 1972 and 1975, employment in Alaska's lumber and wood products industry dropped by 29 percent -- nearly one-third--after having steadily increased since 1965. (Rudeman, 1976). This decline was strongly felt at the Annette Hemlock Mills, where employment dropped by over one-half for several years. This downturn was in large part responsible for Metlakatla's high unemployment of the past few years.

Table 6-4
 Estimated Timber Availability in Southeastern Alaska
 by Ownership Category

Category of Ownership	Productive Forest		Volume of Standing Timber		Maximum Potential Sustained Yield Per Year	
	Acres	Percent	MMBF*	Percent	MMBF*	Percent
State of Alaska	84,000	1.5%	2,000	1.5%	20	1.5%
Lands to be Conveyed to Regional and Village Native Corporations	500,000	9.0	11,250	8.4	150	11.1
Tongass National Forests (after Native and State Selections)	4,950,000	89.4	120,000	90.1	1,180	87.4
TOTAL	5,534,000	100.0%	133,250	100.0%	1,350	100.0%

*Millions of board feet, Scribner Scale

Source: Glass, 1978.

Presently, annual average employment in logging and forest products processing activities totals about 82 jobs. The employment level varies seasonally due primarily to winter shutdowns in logging rather than processing activities. The estimated peak summer employment is about 25 percent higher than the lowest employment level in winter.

The Community has several areas of concern regarding wood products processing activities. First, over time, lumber and wood products plants have tended to employ fewer workers as equipment and methods have improved. (Wall and Oswald, 1975) Thus, maintaining existing employment levels will require either expansion of the existing sawmill, or the initiation of new processing activities such as the construction of a small log mill, shake and shingle mill or veneer plant.

Second, reliance on a single large employer or major industry tends to result in relatively large fluctuations in community employment. Unfortunately, since most of southeast's supply of raw material is controlled by two firms, who themselves exercise very little control over the price, timing or quantity of products that they sell, little can be done to ease this situation aside from diversifying the types of activities the Community pursues. Establishment of new processing activities, using either on or off-island sources of supply, will aid this situation.

Finally, changes in ownership of southeastern Alaska's timber resource may have a significant downward effect on employment and income resulting from timber harvesting and processing activities.

Since many of the newly conveyed private lands have old growth stands of timber, economic incentives would dictate that these timber stands be harvested more rapidly than the maximum sustainable yearly harvest.

A recent analysis of this question concluded that if private landowners (principally Native corporations) harvest their timber on a moderately accelerated basis (about 50 percent increase in volume over sustained yield levels), cant manufacturing employment would probably drop by about 10 percent in southeast Alaska. This drop would occur because more logs would be sold in the round, resulting in less employment in both cant and pulp manufacturing. (Glass, 1978). Further, the increase in round log exports associated with private harvesting could cause the price of round logs to drop by as much as one-half. (Darr, 1977).

Unquestionably, such an occurrence would have serious consequences in Metlakatla. Annette Hemlock Mill employment might drop, and Community income from timber sales would likewise be seriously affected.

There are several reasons, however, to believe that the magnitude of the impact will not be as great as this. First, Annette Hemlock Mill employment is, for the present, closely tied with production at the Louisiana Pacific pulp mill operations at Ward Cove near Ketchikan. Most of the logs supplying the mill are harvested under the 50-year USFS timber sale agreement with Louisiana Pacific. Since much of the timber harvested is of a higher grade than that normally used for pulp manufacture, since this timber must be manufactured in some way prior to export, and since cant manufacturing represents the highest possible financial return to Louisiana Pacific, cant manufacturing

is likely to continue at near normal levels at the Annette Hemlock Mill (long-term sales from the USFS account for about two-thirds of Louisiana-Pacific's pulp needs).

Thus, the presence of fairly structured supply and sales chains precludes the impact of increased private logging on cant manufacturing employment to be overly great. In addition, if Puget Sound cant markets develop (as they may), the overall impact might be negligible or even positive for Metlakatla.

The effect of increased private logging on stumpage rates received by the Community may also not be as great. Since many Native corporations have indicated a desire to use their harvesting of timber as a means to maintain or establish local processing employment, round logging exporting may not be as great as possible. In addition, overly rapid harvesting and export as round logs, and its resultant price decreases, would affect private landowners just as severely as it would the Community. Overall, it is likely that private harvesting and round log exporting will increase over the next decade, leading to somewhat depressed timber stumpage prices, followed by decreased harvesting levels and higher prices in the 1990's. Policies designed to address these issues are listed in Chapter 9.

Recreation Areas

Annette Island provides its residents many opportunities for outdoor recreation. Hiking, fishing, hunting, boating and camping are just a few of the activities engaged in. The areas where these activities take place are spread throughout the island, however, the areas close to Metlakatla or accessible by road receive the most use.

These activities are undertaken with little or no facilities such as picnic tables, campgrounds, or maintained trails. While this lack of facilities may not lessen the enjoyment of the user, in some instances it leads to damage of the area being used. Without such minimal facilities some areas cannot sustain even a moderate amount of use. Such overused areas are characterized by compacted soils, damaged vegetation and litter. Damage to areas frequently used by the residents of the island can be lessened by redesigning and developing them, if only to minimum standards. A few minor efforts would not only improve the ease of use but would protect the environment.

The following discussion describes several recreation areas in and around Metlakatla and suggests possible improvements for each. These areas are numbered for location in Figure 17.

SKATERS LAKE (1)

Located on Airport Road, just south of Metlakatla, Skaters Lake has traditionally been used for recreational purposes. The 14-acre lake is fed by muskeg drainage from the west. Its outflow is carried under Airport Road in a culvert and eventually reaches Port Chester. Due to several barriers and contamination, the lake no longer supports spawning salmon. A new source of contamination is the recently-developed bark dump located just across Airport Road from the lake. Chemicals leached from the bark find their way to the lake,

lowering the quality of the water by consuming oxygen and coloring the water brown. Also impacting the lake are the roads in the immediate area which block the drainage feeding the lake. Less water reaches the lake, and both its water quality and its size have been reported to be reduced.

During the last year the Community obtained funds from the State and developed a trail on the northside of the lake. The trail runs from Airport Road and winds its way through lodgepole pines and muskeg to the extension of Skaters Lake Road. With this developed access, the lake and environs is receiving much more use, accompanied by management problems. These problems include littering, compaction of soils near the trail, and impairment of some of the lakeshore access points.

These problems can be solved by providing facilities such as litter containers, picnic tables and benches and developed shoreline access. An overall master plan could incorporate these and other elements, along with a scheme to fund, construct and maintain the area.

WESTERN AVENUE SHORELINE (2)

This strip of shoreline along Metlakatla's western boundary is historically significant to the Community. It was here, in 1887, that the first party landed to establish the town. This shoreline starts at Atkinson Street and runs west for approximately 3000 feet to the site of the new small boat harbor. Recent developments in this area include the Senior Citizens Center and the Longhouse.

The Community has an opportunity to provide park and recreation facilities for the residents and at the same time create a link between the commercial core area and the new boat harbor. Small picnic and sitting areas, playgrounds and sites for Community-oriented structures could be incorporated in this development. By utilizing existing vacant lots, removing dilapidated buildings, and cleaning up debris along the street and beach, the Community could create a low-cost, high-public-use area. Necessary to the realization of this concept is an overall phased site development plan locating features and suggesting a variety of landscape treatments and land uses.

YELLOW HILL (3)

Yellow Hill is a dominant feature to those traveling along Airport Road. Approximately two miles from Metlakatla, the hill covers an area of 100 acres and is composed of iron-laden dunite, resistant to glacial advance, but rounded by wind and water erosion over the centuries. The view from the top is a spectacular panorama of the Metlakatla Peninsula. The hill has a great potential for rock-climbing and hiking, and with little effort the necessary facilities could be developed. Such improvements as a defined parking area, a signed trailhead and litter containers would be most desirable for this area.

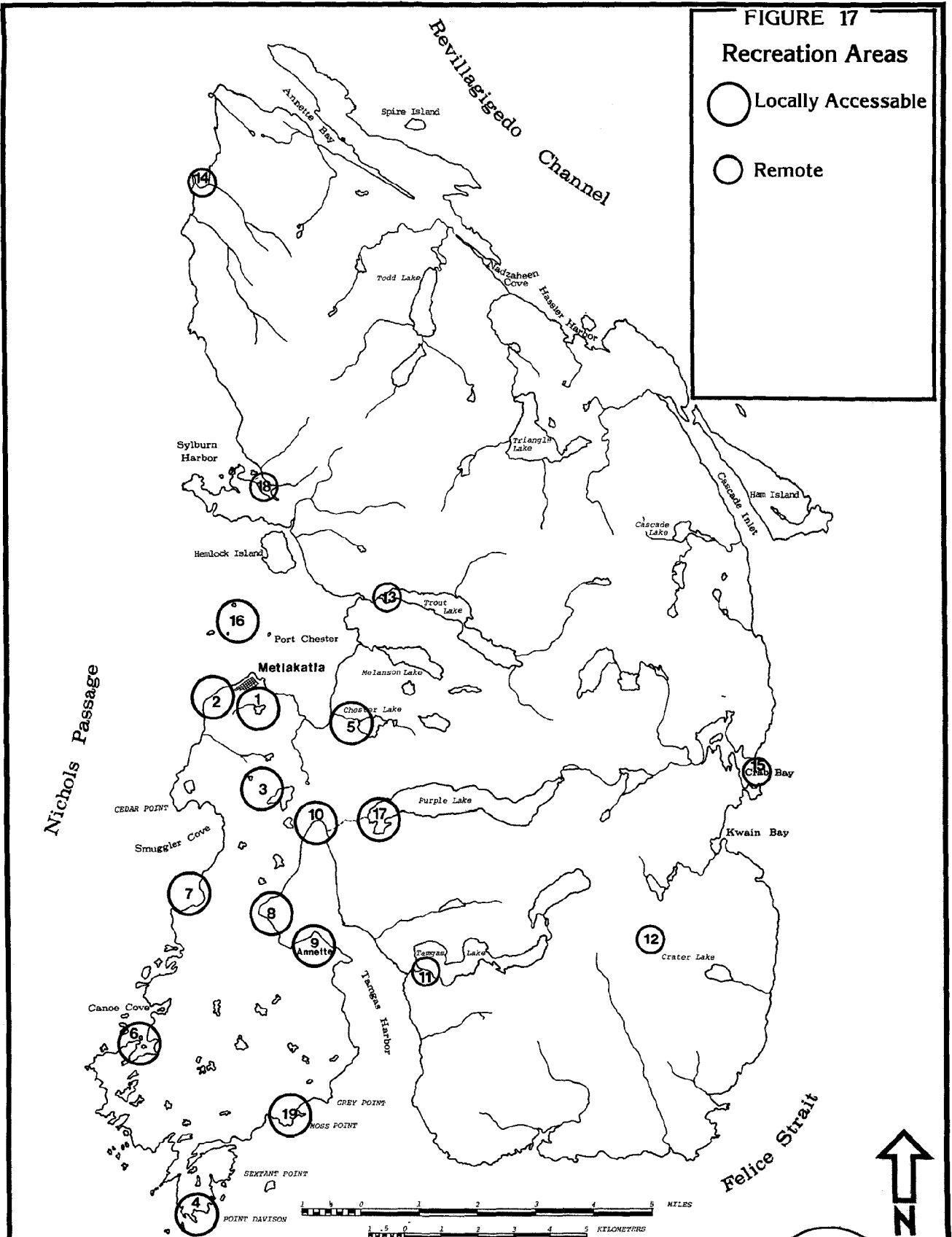
POINT DAVISON (4)

Located at the southernmost tip of Annette Island, approximately 10 miles south of Metlakatla, Point Davison juts into the waters of Clarence Strait. The point is a scenic combination of rock outcroppings and windswept trees

FIGURE 17

Recreation Areas

- Locally Accessible
- Remote



PACIFIC RIM
PLANNERS, INC.
550 14th Avenue NW
Seattle, WA 98107
(206) 798-3340

Annette Islands Coastal Zone Management Program



with pockets of meadow grasses and shrubs. During World War II, Point Davison was used as a gun emplacement and bunker for defense of the military installation on the island. Concrete foundations and scattered debris are all that remain of this occupation.

This area is used by the residents of the island for picnicking, fishing and shellfish gathering. Because of the remoteness of the site and the lack of facilities, management problems such as littering and vandalism are evident. With the introduction of some relatively minor facilities, the site has the potential to become a quality day-use area. Minimum improvements would include upgrading the access road and parking area, picnic tables and shelters, and trash containers. Once developed, the area would require periodic maintenance.

CHESTER LAKE (5)

Chester Lake provides drinking water for Metlakatla. Located east of the town and 825 feet above sea level, the lake also has hydroelectric potential, as described in a recent feasibility study. (Retherford, 1976). A boardwalk and trail system provide access to the lake, from the lake's outlet, is a commanding view of Metlakatla, Port Chester, Nichols Passage and Clarence Strait.

The scenic quality of the lake and its closeness to Metlakatla suggest a likely area for development of recreation facilities; however, because this lake is the Community's drinking water supply, contamination must be avoided. Presently there is no control of access to the lake, and developing facilities would encourage more use. Closing the access to Chester Lake and allowing only authorized entry for maintenance of the trail and the water system would certainly minimize the danger of drinking water contamination.

CANOE COVE AREA (6)

Canoe Cove, located on the western side of the Metlakatla Peninsula, is one of the most scenic areas on the island. About seven miles from Metlakatla by road and trail, it provides excellent fishing and shellfishing. Access to the cove is along a gravel road ending at a trail which winds its way to the water. Recently the cove was studied as a possible site to land log rafts for transport to a log storage area at the airport and finally to the Annette Hemlock Mill in Metlakatla. This proposal has not been acted on.

Little is needed to improve Canoe Cove for the recreationist. Periodic grading of the road and repair of the trail system's boardwalk would improve access. Other development in Canoe Cove might include picnic tables, fire pits and litter containers however these are not a high priority due to the uncertainty over Canoe Cove's future. Canoe Cove is proposed as an Area Which Merits Special Attention. (See Chapter 9).

SMUGGLER'S COVE (7)

Accessible via a short unpaved road off the airport road, Smuggler's Cove offers the user a sheltered sandy beach with a panoramic view of Clarence Strait, with Dall Head to the northwest, and the mountains of Prince of Wales Island in the distance.

This site is popular among Metlakatians for picnics and beach parties. Its proximity to town and lack of facilities, however, have led to heavy accumulations of litter. This area would benefit considerably from the addition of litter containers and picnic tables.

TAMGAS HARBOR BEACHES

Several beaches on the west side of Tamgas Harbor are frequently used for recreation and subsistence shellfishing. Perhaps the most popular is Hospital Bay (8), along Tamgas Harbor Drive. The area from the boat dock to the Tamgas Apartments (9) is also a heavily used beach. The head of the harbor (1) and Moss Point require travel on somewhat longer, less maintained roads for access, and are used less intensively.

REMOTE AREAS

For those with access to a boat, the reserve offers miles of beach and uplands for picnicking, shellfish gathering, hunting and hiking. Among the favorite remote picnic areas are the small islands offshore of Metlakatla (16), the mouth of Tain Creek (13), Japan Bay (18) and Cowboy Camp (14). Purple Lake (17) and Tamgas Lake (11) are also popular, both requiring a hike up from the east shore of Tamgas Harbor. For the more adventuresome, Tamgas Mountain (12) lies beyond the lake, and can be climbed on a one-day hike. Even more remote is Crab Bay (15) frequently used for overnight boat camping, crabbing, and hunting.

These areas are subject to less use than those with road access, and therefore require little or no facilities or improvements. Protecting their natural amenities through buffer strips, etc., will help maintain their value as recreation areas for the Community.

CHAPTER 7

FRESHWATER RESOURCES AND HABITATS

Perhaps more than any other component of the environment, the flow of freshwater intertwines the resources of the Annette Islands Reserve. From clouds blown in from the Pacific Ocean, it falls as rain, dripping from the branches of the trees, nourishing the forests, and flooding the muskegs. Seeping downhill through the soil it emerges to the surface slowly trickling, joining other trickles to form a creek. Where several creeks flow together, they form one large stream, cutting at its bank on one side, and building it on the other, changing the shape of the land and carrying sediment downstream. The stream also carries nutrients from the soil as well as leaves, twigs and other material used as food by insects, which in turn feed fish. Young salmon use the streams to swim toward the sea and the adults return to the streams to spawn the next generation. Otter, mink, and other wildlife feed on the fish where the streams flow through the forest. As it opens into the marine water, the stream provides food for eagles, herons, and a variety of waterfowl. This chapter reviews some characteristics of Annette Island's freshwater resources and habitats, and discusses their present and prospective uses.

Groundwater

Although Southeast Alaska receives heavy precipitation, and surface runoff is extensive, groundwater suitable for municipal water supplies is elusive. The geology of the region is largely responsible for the difficulty in obtaining groundwater. The same impermeable igneous and metamorphic bedrock that causes rainwater to run off the surface of the land also hinders the development of large supplies of groundwater.

In the mid-1960's researchers drilling test wells on Annette Island found only small amounts of groundwater available in bedrock, largely from fractures in the impermeable rock. Recharge of groundwater into these test holes was slow, and continuous pumping led to an increase in chloride content of the water, believed to be caused by seawater intrusion (Marcher, 1971a). This chapter reviews some characteristics of Annette Island's freshwater resources and habitats, and discusses their present and prospective uses.

A more promising source of groundwater, detected in related research, is the beach uplift formations around the perimeter of most of the Metlakatla Peninsula. These sand, gravel and clay deposits, ranging up to 500 feet in width from the shoreline and up to 33 feet in depth, are described by Marcher (1971b) as receiving regular but slow recharge from the island's abundant precipitation. They could probably be developed into groundwater supplies using horizontal infiltration galleries, although their proximity to the surface suggests that areas surrounding the infiltration galleries should be protected from pollution to avoid contaminating the water supply.

Streams

At least 64 streams drain Annette Island. These streams range in size from small trickles, unnamed but flowing throughout the year, to the rushing cascades of Tangas Creek, now the site of the salmon hatchery. While some of the larger streams are known to teem with salmon during spawning season, the smaller undocumented creeks also produce salmon and cannot be ignored in the Community's resource management efforts.

STREAMFLOW AND WATER QUALITY

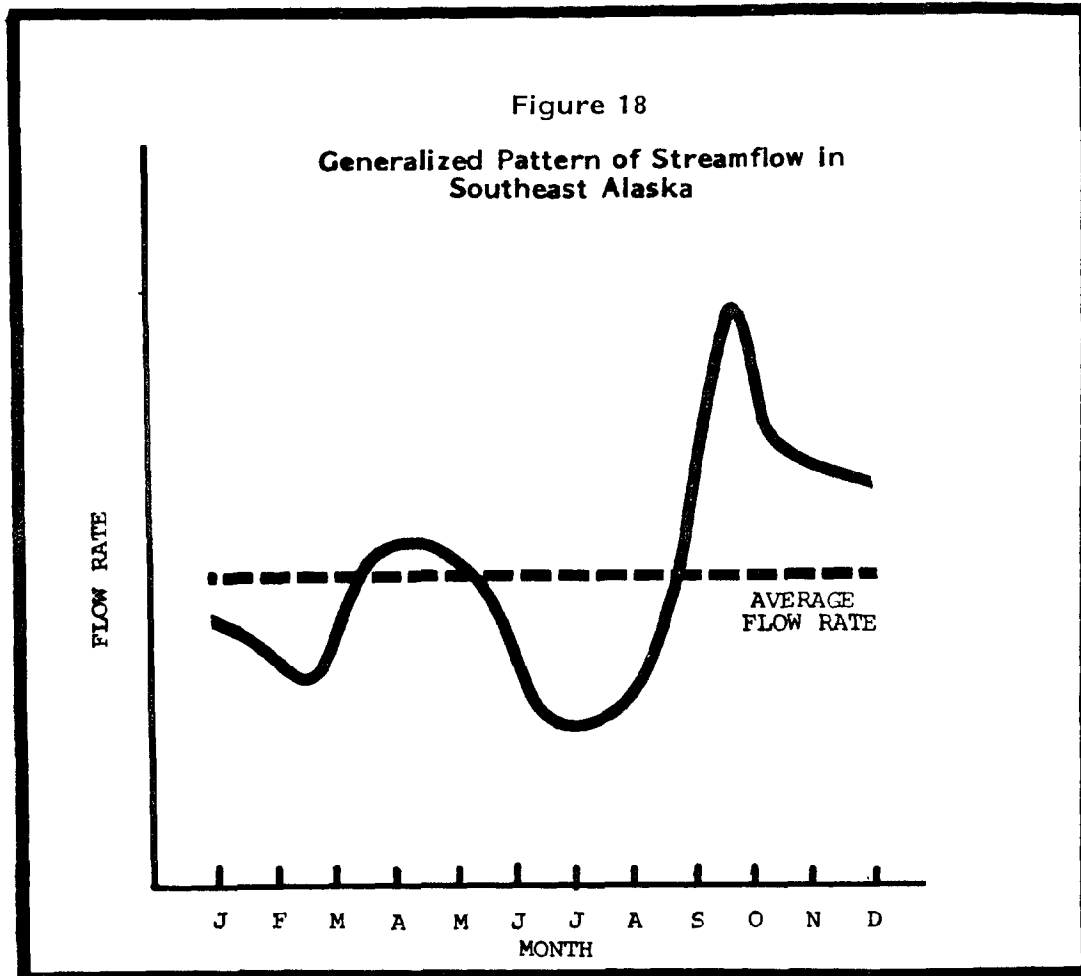
The suitability of a stream as habitat for fish and wildlife as well as its ability to transport sediment, nutrients, and organisms depends on a number of physical and chemical properties. Perhaps most important in determining the character of the stream is its flow rate, although related properties such as temperature and dissolved oxygen are also critical.

Flow Rates

The rates of streamflow fluctuate greatly from stream to stream, and from season to season. Although the size of both the streams and the watershed varies, the streamflow appears to exhibit a pattern, which can be illustrated by the following graph (Figure 18) developed by the U.S. Forest Service from studies of a number of Southeast Alaskan Streams.

As the graph shows, streamflow is at a fairly low level in the early months of the year, as precipitation is locked up on snow in the mountains. (Streams draining primarily low-elevation watersheds would show a higher discharge in the winter.) In the spring, as temperatures rise and the mountain snowpack melts, the streams grow steadily, fed by both the snowmelt and the continuing rain.

After May or June, precipitation generally falls off, and with the snowpack nearly or completely gone, the streamflow decreases drastically. Occasional summer rains create short-term increases in the flow of some streams, particularly in the watersheds that lack muskegs or lakes to hold this water for gradual release. Streams originating in these watersheds respond rapidly to even short rains or short dry spells.



(Adapted from: Schmiege, Helmers, and Bishop, 1974)

The return of the rainy season in September and the storms later in the fall swell the streams to their heaviest flow of the year. This increase continues sharply throughout the fall, until the cold temperatures once again freeze the water and lock it in the mountains for the winter.

Water Chemistry

Like the streamflow, the physical and chemical properties of the water vary with the seasons and with the stream. Only a limited amount of data on water chemistry in the island's streams has been collected by PRPI and the U.S. Fish & Wildlife Service. Although this is too little data to draw any conclusions or to recognize trends, a general discussion of stream characteristics, particularly with regard to the requirements of salmon, suggests that the stream chemistry is consistent with the needs of good salmon habitat.

The temperature of a stream follows seasonal trends similar to that of the air temperature, but with a much narrower range. The flow of a stream moderates the effects of the summer's heat as does the shade provided by thick forest vegetation; a fast-flowing stream shaded by the forest is likely to be cooler in summer than a slower stream in a cleared area. For optimum growth and survival of salmonids, water temperature should range from 40° to 57° F. (9° to 14°C.) and should not exceed 62° F. (16°C.) (Bell, 1973). Of the limited stream data available; there are no records of a stream exceeding 62°F., although the upper limit of the optimum range has been exceeded both in large, fairly swift streams and in small, sluggish streams. There is only one record of a stream colder than the lower limit of the optimum range, but most of the data so far have been collected in spring and summer. Very likely the streams do get cooler than ideal for growth of fish in winter.

The water's pH (or acidity-alkalinity) also affects its suitability for fish, in part by affecting the way various dissolved chemicals act on the fish. Bell (1973) gives a pH of 6.7 to 8.3 as the range "in waters where good fish occur." On Annette Island several streams have been measured as having a lower pH (more acid) than 6.7. Very likely the low pH of the water is caused by tannic acid leached from muskeg peat. This tannic acid also gives the streams their characteristic clear brown color. Whether or not the acidity limits fish production in the streams is not certain at this time but the possibility must be considered before any efforts are devoted to stream enhancement.

Dissolved oxygen in the water is another critical factor determining its carrying capacity. Bell (1973) states that for salmonids the dissolved oxygen should not drop below 5 parts per million (ppm) and should exceed 7 ppm in spawning areas. Dissolved oxygen is related to the streamflow, since a rapidly flowing stream is usually well aerated. Temperature also affects the stream's dissolved oxygen content; cold water is capable of holding more oxygen in solution than is warm water. Thus, in the summer, when the streamflow is at a minimum and temperature is at a maximum, the streams dissolved oxygen content is usually reduced. Data available on oxygen content of Annette Island streams are not sufficient to evaluate their suitability for fish production; however, the smaller, slower streams that flow through unforested areas may undergo serious declines in their dissolved oxygen content during the summer months.

STREAMBED MATERIAL

Most of the streams on the island cut through bedrock, and many faster streams have streambeds composed of bedrock or large boulders. Others slip quietly through muskeg, and have streambeds of soft muddy peat. Neither of these materials are suitable for salmon spawning.

Salmonids require a clean gravel streambed as spawning habitat. The proper sized gravel is small enough so that the adult salmon can bury the eggs in it, but large enough to have a great deal of void space, or interstices, through which water can flow, providing the developing eggs with oxygen and removing waste products.

The proper substrate is also essential for production of food organisms. The food species which are most useful and available to salmonids are those which cling to the surface of objects such as rocks or gravel, vegetation, logs, etc. An ideal streambed substrate, therefore, is composed of these materials, rather than of sand or silt which supports organisms that burrow and therefore are not available as fish food.

Logging, road building and other soil-disturbing activities can have a severe impact on a stream's ability to support fish by changing the composition of the streambed sediment. As soil is eroded from the surface of steep slopes, or is lost in mass movement (Swanston, 1974), it is carried into the streams where it settles out into the spawning gravel. When it fills the voids in the gravel, it impedes the flow of oxygen-containing water and kills the developing salmon eggs. Mortalities of salmon eggs can reach 85% if 15 to 20% of the voids in the gravel are filled with silt (Bell, 1973). The change in streambed substrate also affects the food supply for young salmonids, reducing the clinging species, and creating habitat for the less desirable burrowing species (Meehan, 1974).

FOOD SUPPLY IN STREAMS

As it does in the sea and on the land, the food in streams originates in green plants, capturing energy from the sun and converting it to organic material. Unlike its marine waters, however, Annette Island's streams do not receive a great deal of sunlight, and aquatic vegetation is sparse.

Overhanging trees and shrubs apparently provide a substantial portion of the stream's food supply in rainforest areas. Material such as leaves and twigs dropped into the stream is processed into food by insect larvae and other invertebrates, and by bacteria. The insect larvae feeding on this material are available as food for coho salmon rearing in the streams (Meehan, et al., 1977).

In those streams with adequate light, primary productivity (and therefore food supply) may also be limited by the levels of dissolved nutrients in the stream. For several reasons, mostly related to geology and climate (and discussed in more detail in the section on lakes, following) the streams' water is probably low in dissolved inorganic nutrients. Recent experiments have explored the possibility of fertilizing streams to enable aquatic algae to produce more food (Stockner and Shortreed, 1978.) While the results appear to have some promise, any such methods would be very costly. Retaining the trees and shrubs along the streambank appears to be the most feasible method to ensure a food supply for fish and other aquatic organisms.

SALMONID USE

Of the 64 streams on the island, 38 have been documented by the U.S. Fish & Wildlife Service as producing salmon, trout or Dolly Varden. Thirty-two of these produce salmon, with or without cutthroat trout and Dolly Varden, while six streams produce only cutthroats and Dolly Varden (Figure).

Twenty-eight of the 32 salmon streams produce pink and/or chum salmon, while only 10 support coho. Pinks and chums usually migrate downstream into the estuary immediately after they emerge from the gravel as fry. The streams they use need sufficient flow and water quality only during the fall, winter and spring. In the summer, when flow is low and water quality may be impaired, the pinks and chums are not present.

Coho, on the other hand, spend the first year of their lives in the streams, and therefore require adequate streamflow and water quality throughout the year. Some of these are very small insignificant-appearing streams, yet they are important for coho rearing. Maintaining the integrity of the coho-producing streams is a high priority if the island's coho runs are to be sustained or increased.

Sockeye salmon migrate through two of the island's streams, Tamgas Creek and Lower Trout Creek (Tain Creek), on their way to and from their spawning and rearing grounds in Tamgas Lake and Trout Lake.


Lakes

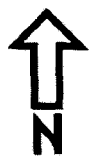
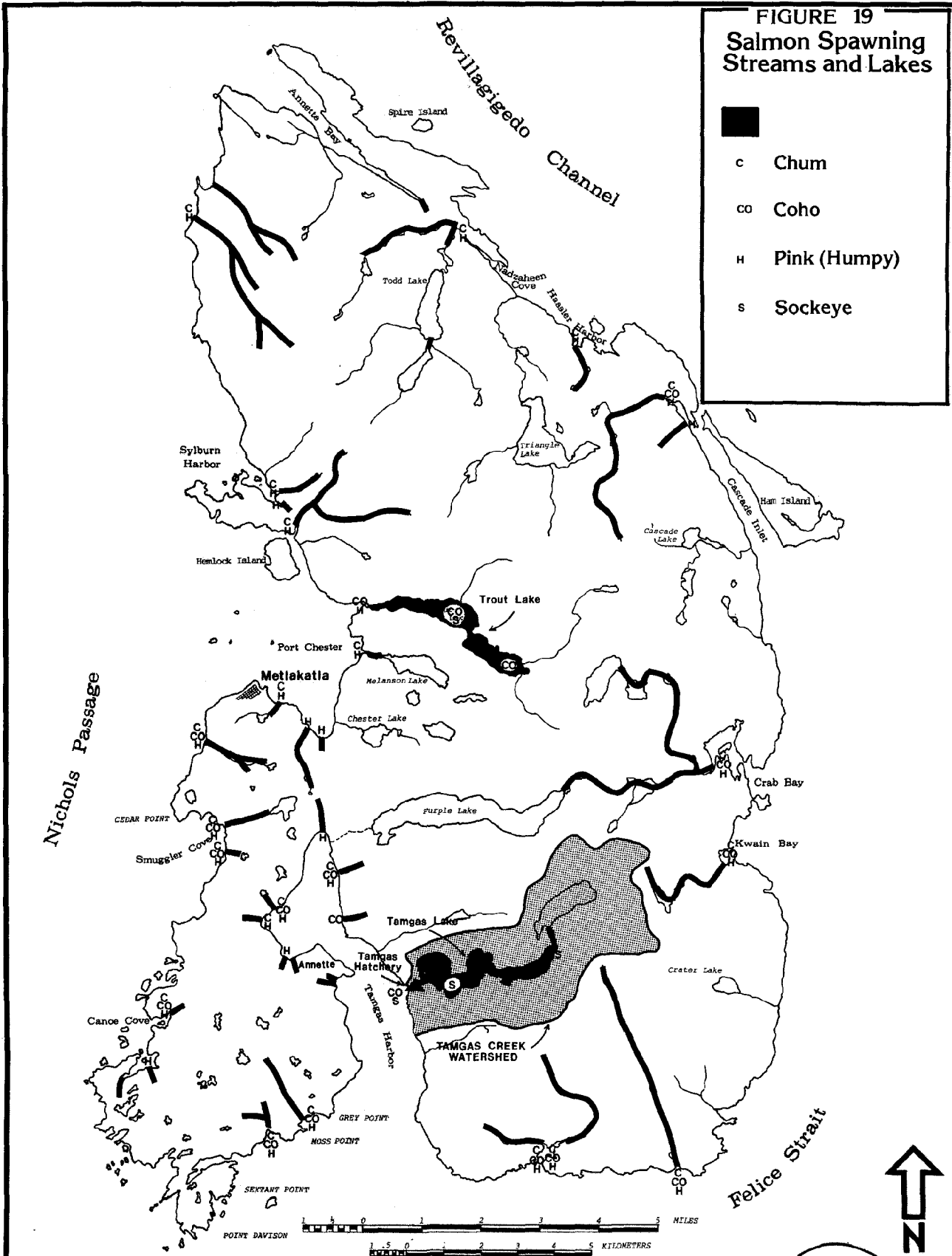
Annette Island has some 20 alpine lakes of at least five acres in size, along with many smaller alpine lakes and literally hundreds of muskeg lakes ranging in size from large puddles to several acres. Although they vary in appearance, these lakes share several characteristics which have important implications for their management.

In general, the lakes are not very biologically productive. Nutrients available for primary production are limited in quantity for several reasons. Rainfall cannot percolate into the impermeable bedrock and therefore cannot carry dissolved inorganic nutrients from the rock into the lakes. The soil, as described earlier in this chapter, is also a poor source of inorganic nutrients, and probably does not contribute much in runoff to the lakes.

Organic material such as leaves, twigs, etc., is another possible source of nutrients, but many of the alpine lakes (such as Chester Lake) lack overhanging vegetation which would contribute organic material. Other alpine lakes (such as Tamgas Lake and Todd Lake) have overhanging trees and shrubs, and most of the muskeg lakes have sedges, pondweed and water lilies growing along their shores; however, the presence of organic material in the lake does not necessarily lead to a fertile lake. The cold water temperatures slow the decomposition which converts the organic material into usable nutrients in organic form. Decomposition is probably slower in the higher elevation alpine lakes, but even muskeg lakes near sea level have thick deposits of peat -- organic material

FIGURE 19
Salmon Spawning
Streams and Lakes

-  Stream
- c Chum
- co Coho
- H Pink (Humpy)
- s Sockeye



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Annette Islands
Coastal Zone Management Program



which has only partially decomposed -- in their beds. It is possible that the sedges and other emergent vegetation could reduce the fertility of a lake's waters by consuming the dissolved nutrients from the water and then, over the years, locking the nutrients up in thick beds of peat on the lake bottom.

The low fertility of the lakes has consequences that can spread up the food chains to affect the production of fish. Dissolved inorganic nutrients can be used by phytoplankton (microscopic algae) to produce food which is used by zooplankton (microscopic crustaceans and other animals). The zooplankton can be used as food by fish, or by insect larvae which can be eaten by fish. A low fertility of the water thus results in low phytoplankton production and can limit the potential of a lake to produce fish. While some insect larvae and other invertebrates can feed on the slowly-decomposing organic material in a lake bed, these organisms are unavailable to fish if they burrow into the material, as they likely do in peat deposits in muskeg lakes.

The cold water temperature has a more direct influence on fish production, by slowing the fishes' growth, since digestion of food and other metabolic processes are temperature-dependent (Everhart, et al., 1975). In addition, some of the alpine lakes are so shallow (as little as three feet deep) that they freeze to the bottom in winter, precluding use by resident fish.

Use of some lakes by anadromous fish is limited by barriers to their passage. Waterfalls, beaver dams and log jams restrict fish movement. In at least one case (the outlet of Skaters Lake), a poorly placed culvert prevents passage of fish.

In spite of these unfavorable conditions, many of the lakes do support fish. Research by the U.S. Fish and Wildlife Service has documented resident or anadromous salmonids in 12 alpine lakes and in 24 muskeg lakes. The alpine lakes are used by coho and sockeye salmon for rearing, and by resident cutthroat trout and Dolly Varden (which very likely prey upon the salmon fingerlings). Cohos were found in only two muskeg lakes, but cutthroats and Dolly Varden appear to be more widespread in this habitat.

The fish production of some of these lakes might be improved with a few enhancement measures requiring relatively little effort. Realignment of culverts and removal of barriers such as log jams or beaver dams could make some lakes accessible to fish migration, and possibly usable for rearing coho and sockeye. (Several of the muskeg lakes, on the other hand, were created by beaver dams and would not benefit from removal of the dam!)

Introducing rainbow trout into Annette Island lakes has been attempted by the U.S. Fish and Wildlife Service, but predation by indigenous Dolly Varden or cutthroat trout has apparently eliminated the transplants. Other lakes, without predators and with more suitable water characteristics, might prove more receptive to transplants.

Manipulation of the water quality has proved successful in some areas as a means to enhance the lake habitat. A fairly simple procedure involves adding agricultural lime to muskeg lakes to increase the pH (reduce the acidity). Fertilization is a much more sophisticated technique, in which the limiting nutrients are added artificially to increase a lake's productivity. Either of these methods would require at least a year of water quality monitoring on the lake in question before it could be successfully carried out, and follow-up sampling to evaluate the effectiveness of the efforts.

HUMAN USE OF FRESHWATER RESOURCES

In addition to their value as fish and wildlife habitat, the lakes and streams of Annette Island are vital to the utilities which serve the Community. They have provided both water and power since the early days of Metlakatla, and will likely be developed further to fill local needs.

Chester Lake, overlooking Metlakatla from its perch above Port Chester, has been tapped as a source of water and power since the founding of the Community. It powered Metlakatla's water-driven sawmill in 1889, and for many years ran a hydroelectric plant which now sits vacant at the foot of the waterfall. Several cedar pipelines, antiquated and abandoned, attest to the years of using Chester Lake as a water supply for the town. These lines have been replaced by a large modern galvanized pipe, as the lake continues to fill Metlakatla's needs for water. To supplement its hydroelectric power from Purple Lake, the Community has developed plans to raise the dam at Chester Lake and install a new hydroelectric plant. These plans are now pending federal approval of permit applications.

The Purple Lake Power Plant now supplies the reserve with most of its electric needs (although diesel fuel must be burned to supplement it at times of low water and/or high demand.) This facility taps the water of Purple Lake through a pipeline and tunnel bored through the west side of the lake. The surplus water in the lake continues its natural drainage pattern to the east, into Crab Bay, while that needed for power generation drains west.

Yellow Hill Lake, just south of Metlakatla, provides drinking water to the south end of the peninsula: the Annette area, the airport, RCA and the National Weather Service. Since 1977, this water has been used to supply the interim fish hatchery facilities at Annette. Although originally intended as a temporary use, the abundant, high quality, gravity-flow water from Yellow Hill Lake has proved such an ideal source that the temporary hatchery may be continued as a permanent facility.

The new hatchery on the island, under construction at the mouth of Tangas Creek uses the water from Tangas Lake. Plans call for tapping the water from the surface and from deeper in the lake. Although Tangas Lake is only 100 feet above sea level, it has a large drainage basin, and if consistent with the hatchery operation, the lake may have some potential as a low-head source of hydroelectric power.

Another lake with hydroelectric potential is Triangle Lake, on the island's east side. With the development of hydroelectric power from Chester Lake, it is unlikely that Metlakatla would require additional power from Triangle Lake, but there has been some discussion of developing a facility there to sell power off the island.

CHAPTER 8 MANAGEMENT FRAMEWORK

The Metlakatla Indian Community's unique legal and cultural status ascribes to its environmental management powers unparalleled within Alaska, and perhaps within the country. These powers and responsibilities derive from a long series of actions by federal, state and Community governments, which would require far more space than is available in this document to explain completely. Instead, this chapter will discuss some of the events and actions which have significantly influenced the shape of the Community's management. Later sections of this report will describe management practices which the Community has employed, and proposes changes in management practices following the adoption of this coastal management program.

Governance of the Reserve

The Metlakatla Indian Community is a federally-recognized government. The Annette Islands Reserve was established by Act of Congress on March 3, 1891, setting apart "the lands known as Annette Islands for the use and occupancy of the Metlakatla Indians and other natives of Alaska who might be permitted to join them." The boundaries were later expanded by Presidential Proclamation on April 28, 1916 reserving "the waters surrounding these islands to a distance of 3,000 feet from the shore line for the use and benefit of the Metlakatla Indians and such other Alaska natives as had joined or might join them" (U.S. Department of the Interior, 1946).

The original settlers of Annette Island established a council form of government soon after arrival in 1891. Formal recognition of the Community's government did not come, however, until publication of approval of "Rules and Regulations for Annette Islands Reserve" by the Secretary of the Interior on January 28, 1915. Later, Congressional acts granting greater authority to Indian groups persuaded the Community to amend its constitution. The present Constitution of the Metlakatla Indian Community was approved by the Secretary of the Interior on August 23, 1944 and ratified by a vote of the Community on December 19, 1944 (U.S. Department of the Interior, 1946).

COMMUNITY GOVERNMENT

The Community Constitution establishes a government comprised of executive, legislative and judicial branches. The executive branch includes the Mayor, the Secretary and the Treasurer, each elected to two-year terms by popular vote. The Community Council consists of 12 members, elected to staggered two-year terms. At the beginning of each year, the Council appoints a magistrate for a one-year term.

The Mayor presides over meetings of the Council, and may vote only in the event of a tie vote on a particular matter. In addition, the Council elects from its members a chairman, who serves as Acting Mayor in the absence of the Mayor.

The Constitution also defines the qualifications, rights and responsibilities of membership in the Metlakatla Indian Community. Applicants for membership in the Community must be an Native of Alaska indigenous race, at least 21 years of age, and have maintained a residence in Metlakatla for at least a year. Applicants must not have received any benefits authorized by the Alaska Native Claims Settlement Act and must be approved for membership by a vote of three-fourths of the Community Council. Indians from British Columbia may apply for membership in the Community after two years' residence in the Community. Minor children whose parents are Community members are considered members until they reach the age of 21, at which time they must satisfy the above requirements to retain member status.

The Community's constitution also allows members to vote in Community elections, run for and hold Community office. Members are liable for fees, fines or levies which are imposed by the Community. Among the benefits for which members are eligible are the right to receive assignment of a Community-owned lot in Metlakatla for construction of a residence, and the assignment of 10 acres of land (other than mineral land) for agricultural purposes.

The Community Constitution authorizes the Community Council to:

... pass such ordinances for the local government of the Community as shall not be in conflict with the laws of the United States, and, wherever there is no applicable clause of the (Community) Constitution nor an ordinance of the Metlakatla Indian Community the Council shall have authority to apply and enforce Federal law within the boundaries of the Annette Islands Reserve as the law of the Community, except in jurisdiction. (Article IV, Section 1)

The constitution grants the Council a good deal of authority related to management of lands and resources. The Council may prevent the sale, disposition, lease or encumbrance of Community lands, interests in lands or other Community assets. The Council also can issue permits for Community members to use and occupy land for residential and agricultural purposes. If need be, the Council also has the authority to employ legal council, and to negotiate with the State and Federal governments.

RELATIONSHIP WITH THE FEDERAL GOVERNMENT

An important feature of the governance of the Annette Islands Reserve is the relationship between the Community and the federal government. As with many

other American Native groups, the Reserve was established during a period in the nineteenth century when the federal government sought to end Anglo-Native conflicts by establishing reservations and guaranteeing Native rights. This was accomplished by the federal governments' assumption of a trustee role over Native lands and affairs. One author noted:

Essentially, this unique (Federal-Indian) relationship is derived from treaties, statutes, executive orders, and administrative determinations. That is to say that American Indians are the only people specifically mentioned for special treatment in the Constitution. Further, the Indian tribes or nations have retained many aspects of sovereignty and relate to the Federal government, in some respects, as sovereign nations. (Seneca, 1972)

Assumption by the federal government of trust responsibilities over Natives, in effect, created a double-edged sword. On the one hand, Native groups were given "sovereignty" over their own affairs, including exemption from most forms of state taxes (particularly property taxes) and prosecution and authority over use of reservation lands and resources. The trust status also theoretically guaranteed Natives many other benefits provided for in treaties, such as schools, health care, and financial and technical assistance in community and economic development.

On the other hand, Natives in effect became wards of the federal government. The federal government--through the Bureau of Indian Affairs intruded into virtually every aspect of Native life. In the use of reservation lands, for example, the federal government determined how the lands would be used, who could lease the land and for how much and, eventually, to whom the land could be sold.

During the decades since, federal policy has wavered, from efforts to terminate treaties, reservations and trust status to attempts to achieve genuine self-sufficiency. The Alaska Native Claims Settlement Act of 1971, which provided payments of cash and land in exchange for settlement of Alaskan Native land claims, is one recent example of federal action aimed at termination of federal trust status.

Throughout nearly a century of settlement in the U.S., the Community has sought to retain and increase its jurisdiction over its own affairs and the natural resources of the Reserve within the context of often inconsistent federal policy. As a result, decisionmaking regarding resources management is often fragmented and cumbersome, and Community initiatives are often blunted by requirements that decisions be circulated through numerous layers of federal agencies and offices.

Currently, several federal agencies share public service or other responsibilities with the Community government. In many cases, the powers and responsibilities supercede those of the Community's government, just as federal powers supercede those of states. An important distinction, though, is that title to all lands of the Reserve is held by the federal government in trust for the Community. As a result the powers of federal agencies are not subject to the same constitutional restrictions compared to federal-state relationships, and federal powers are more extensive on the reserve.

In most cases, however, both the Community and the federal governments share powers and responsibilities to provide public services to the Reserve and its Native residents. This is true for education, health, water supply, sewage disposal, police and fire protection, and streets and roads.

There is a major distinction in the use of the Reserve's natural resources--land, water, timber, minerals, fish, and wildlife. In these areas, the Secretary of the Interior (through the BIA) has much greater powers than does the Community government, in some cases possessing nearly exclusive powers to plan or permit any uses of natural resources.

The Community does, however, have several important tools with which to influence this process and accomplish its objectives. These tools include approval of agency operating plans, contracting of BIA functions, direct bargaining with federal agency officials, and lobbying for specific Congressional appropriations.

Approval of agency plans is an important tool. Generally, federal regulations require agency operating plans for the Reserve to be ratified by vote of the Community Council. BIA Timber Operating Plans are a good example of this process. In addition, many specific actions, such as land lease agreements, must also be ratified before BIA personnel may legally take actions committing Reserve resources. Through this means, the Community Council can exercise veto power over agency plans. The difficulty presented by this method is that vetoing proposed agency plans may result in long waits before new plans are drafted; consequently, lengthy (and often unacceptable) delays may result.

Contracting BIA functions is another tool which has only recently been available to the Community. The Indian Self-Determination Act allows Indian tribes, at their option, to contract directly with the BIA to perform part or all of certain functions normally performed by BIA personnel. The Community has used this opportunity to establish natural resources management and municipal services divisions. Control of these functions (including forestry and, to a lesser extent, fishery management) allows the Community to assure that staff work in these areas more closely conforms to Community wishes, and measurably speeds planning lead times.

Third, partly as a result of contracting BIA functions and better control over information-gathering functions, Community officials are now better able to bargain with officials of federal agencies exercising trust responsibilities over the Reserve.

Finally, the Community also sends officials to Washington, D.C. to directly lobby federal budget officials and legislators to secure specific appropriations for projects desired by the Community. As a result of better use of these tools, the Community has recently emerged with a newer, stronger voice in the use and management of its resources by federal trustees.

RELATIONSHIP WITH THE STATE OF ALASKA

A prior agreement with the federal government preempts the State of Alaska from exercising many of its powers within the Annette Islands Reserve. Most involvement by state agencies is service-oriented in nature, such as providing educational services; the state has little jurisdiction or power over most aspects of Community governance as it relates to use and management of coastal resources.

The State does, however, act as an advisor to the Community and BIA in many resource management decisions, such as the setting of commercial salmon harvest regulations, for the Reserve. The extent of State influence over Community resource management decisions thus depends to a large extent on how vigorously State agencies pursue this advisory role.

CHAPTER 9 POLICIES AND IMPLEMENTATION

The preceding chapters of this report have discussed the resources of the Annette Islands Reserve, and have analyzed the uses and management of those resources. The report has also presented issues facing the Community, and a list of goals and objectives for community development and resource management. Chapter 8 drew together the information presented to that point and discussed the approach to address the issues consistent with the goals and objectives.

In this chapter, the approach is presented in a systematic fashion, as a program of policies and actions. Some explanation of the format is helpful at the outset. As discussed in Chapter 2, the goals are general, broad statements of desired conditions in each area of resource management. Objectives are steps to be completed to attain the goals. Policies are the guidelines or "rules of thumb," which spell out the Community's stand on particular issues. Actions are the detailed steps, consistent with policies, which the Community and others need to take to satisfy overall goals and objectives.

This chapter describes how the governance system of the reserve functions in the operation and management of activities which affect or are affected by the Reserve's coast resources. This section also describes methods which will be used to manage these resources and implement the program's policies and standards.

Where not otherwise specified, actions taken by the Community and referred to in this chapter are first authorized by Council and implemented by the Mayor or his staff.

Fisheries

COMMERCIAL AND SUBSISTENCE FISHERIES AND SEAFOOD PROCESSING

One of the unique aspects of the Annette Islands Reserve is the 3,000-foot fishery reserve surrounding the islands. Commercial fishing in the reserve is set aside exclusively for Community members.

The BIA Southeast Alaska Area Office is responsible for management of the fishery reserve. Federal regulations, written especially for the Annette Islands Reserve, direct the BIA Area Director to set sport and subsistence fisheries regulations,

... in accordance with the season, gear and bag restrictions established by rule or regulation for Southeastern Alaska by the Alaska Board of Fish and Game. Both subsistence and sport fishing shall also be in accordance with such ordinances as may be adopted by the Council of Metlakatla Indian Community and approved by the Secretary of the Interior.

Also, the Commissioner of Indian Affairs, after consulting with Community officials,

... is authorized and directed, upon a determination of the necessity to promote sound conservation practices, to restrict or close to commercial, subsistence or sport fishing any portion of the Annette Islands Reserve by notice given appropriate local publicity. (25 CFR 88.6 (e))

The regulations also authorize the Community to operate fish traps at any four of eight specified sites within the Reserve. The regulations restrict commercial fishing (seine, gill net and troll) to periods when such fishing is allowed in adjacent areas by the Alaska Board of Fish and Game.

These regulations establish a complex management system, for both the BIA and ADFG must consider what the other will do before setting regulations and season openings for areas under its jurisdiction. Unfortunately, the relationship among the Community, BIA and ADFG is often adversarial, since much is at stake and the state of knowledge concerning the fishery resource is limited.

Both commercial and subsistence fishing are highly important. Many Community members earn their living fishing within the Annette Islands Fishery Reserve. Also, many fishermen have purchased state limited entry fisheries permits to fish in non-reserve waters, or participate in non-limited off-island fisheries.

Subsistence fishing is open to all Community members year round, except when specific areas are ordered closed by the Community Council for conservation purposes. Increasing numbers of Community are now fishing commercially within the reserve raising the possibility of conflicts with conservation enhancement and subsistence objectives of the fishery. Subsistence uses of bottomfish, shellfish, etc., do not appear to be threatened.

Seafood processing is also unique and important. The Community-owned Annette Island Packing Company has operated since 1924, providing an important source of income to Community residents. Profits of the company are also used by the Community Council to provide many public services.

To preserve and enhance the important values associated with fisheries and fish processing, the following goal , objectives, policies and actions will be applied:

GOAL 1: Management of fisheries resources to maintain or improve yield and provide income over the long-term to individuals and the Community.

OBJECTIVE 1.1. Determine the extent and characteristics of each commercially harvestable species.

POLICY 1.1.1. The Community will conduct and support research into the extent and characteristics of stocks of commercial fish species.

ACTION 1.1.1.1. Create a position of fishery manager under Annette Natural Resources Center. Fishery manager will conduct field surveys and other pertinent research into Annette Island's fishery stocks for management purposes, and will work with the Mayor and the Packing Company to manage the fisheries. Funding can come from BIA, EDA, or other federal or state agencies. One or more technical assistants will also help in the effort.

ACTION 1.1.1.2. If additional staffing is not feasible, or if staff requires technical assistance, contract for support from National Marine Fisheries Service, Alaska Department of Fish and Game, or outside consultants, to perform work noted in Action 1.1.1.1.

ACTION 1.1.1.3. Fishery manager will develop and follow study plan designed to determine:

- a) extent of fish stocks
- b) critical habitat needs
- c) spawning escapement needed to sustain stocks.

OBJECTIVE 1.2. Allow adequate spawning escapement to sustain or improve fish stocks.

POLICY 1.2.1. The Community shall establish harvest guidelines or catch quotas allowing spawning escapement sufficient to sustain the stocks at least at the level of equilibrium yield.

ACTION 1.2.1.1. Implement guidelines through Council-adopted ordinance and local fisheries enforcement.

ACTION 1.2.1.2. Follow-up research after fishing each year by local fishery manager or consultant to determine extent of spawning escapement.

POLICY 1.2.2. Net fishing near stream mouths shall be regulated to ensure that escapement is representative of the stream stock in terms of both species and timing.

ACTION 1.2.2.1. Fishery manager will collect data on the species and timing of escapement in important streams.

ACTION 1.2.2.2. Council has closed stream mouths to commercial net fishing (by ordinance and annual regulations)

OBJECTIVE 1.3. Develop and adopt an equitable method of allocating the harvestable surplus.

POLICY 1.3.1. The Community shall allocate the fishery harvest in a manner that allows a reasonable catch level to fishermen using all gear types, and to Community-owned vessels and traps.

ACTION 1.3.1.1. Once the allowable harvest level of each species is calculated (in Action 1.1.1.3.), the Council's Natural Resources Committee, the staff of the Natural Resources Department, and outside consultants or agencies (as needed) develop an allocation formula that satisfies the criteria of Policy 1.3.1.

ACTION 1.3.1.2. Council implements plan through adoption of ordinance, and enforces through island fishery patrol.

OBJECTIVE 1.4. Improve and implement enforcement capabilities.

POLICY 1.4.1. Recognizing that effective fishery management requires implementation of harvest guidelines, the Community shall strictly enforce harvest levels and allocation formulas.

- ACTION 1.4.1.1. Council establishes standards for fishery patrol procedures.
- ACTION 1.4.1.2. If effective enforcement by local personnel is not feasible, contract with U.S. Fish and Wildlife Service, Division of Law Enforcement or BIA or other appropriate agencies to perform these services.
- ACTION 1.4.1.3. Council ordinance establishes penalties for fishermen violating regulations and guidelines.

OBJECTIVE 1.5. Protect critical fish habitats.

- POLICY 1.5.1. The Community shall ensure that critical fish habitats are not degraded. (These habitats are described in this report, Chapter 4, and shall be supplemented by information collected in Action 1.1.1.3.b.)
- ACTION 1.5.1.1. Forester and fishery biologist conduct site-specific surveys of timber sale lands, or other areas subject to earthmoving or major construction projects.
- ACTION 1.5.1.2. Designation by fishery manager, in cooperation with Annette Island forester, of fishery protection zone along streams and shorelines, and development of standards for activities allowable in this zone.
- ACTION 1.5.1.3. Site-specific habitat protection clauses will be included in contracts for timber harvesting, road-building, and construction, and in land or water leases.
- ACTION 1.5.1.4. Community's forestry staff will monitor timber harvesting operations to ensure contract compliance.

OBJECTIVE 1.6. Enhance capabilities of habitats to produce fish.

- POLICY 1.6.1. In order to increase the size of salmon stocks around Annette Island, and to take advantage of natural habitat, the Community shall explore and implement measures to enhance salmon spawning habitat on the island.

- ACTION 1.6.1.1. Annette Natural Resources Center staff (with outside support as needed) will inventory streams and lakes with salmon-producing potential, analyze obstacles to salmon production (e.g., log jams, silted streambeds, waterfalls, beaver dams) and develop and implement program of removing obstacles where feasible. Among the activities to be considered are:
- o Construct deflectors in streams where analysis indicates that they will expand available spawning area without harming existing habitat.
 - o Plans for destratification of lakes to improve water quality and enhance productivity.
 - o Working with hatchery staff to plant coho fry in suitable lakes for rearing.

OBJECTIVE 1.7. Develop a commercial shellfish industry on Annette Island.

POLICY 1.7.1. The Community shall pursue State certification of the reserve's shellfish beds.

ACTION 1.7.1.1. Council will contact the State DNR and request certification research.

POLICY 1.7.2. The Community shall explore the extent and characteristics of the shellfish resource on the reserve.

ACTION 1.7.2.1. Annette Natural Resources Center will undertake test harvests of clams using to determine characteristics of shellfish beds and productivity of different combinations of harvesting equipment.

POLICY 1.7.3. Shellfish enterprise development shall emphasize private participation and maximize opportunities for Community member training and employment.

ACTION 1.7.3.1. Annette Natural Resources Center will explore methods of financing equipment and operating shellfishing enterprises on a private basis, and will convey this information to interested fishermen.

OBJECTIVE 1.8. Ensure continued availability of and access to fish by Community members for subsistence use.

POLICY 1.8.1. Community subsistence use of fish resources shall be accorded equal priority to commercial fishing.

ACTION 1.8.1.1. If sufficient data becomes available on stream escapement and carrying capacity (in Actions 1.1.1.3 and 1.2.2.1.), and if Council revises the fisheries ordinance to permit regulated terminal fisheries, the ordinance will ensure adequate supply for subsistence use and spawning escapement.

Forest Resources

Large scale logging on Annette Island began in 1967. At that time, the BIA responded to Community requests and established a position of Reserve Forester at Metlakatla. Several timber sales were then conducted. In 1976, the Community contracted with the BIA to provide forestry services, and establish a Forester position in the Annette Natural Resources Center. The number has since grown to two full-time Foresters and two Forestry Technicians.

Under BIA regulations, logging must be preceded by the preparation of a Timber Operation Plan which describes planned logging, road construction and reforestation activities. The BIA prepared an initial Timber Operating Plan in 1966, but the Community has refused to approve it. As a result, timber sales have been planned, approved and conducted on a case-by-case basis.

Since the Reserve Forester position has been under the control of the Community, staff work has been directed to updating the Timber Operating Plan to a satisfactory state and completing surveys, plans and legal documents needed to conduct future timber sales. In this way, timber sales can be timed to coincide with favorable market conditions and respond to Community financial needs.

Equally important, local management of the forest resources allows the development of policies and standards to protect the long-term productivity of the island's soils, streams and wildlife habitat. Other management activities are the establishment of long-range (10 years or more) timber sale plans coordinated with Community financial planning. Policies and regulations have recently been developed concerning use of beach driftwood logs. Community staff and officials will also address, as staff time allows, the question of best uses of timber sale income.

The Annette Hemlock Mill is situated on prime industrial land bordering Port Chester. Adequate land is available to the east to allow for expansion or new facilities. There are, however, two major problems associated with accommodating this type of processing.

One is the problem of bark and chip disposal. Although in other areas bark and chips are commonly processed into byproducts or consumed as fuel in processing, high transportation costs and fluctuating markets discourage Southeastern mills from utilizing the bark and chips. Instead, these materials are disposed of on the island.

A second problem is that log storage in Port Chester may have adverse effects on Port Chester's water quality. The Community has limited information of these effects, but has concluded that in-water storage in Port Chester is perhaps the best alternative that can presently be pursued.

Goals, objectives, policies and actions designed to address these issues are listed below.

GOAL 2: Management of forests on a multiple-use, sustained yield basis to provide income and employment to the Community.

OBJECTIVE 2.1. Establish a forest inventory system to store, classify and retrieve forest resource information.

POLICY 2.1.1. The Community shall collect and maintain data on growth rates, soils and other resource data in a manner compatible with automatic data processing.

ACTION 2.1.1.1. Research forester in Natural Resources Department will work in data collection, inventory and analysis of forest data.

ACTION 2.1.1.2. Develop computer coding system to store data, and program to retrieve and display data.

OBJECTIVE 2.2. Revise long-term timber operating plan.

POLICY 2.2.1. The timber operating plan shall incorporate results of recent management research, new inventory data, and changing Community preferences.

POLICY 2.2.2. The timber operating plan shall allow flexibility in cutting schedules to take advantage of changing market conditions.

POLICY 2.2.3. The timber operating plan shall incorporate the BIA trust responsibility to harvest timber on a sustained yield basis.

POLICY 2.2.4. The timber operating plan shall protect other non-timber uses of the forest such as fish and wildlife habitat, water supply, etc.

OBJECTIVE 2.3. Exercise greater Community self-determination over forest management.

POLICY 2.3.1. The Community shall promote greater public awareness of the opportunities and limitations of the island's forest resources.

ACTION 2.3.1.1. To increase awareness among Metlakatla students, the Community's foresters will prepare and deliver slide presentations, posters, charts, and other displays to the schools on forest management on Annette Island.

ACTION 2.3.1.2. To provide the Council with additional information the Community forester will conduct on-site inspections of timber sale areas for Councilmen.

ACTION 2.3.1.3. To enhance awareness of the general public, the forester will prepare articles on forest management and issues for the Community News.

POLICY 2.3.2. The Community shall encourage direct employment of Community members in forest management and timber harvesting on Annette Island.

ACTION 2.3.2.1. Establish a program of forestry training to provide students with career and educational opportunities.

ACTION 2.3.2.2. Work with other Indian reservations and public agencies with similar responsibilities to exchange services, information and expertise in training for forestry careers.

ACTION 2.3.2.3. Include employment preference clauses in timber sale contracts to insure Community members the opportunity to work in timber harvesting operations.

POLICY 2.3.3. In order to maximize returns from its timber sales, the Community shall explore and analyze the feasibility of the following actions:

ACTION 2.3.3.1. Present system of contracting timber sale and roadbuilding as one package.

ACTION 2.3.3.2. Contracting the roadbuilding and the logging as two separate contracts, with the Community financing the roadbuilding, in order to attract additional bidders on timber sale.

ACTION 2.3.3.3. The Community building its own roads, and selling the timber separately.

ACTION 2.3.3.4. The Community building its own roads, and harvesting and marketing its own timber.

ACTION 2.3.3.5. The Community contracting the timber harvesting, but marketing the timber itself.

OBJECTIVE 2.4. Maintain soil productivity.

POLICY 2.4.1. The Community shall acquire baseline information on soils of Annette Island.

ACTION 2.4.1.1. Conduct a study of the island's soils, to include at least:

- o inventory and mapping of soil types;
- o analysis and interpretation of suitabilities and sensitivities of soil types to specific uses;
- o recommendations of silvicultural, management and harvesting practices for each soil type.

POLICY 2.4.2. The Community shall not permit or contract for activities which are likely to result in significant soil erosion, mass movement, or loss of the upper soil layer.

ACTION 2.4.2.1. Timber sales will be designed and roads will be engineered to minimize logging, roadbuilding, and other soil disturbance on slopes in excess of 67%.

ACTION 2.4.2.2. Contract specifications will require yarding techniques that minimize the disturbance of the upper soil layer. All logs shall be yarded uphill, away from streams, with at least the leading end of the log elevated.

ACTION 2.4.2.3. The Community's foresters will monitor logging operations to ensure contract compliance.

OBJECTIVE 2.5. Maintain water quality.

POLICY 2.5.1. The Community shall not permit or contract for activities which are likely to introduce sediment into perennial streams and lakes.

ACTION 2.5.1.1. All timber sales will leave an unlogged or selectively logged streamside protection zone on both sides of all perennial streams and their tributaries. The width of these zones shall be determined by a forester and fishery biologist to ensure against sedimentation into the stream, or blowdown of the timber.

POLICY 2.5.2. The Community shall not permit or contract for activities which are likely to increase the summer temperature of streams beyond the range optimal for salmon habitat.

Standard 2.5.2.1. Streamside protection zones shall be wide enough, and sufficient large trees shall be retained to shade the stream.

Standard 2.5.2.2. No activities or structures shall be permitted which are likely to increase stream temperatures 4.0 degrees F. (1.8 degrees C.) above natural temperature, nor shall they exceed 60.0 degrees F. (15.5 degrees C.)

POLICY 2.5.3. Log handling and rafting operations shall be conducted so as to minimize impact upon water quality.

ACTION 2.5.3.2. The log dumps in Hemlock Bay and Annette Bay shall be used for timber logged from the north half of Annette Island. If new log dumps are established, they shall meet the following standards

Standard 2.5.3.2. Logs or log bundles shall be lowered by crane, rather than dumped into the water.

Standard 2.5.3.3. Log rafts shall be stored in water having sufficient circulation to prevent accumulation of leachates. Tidal currents in rafting areas shall be at least 0.10 mph one hour after and one hour before high and low tides; or surface outflow shall be at least 0.07 mph at the time of high tide. These flow rates shall be measured during the dry season.

Standard 2.5.3.4. Log booms shall be located in water deep enough to prevent grounding of logs at extreme low tide.

Mineral Development

Few commercially valuable minerals are known to be sufficiently abundant on the reserve to make mineral extraction likely in the near future. Annette Island does, however, contain deposits of barite which could prove to be commercially feasible. With some preparation, the Community can respond knowingly, should interest in exploration and development of these and other deposits arise.

A related issue in use of the reserve's minerals involves extraction of rock and gravel. Glaciation and muskegs have left the island short on structurally sound soil, and as a result, fill, road-building material and aggregate must be obtained from rock quarries or beaches, raising the question of conflicts with other resources.

Goals, objectives, policies, and actions related to mineral extraction and processing within the reserve are listed below.

GOAL 3: Development of non-renewable mineral resources in a manner that will maintain the productivity of renewable resources and will provide long-term economic benefit to the Community.

OBJECTIVE 3.1. Establish a relationship between the Community and a mineral development firm for the purposes of exploration and development.

POLICY 3.1.1. Recognizing that the costs of mineral development are high, the Community will pursue a formal relationship with a private mineral development firm.

ACTION 3.1.1.1. Contact private firms to determine their interest in a formal relationship with the Community (see list in PRPI, 1977c).

ACTION 3.1.1.2. Form a joint-venture partnership or corporation with the mineral development firm.

POLICY 3.1.2. In the interests of stimulating the local economy, the Community shall encourage employment of Community members in on-island mineral exploration and development.

ACTION 3.1.2.1. Provision in mineral rights lease requiring corporation to hire Community members for at least half the jobs in on-island work if Community members wish to become involved.

OBJECTIVE 3.2. Determine potential of known mineral deposits.

POLICY 3.2.1. The Community shall promote efforts to define the extent of mineral deposits on Annette Island.

ACTION 3.2.1.1. Council requests continued technical assistance from U.S. Geological Survey and BIA.

ACTION 3.2.1.2. Further exploratory work, engineering, and feasibility analysis by private mineral development firm.

OBJECTIVE 3.3. Specify extraction methods that will not impact upon the water quality or soil productivity of the surrounding areas.

POLICY 3.3.1. Recognizing that the reserve's timber and fish resources depend on productive soil and adequate water quality, the Community will ensure that mining operations minimize their impact upon lakes, streams, or marine waters, or upon the soils outside the limits of the mining area.

ACTION 3.3.1.1. Before any mining begins, the Annette Natural Resource Center will delineate the limits of the area needed for mining (as determined in Actions 3.2.1.1 and 3.2.1.2.) These areas must be at least 400 feet horizontally from any stream, lake or marine waters, and must be determined, from engineering studies, to be on soils which are not subject to slides or other mass soil movement. The best practicable technology will be employed in extracting the minerals.

ACTION 3.3.1.2. By controlling interest in any enterprise, or by use of permits or leases, the Community will specify the following standards for mining:

STANDARD 3.3.1.2.1. All overburden or mine tailings shall be retained inside the mining area.

STANDARD 3.3.1.2.2. Roads and other access shall, at a minimum, follow standards specified for logging roads in the Community's timber sale contracts.

ACTION 3.3.1.3. The Council will not permit gravel extraction from beaches until an analysis is completed which projects the effects of the extraction upon other resources, and includes measures to minimize the negative effects.

OBJECTIVE 3.4. Establish a permanent fund with proceeds from the mineral development.

POLICY 3.4.1. Because minerals are a non-renewable resource and can be extracted only once, the Community shall invest at least one-half of its returns from mineral development in a permanent fund, to convert the non-renewable resources into a continuing source of funds.

ACTION 3.4.1.1. Council will pass an ordinance establishing a permanent fund, with no withdrawals to be made from the principle, and with the interest to be applied to resource development projects.

POLICY 3.4.2. Because mineral development projects will cause some impacts to soil, timber and wildlife in the mining area, these areas will be restored to a productive conditions after the mining is completed.

- ACTION 3.4.2.1. A portion of the proceeds from the permanent fund will be used by the Community (through the Annette Natural Resource Center) to restore former mining areas to a productive state.
- ACTION 3.4.2.2. If no ownership agreement has been developed, the Community will require a surety or performance bond from the mining company to pay for restoration.
- ACTION 3.4.2.3. Local workers will be employed in restoration projects.

Land and Water Development

This section describes the objectives, policies and actions of the Community which relate to coastal development, geophysical hazard areas, energy facilities, transportation, and utilities.

COASTAL DEVELOPMENT

The Annette Islands Land Use and Housing Plan presents an overall plan and program to guide coastal development in the community. Since buildable land is quite limited, the plan identifies areas suitable for development based on soils, vegetation, coastal hazards, and proximity to existing utilities and services. (Since all land is owned in trust for the Community, land ownership was not a consideration.) Generally beach uplift areas and areas previously developed for federal use (Airport, Annette housing area) are considered prime developable sites. The officially adopted land use plan for the Community is presented in Chapter 4 of that report. Other goals, objectives, policies, and actions necessary to implement the land use plan, in addition to other coastal development considerations not considered in that plan, are presented herein.

Among the considerations involved in the development of the Annette Islands Land Use and Housing Plan were geophysical hazard areas. These areas, which are classified in that plan as "Natural Hazard Unit" are managed by general use guidelines used by the Community in leasing, assignment, or facility construction decisions. (See Chapter 5 of land use plan.)

TRANSPORTATION

One of the trust responsibilities of the Bureau of Indian Affairs is to provide roads to service development on the reserve. The State of Alaska provides a floatplane dock and ferry landing. The Annette Airport is maintained by the Community. Policies and actions for use of the airport are covered by a master plan, currently in draft form.

UTILITIES

Past analyses have concluded that, although there are no cheap solutions to energy problems, hydroelectric power appears to have the greatest potential for low-cost reliable power. As a result, the Community is proceeding with

plans to raise the existing dam at Chester Lake and convert it to hydroelectric use to supplement the Purple Lake power plant.

Beyond this action, the Community might explore other sources of power as well. Energy conservation, through housing rehabilitation and construction of new homes, is already underway, but might be developed further.

Drinking water sources, at Chester Lake and Yellow Hill Lake, are both accessible to the public, but so far no significant water quality problems have arisen with either source, and capacities appear adequate for present and projected use. The water system was constructed by the Indian Health Service and is operated by the Community. Watershed management is controlled by the Community and the BIA. The Community does not allow swimming in either lake.

Goals, objectives, policies and actions related to land and water development are listed below.

GOAL 4: Land and water development to provide opportunities for the Community, enhancing the qualities for which an area is developed, while maintaining the productivity of renewable resources and the character of the island.

OBJECTIVE 4.1. Develop Metlakatla waterfront to promote water-oriented use and access, while maintaining the quality of the environment.

POLICY 4.1.1. The Community shall pursue and support projects to increase public use of the waterfront

ACTION 4.1.1.1. Develop new small boat harbor and support facilities.

ACTION 4.1.1.2. Develop and improve public access at vacant waterfront sites by constructing mini-parks, with tree and shrub plantings, picnic tables, litter receptacles, and benches.

ACTION 4.1.1.3. Develop a city park and parking area at floatplane ramp (see conceptual design in Annette Islands Land Use and Housing Plan, p. 78)

ACTION 4.1.1.4. Provide street trees and other plantings along Western Avenue between floatplane dock and longhouse.

POLICY 4.1.2. Development criteria of the land use and housing plan will be followed in coastal development decisions.

ACTION 4.1.2.1. Council's Planning Committee will review development proposals for consistency with development criteria in land use plan.

OBJECTIVE 4.2. Provide new roads to undeveloped areas when needed and feasible.

POLICY 4.2.1. The Community shall initiate and/or approve

construction of new roads to undeveloped areas only when it is evident that presently accessible areas are used to their capacity.

POLICY 4.2.2. Development of non-logging roads shall be initiated by the Community, but construction and maintenance shall be the responsibility of the BIA.

ACTION 4.2.2.1. When the Community has a demonstrated need for new roads, the Council passes a resolution requesting the BIA to construct and maintain the new road.

POLICY 4.2.3. Road development shall not be initiated unless sufficient funding is committed by the BIA to ensure that roads will be maintained and that recreation facilities will be provided to help prevent littering, vandalism, etc. (See Objective 4.3.)

ACTION 4.2.3.1. Community obtains a written commitment from the BIA that it will comply with Policy 4.2.2.

OBJECTIVE 4.3. Provide outdoor recreation facilities on Annette Island which will satisfy the needs of the Community members.

POLICY 4.3.1. The Community shall strive to maintain a high quality of recreation experience on Annette Island.

ACTION 4.3.1.1. Maintain inventory of areas used for recreation purposes, their degree of use and degradation of the site.

ACTION 4.3.1.2. Formulate strategies and conceptual designs to maintain, improve and/or control the use of existing areas used for recreation.

POLICY 4.3.2. The Community shall seek opportunities to develop low-cost, highly durable recreation facilities.

ACTION 4.3.2.1. Develop recreation areas through the use of local skills and materials.

ACTION 4.3.2.2. Focus the energies of local civic groups to support and actively be involved in the development and maintenance of recreation facilities on the island.

ACTION 4.3.2.3. Utilize vacant lots in Metlakatla, on a temporary basis, to establish portable playgrounds with the equipment to be removed if and when the site is needed for development.

OBJECTIVE 4.4. Provide energy and other utilities at the lowest practical cost when needed.

POLICY 4.4.1. The Community shall pursue development of electrical and other utilities using local, renewable sources whenever possible.

ACTION 4.4.1.1. Pursue development of the Chester Lake hydro-electric project.

ACTION 4.4.1.2. Analyze, as available funds and staff resources permit, the potential of sources of hydro, thermal, wind or other power available to the Community.

ACTION 4.4.1.3. Promote energy conservation in the Community's homes, and promote awareness of energy conservation needs among residents.

Economic Development

Recent losses in employment due to relocation of federal employment and uncertain fisheries and forest products activities have made it imperative that the Community government actively pursue the development of new employment and income producing activities.

Since 1966, the Community has operated an Economic Development Planning Office. Goals, objectives, policies and actions of the office's activities are listed below.

GOAL 5: Development of a productive, diversified, stable economy, providing meaningful employment for Community members.

OBJECTIVE 5.1. Diversify the island's economy to provide protection against any one activity or industry exercising undue impact on the Community.

POLICY 5.1.1. New or existing business enterprises shall be encouraged to utilize Community members to fill job openings wherever possible.

ACTION 5.1.1.1. Land or facility leases with enterprises not owned or controlled by a Community member shall contain a provision encouraging employment of Community members at Annette Islands-based jobs.

POLICY 5.1.2. Community shall devote resources (financial, technical assistance, etc.) to aid Community members in establishing and maintaining, or expanding business enterprises.

POLICY 5.1.3. Community shall promote or otherwise encourage enterprises with opportunity for off-season employment and ease of entry to adjust for availability of community labor force.

POLICY 5.1.4. Community shall promote private, rather than public, ownership of enterprises wherever possible, to take maximum advantage of initiative of Community members.

POLICY 5.1.5. Enterprises which export or sell most of their product to off-island clients shall be encouraged to diversify to reduce dependence on single markets, and to smooth the ups and downs of traditionally cyclical activities.

ACTION 5.1.5.1. Forest Products Activities: The Community shall explore feasibility (and pursue establishment) of new forest products activities on the island. Activities to be examined include:

- o Processing of round logs and cants into dimensional lumber.
- o Kiln drying (using wood chips from sawmill for energy).
- o Veneer plant (for plywood manufacturing).
- o Shake and shingle manufacturing.
- o Log storage

ACTION 5.1.5.2. Manufacturing and Trade Activities. Community shall explore feasibility (and pursue establishment if promising) of new manufacturing and trade activities on the island. New activities to be examined or pursued include:

- o Mineral development staging.
- o Prefabricated building component manufacturing.

ACTION 5.1.5.3. Fisheries Activities. The Annette Natural Resource Center will explore the feasibility of (and pursue the establishment of, if promising) new fisheries activities based on the reserve. Among the activities to be examined are:

- o Expanded harvesting and processing of bottomfish and shellfish from the Gulf of Alaska or Annette Islands waters.
- o Salmon smokery.

ACTION 5.1.5.4. Minerals and Energy Production. Annette Natural Resource Center will explore the feasibility of (and, if promising, pursue) mineral and energy production activities on the reserve. Among the activities to be examined are:

- o Barite mining.
- o Electricity generation through use of wind power or use of wood waste from sawmill.

OBJECTIVE 5.2. Achieve economic development which strikes a reasonable balance between environmental and economic values.

POLICY 5.2.1. Long-term use of coastal resources shall be preferred over short-term use in the Community's economic development program. Where short-term use is either unavoidable or judged by the Council to meet major Community needs (such as providing substantial employment) part of the revenues to the Community shall be reserved for restoration and enhancement of the resources once the use is completed.

IMPLEMENTATION NEEDS

As the reader may surmise, the Coastal Management Program of the Annette Islands Reserve is an ambitious attempt by a uniquely situated local government to comprehensively manage vital natural resources. Many of the management activities listed above, particularly those of a regular, ongoing nature, have been provided locally through a combination of local, State and federal funding.

Non-regulatory management activities, such as research and data collection, compilation of inventories and management activities for specific resources, however, have not been funded at a desirable level. Table 9-1, following, presents current and proposed activities of the Annette Natural Resource Center and other Community functions related to coastal resource management. Some of these activities are proposed for funding under Section 306 of the Coastal Zone Management Act. Briefly, these activities are:

- o Institution of fisheries resource management capabilities. (\$25,000)
- o Initiation of a comprehensive soil survey (\$10,000)
- o Water quality, streamflow, and precipitation research to establish management information on important fish spawning and rearing areas, and potential aquaculture sites. (\$35,000)
- o Continuation and expansion of computerized resource data inventory system (1 staff position, \$16,000)

Table 9-1

Annette Natural Resources Center
Current and Proposed Resource Management Activities and Funding Level

Assoc. Staff*	Activity	"306" Funds	Other Funds Met. Ind. Community and Others
<u>Forestry</u>			
2-P	Contract timber sale admin.	-	X
2-P	Forest redevelopment	-	X
<u>Fisheries</u>			
5-P 3-P	Salmon hatchery - egg collection, propagation and release	-	X
Fisheries planning, management and enforcement			
1-P, 5-S 1-S	Salmon fishery - enforcement Herring fishery - planning, management, enforcement	-	X
PR	Shellfish development and PSP research	-	X
PR	Fisheries management planning	\$ 25,000	
<u>Other Natural Resources Planning and Management</u>			
4-P PR	Administration reserve soil survey	- 10,000	X X
PR	Mineral strategy development	-	X
PR	Water quality and streamflow research	35,000	-
1 + PR	Completion of automated resource inventory system	16,000	
<u>Community Planning and Economic Development</u>			
2-P	Program office	-	X
<u>TOTALS</u>		<u>\$ 86,000</u>	

P - Current number of full time staff S - Current number of seasonal staff
PR - Proposed project
X - Indicates other funds will be used to support activity.

CHAPTER 10

AREAS WHICH MERIT SPECIAL ATTENTION

Although all of the Annette Islands Reserve is important in the functioning of the freshwater, marine and upland ecosystems which produce the natural resources, there are several areas which are particularly noteworthy as locations of resource production and use. These include three estuaries and their upland drainage basins, where uses range in intensity from light recreation to heavy industry, but which have a high potential to produce renewable natural resources. These three areas, Canoe Cove, Tamgas Harbor and Port Chester, and their watersheds, (Figure 20) are recommended as Areas Which Merit Special Attention in order to devote to them more intensive efforts in resource inventory and management.

Canoe Cove and Watershed

(1) Basis for Designation (under Alaska Coastal Management Act)

(A) *"areas of scarce, fragile or vulnerable natural habitat"*

Of all the estuaries on Annette Island, the inner portion of Canoe Cove is the most protected from wave action, and is one of only a few substantial areas of soft-sediment tideflat with tidal marsh on the west side of the island. The tideflats and marshes are vulnerable to disturbance from any vehicle use or construction. The streams feeding the cove are also vulnerable to disruption by activities in the uplands.

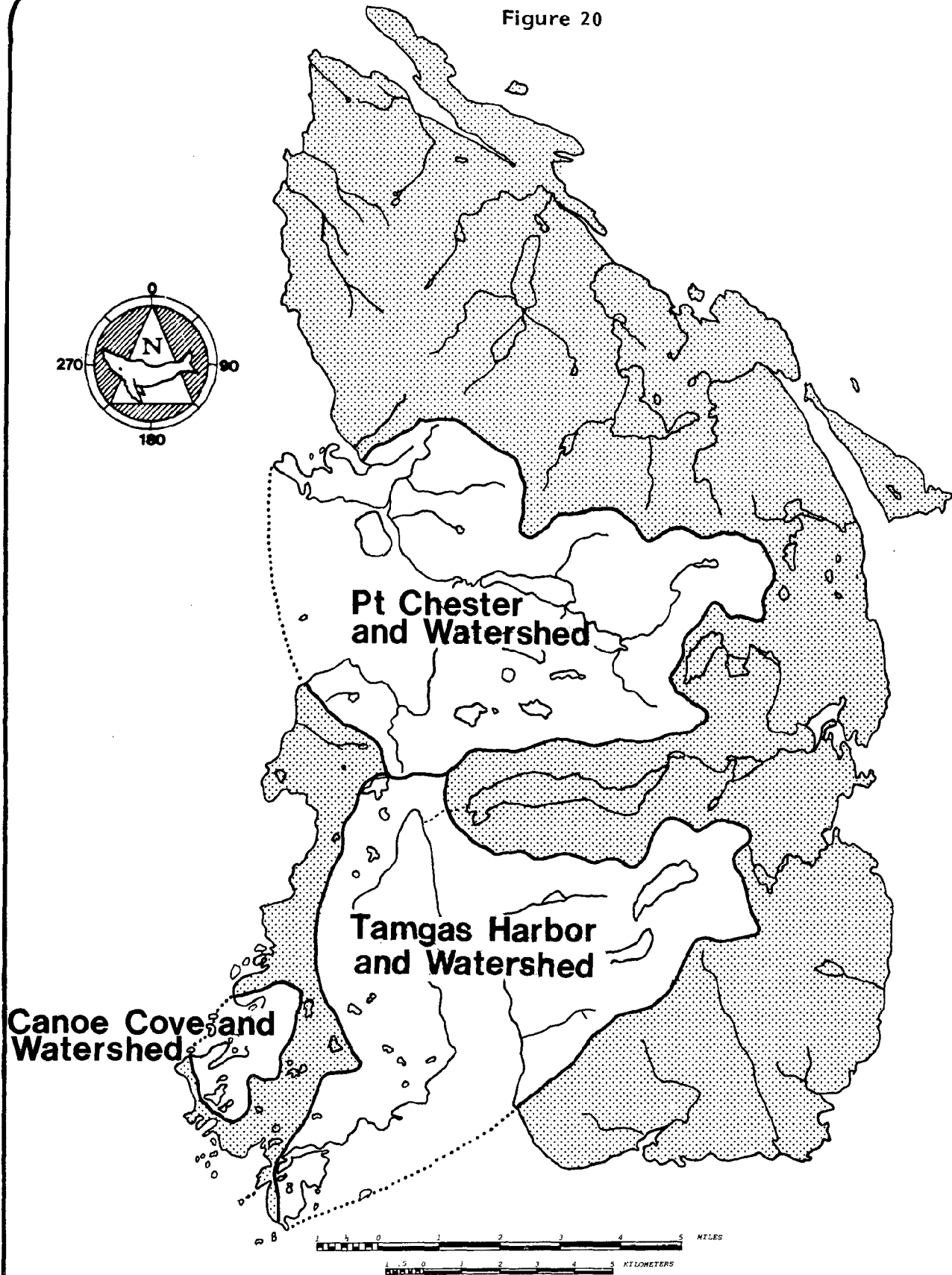
(B) *"areas of high natural productivity or essential habitat for living resources"*

The tidal marshes and eelgrass beds in the estuary have a high primary productivity, and the tideflats appear to be exceptionally productive of clams. The streams feeding the bay are essential spawning habitat for pink, chum and coho salmon, and the tideflats are probably essential feeding habitat for the pink and chum salmon.

(C) *"areas of substantial recreational value or opportunity"*

Canoe Cove is presently used for recreation by some Metlakatla residents. With minor improvements, it could draw additional recreationists without harming the natural systems.

Figure 20



Areas Which Merit Special Attention

(2) Map

Canoe Cove and its watershed are mapped in Figures 21 and 23.

(3) Description of the Area

The smallest of the three AMSA's, Canoe Cove is a 415-acre (168 hectare) embayment on the west side of the Metlakatla Peninsula. As Figure 21 shows, the cove can be divided into an outer cove and an inner cove, based on the exposure to the more open waters of Nichols Passage and Clarence Strait.

The inner cove includes the southern one-fifth of the area of Canoe Cove. It is composed largely of tideflats and shallow water, and is protected from the open water by a narrow constricted entrance, and by several small islands and gravel bars which break the force of the waves at high tide and restrict the circulation of the water. The inner cove is accessible to hikers by a short trail leading from the end of Canoe Cove Road.

The outer cove includes the area north of the inner cove, out to a line running northeasterly from Point McArthur to a U-shaped island in the cove, and then northerly from that island to the first point of land. The low tide exposes a much smaller portion of the outer cove than the inner cove.

Water Conditions

The water conditions in Canoe Cove make possible the growth and survival of the population of marine and estuarine organisms which inhabit or migrate through the cove. At the time of preparation of this report only a small amount of quantitative data on water conditions was available, from sampling in August, 1978, and January, April and May, 1979. (Appendix IV). This discussion is based on those data, along with observations from winter, 1977, and spring, 1978.

The available data do not show any certain deficiencies in the ability of Canoe Cove's water to support fish and shellfish, but they do point toward possible problems, the severity of which depends on circulation and exchange.

The highest temperature recorded to date was 15.0° C on the surface in the outer cove on a hot day in August, 1978. This temperature is within the range required for survival by salmon, although not within the optimum range as listed by Bell (1973). The lowest dissolved oxygen levels were measured only in January, 1979 at 7 ppm on the surface and 6 ppm on the bottom of the Outer Cove, and 7 ppm on the surface and 8 ppm on the bottom in the Inner Cove, the 6 ppm needed for salmon survival.

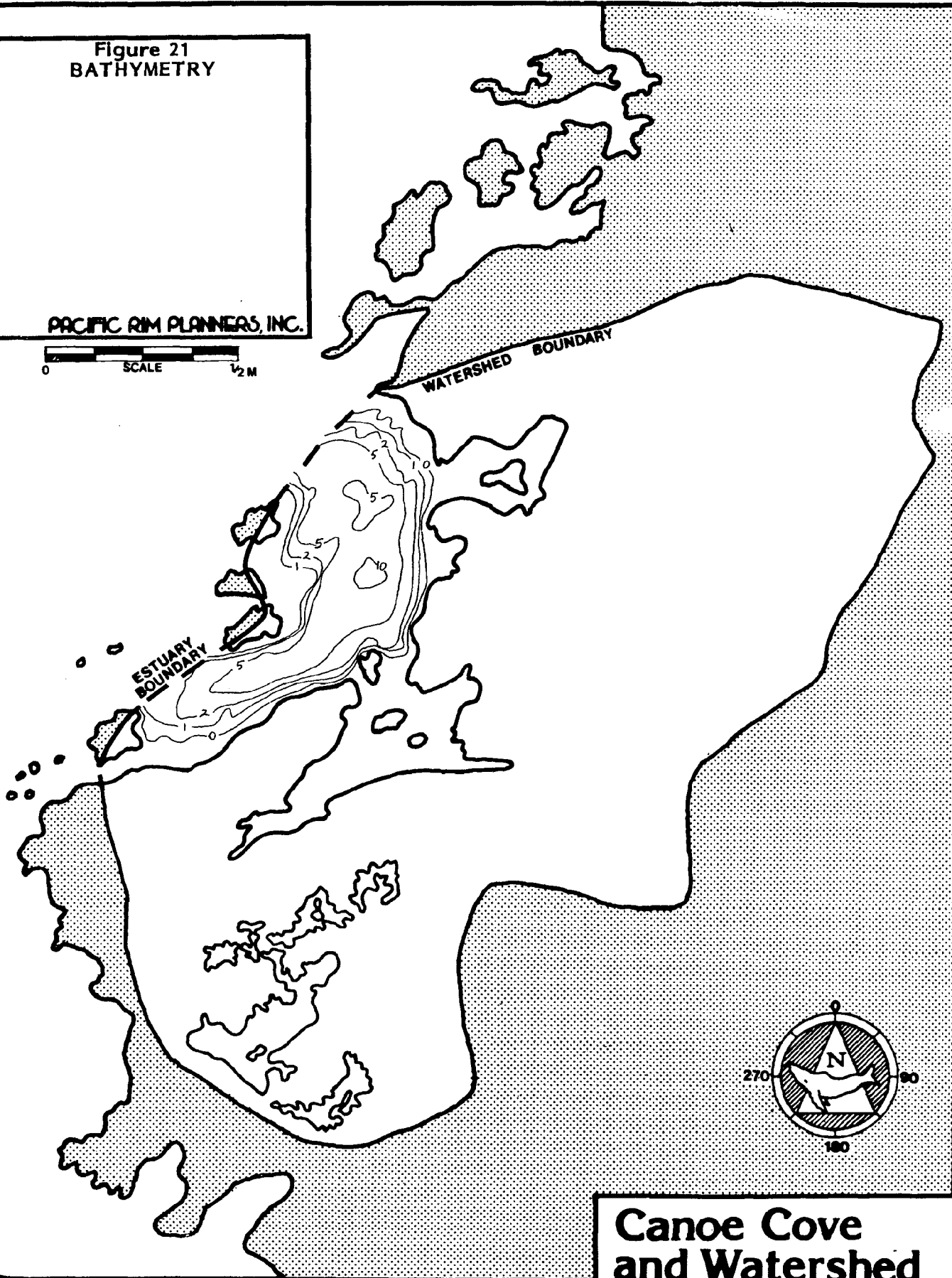
It is possible that in the summer the water in the inner cove may undergo changes that would stress salmon. When the tide brings the warm surface water from the outer cove into the inner cove, over the sun-heated tideflats, the temperature of the water might exceed the 16° C

Area Which Merits Special Attention

Figure 21
BATHYMETRY

PACIFIC RIM PLANNERS, INC.

0 SCALE 1/2 M



Canoe Cove
and Watershed

upper limit of salmon tolerance. Not only would the temperature be dangerously high, but the oxygen would be less soluble in the warmer water. At 18°C, for instance, the dissolved oxygen would drop to no higher than 6 ppm.

Whether such a problem would be a serious limitation on the cove's ability to produce fish and shellfish would depend on whether the circulation patterns of Canoe Cove allow any warm, oxygen-deficient water to be exchanged with cooler, oxygen-rich outside water.

Circulation in Canoe Cove is controlled largely by two factors. Tidal action carries seawater from Clarence Strait into and out of the cove twice daily. In addition, freshwater runoff from the uplands enters Canoe Cove from three major streams and several smaller streams. As this freshwater enters the cove it displaces seawater, helping to flush out the cove into Clarence Strait, and assisting in the maintenance of water quality. In addition, the freshwater outflow promotes an inflow of nutrients, as described in Chapter 5.

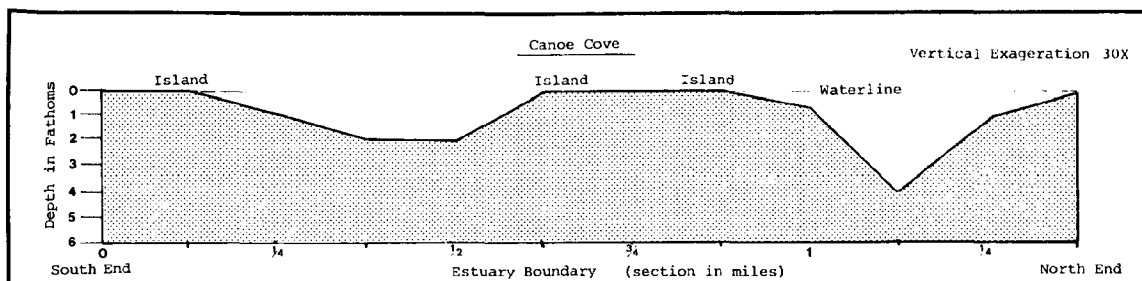
Visual observation at the head of the inner cove indicates that, during times of substantial upland runoff, the water of lower salinity, being less dense than the water of higher salinity, flows out in a somewhat discrete layer on top of the higher salinity water. The layering, or lack of layering, is important in the circulation of water in the cove, since unmixed water masses are likely to undergo less exchange with outside waters. This layering is sometimes maintained (to a lesser extent) in the outer cove as well, in spite of the greater wave and current action. Summer sampling (August, 1978) there revealed a shallow layer of warmer, lower salinity water on the surface, with colder water of a slightly higher salinity below a meter depth. The shallowness of this layer of less dense water suggests that tidal currents and waves generated by north winds probably mix the waters of the outer cove. The data from January, 1979, taken during a time of north winds, also show fairly good vertical mixing of water in the outer cove, as does data from April and May, 1979.

Besides vertical mixing, horizontal mixing of water inside and outside the cove is important in determining its circulation patterns. The movement of water into and out of Canoe Cove was investigated in a series of float studies (PRPI, 1977a). Results from one ebbing tide and one flooding tide showed surface water moving between the head and the mouth of the inner cove in less than half a tide change. At that time (January, 1977) the outflow of low-salinity surface water did not prevent tidal water from moving from the mouth to the head of the inner cove, also at the surface. The narrow entrance is not so constricted as to prevent water from the head of the inner cove from moving out into the outer cove. Once in the outer cove, its exchange with seawater from Clarence Strait or Nichols Passage likely depends on the strength of the tidal currents. In May, 1979, at a time of noticeably strong tidal currents, the waters of Canoe Cove appeared to be nearly identical to those of Clarence Strait outside.

Further complicating the question of flushing and renewal of the water in Canoe Cove is the fact that the bottom of the outer cove between Point McArthur and the islands to the northeast is shallower than it is

to the east or to the west (Figure 21). This formation, referred to as a sill, restricts the circulation of the deeper water on either side. Thus, while the mouth of Canoe Cove is over 5,800 feet (1768 meters) wide at the surface, the unobstructed channel of greater than 12 feet (4 meters) deep is only 1,450 feet (442 meters) wide, about one-fourth the width of the mouth at the surface (Figure 22).

Figure 22
Canoe Cove, Cross Section Across Mouth



Until the circulation patterns, and the resultant water quality can be more fully documented, the inner part of Canoe Cove must not be considered suitable for intensive aquaculture operations. While the fish and shellfish using the estuary confirm its ability to support their populations at the existing (and unknown) levels, there is enough evidence to suggest that large number of fish confined in floating pens or other structures might require more water flow, colder temperatures and more dissolved oxygen than would be available in the summer.

Sediment

In the outer cove, wave action from open waters scours away the finer sediment particles (gravel, sand and silt) leaving primarily large cobbles, angular boulders and exposed bedrock on the beach. In the spaces between and under the boulders, some gravel and sand has collected, but elsewhere it is absent in these exposed areas. Also absent or inconspicuous is organic debris and detritus from fragmented or dead plants and animals. This material is either washed away by the waves into deeper, quieter water, or quickly consumed by animals.

In the constricted channel between the outer cove and the inner cove the action of the water is less severe. Cobbles are more prominent on the beach here than in the outer cove, along with some angular boulders.

Further inside, the inner cove is protected from most strong wave action, and tidal currents appear to be the main influence in transporting sediment. Here finer sediment is able to settle out, forming extensive tideflats. With the exception of a few channels through which the outgoing water flows, the entire inner cove is exposed at MLLW. In the areas with little scouring action by currents, the tideflats are composed largely of sand, silt and clay. In other areas, particularly at the mid-tide elevation, where the current is strongest, the beach is made up of cobbles and gravel with the finer sediments found only underneath, where they cannot be washed away by the currents. There are also a few bedrock outcrops in the inner cove, protruding from the tideflat at low tide, and appearing as small islands in the cove at high tide.

The calm water in the inner cove has also allowed the accumulation of decomposing organic material in the fine sediment. As this material is broken down by bacteria, the dissolved oxygen becomes insufficient to support the aerobic (oxygen-consuming) bacteria, and the decomposition is then carried on by anaerobic (non-oxygen-consuming bacteria). These bacteria produce the characteristic black color and hydrogen sulfide (rotten eggs) odor in the sediment. The color and odor of the tideflats therefore indicate insufficient oxygen to support both aerobic bacteria and the animal life present there (Green, 1968).

Benthic Habitats

The animals and plants of the benthic, or bottom-dwelling community vary greatly in their structure and behavior with the diverse habitats found in Canoe Cove. The type of substrate, determines to a great extent which organisms can inhabit an area.

The outer cove's beaches characterized largely by solid bedrock, boulders and cobbles, affords habitat for attached animals, such as sponges, barnacles, mussels and anemones, and for clinging animals such as sea-stars, snails, limpets and chitons. These animals, and the rockweed, kelp and other species of algae present are exposed to rougher water than are those on the inner cove. By permanently attaching themselves to a rock, or clinging to the rock and moving very slowly, they can protect themselves against the wave action.

Motile animals (those which walk or swim) are represented in the outer cove by purple shore crabs, hermit crabs, other small crustaceans and blennies (small eel-like fish). These animals are found in the spaces under and between the boulders and cobbles, where they are protected not only against wave action but against predators as well. While they are not readily visible to the casual beachwalker, they become more apparent if one turns over the boulders and cobbles. Burrowing animals, such as clams and worms, are sparse here, due to the rocky substrate which is unsuitable for burrowing. Subtidally, where wave action is less intense and rich kelp beds enhance the habitat, larger invertebrates such as octopus, abalone, and rock scallop inhabit the cove (Chuch Osborne, U.S. Fish and Wildlife Service, personal communication, February, 1977) along with smaller animals including anemones, nudibranches, seastars and sea cucumbers, which live in water just below the MLLW line.

In the inner cove, where the sediment is composed of smaller cobbles, gravel, sand and mud, burrowing animals are predominant. Littleneck and butter clams are common in the gravel beds, while *Macoma* clams inhabit the sand and mud. Polychaete worms (bristleworms) burrow in the tideflats as well.

The marine vegetation in the inner cove is dominated by rockweed, which, although it lacks a solid substrate for attachment, thickly covers vast areas of the tideflats. At tide levels below MLLW, such as in the tidal discharge channels, beds of eelgrass grow in the soft sediment. Both the rockweed and the eelgrass serve as food, shelter and a surface for attachment for a diversity of animals and plants.

The eelgrass and the animals of the tideflat provide food for migratory waterfowl, indirectly contributing to hunting in Canoe Cove.

The U.S. Fish and Wildlife Service has found that the inner cove is extremely rich in Dungeness crabs, and possibly serves as a nursery area for juvenile crabs. Spot shrimp, another commercially valuable shellfish species, have been found to use the quiet waters of the inner cove.

Aside from using the eelgrass habitat, attached and clinging species in the inner cove are limited to two habitats. They use the rocky substrate on the few small islands, and the cobbles that line the shoreline at the mid-tide levels. These animals include periwinkles and limpets on the cobbles, joined by barnacles and mussels on the larger cobbles, boulders and bedrock.

Fish

Available information on fish utilizing Canoe Cove is extremely limited and conflicting. Sampling by the U.S. Fish and Wildlife Service found no fish in creeks which they labelled "Canoe Cove Creek I" and "Canoe Cove Creek II." The USF&WS sampling effort may not have been sufficient to document fish use in those streams, or the sampling may not have coincided with the timing of spawning escapement and juvenile outmigration.

Reports from local residents rate Canoe Cove as valuable to the fishery resources of the island. The stream flowing into the southeast corner of the inner cove apparently supports pink salmon, while one feeding the southwest corner is reported to be an excellent coho stream. One fairly successful Metlakatla fisherman reported in 1977 that, during spawning runs, the cove is "plugged" with salmon. Gillnet Creek, feeding the outer cove was rated by the USF&WS as good spawning habitat and is used by pink, chum and coho salmon.

Other fish likely to use Canoe Cove include flounder and sole feeding on the burrowing animals of the inner cove during high tide, and sculpin, rockfish and possible cod and pollock in the rocky areas of the outer cove.

Watershed

Canoe Cove's 1,498-acre watershed is typical of most of the Metlakatla Peninsula. Underlain by impermeable metamorphic rock, it has developed the muskeg communities and peat soil characteristic of poorly drained land in southeast Alaska. Much of the land is covered with sphagnum moss, with shrubs and herbaceous plants present in lesser coverage. scrub muskeg, with stunted cedar, hemlock and lodgepole pines is also common. Several sizeable but shallow lakes are located to the south of Canoe Cove. These lakes are bordered by sedge muskeg. Those three muskeg types provide habitat for birds, small mammals, furbearers and deer, as discussed in Chapter 7.

The only true forests in the watershed grow on the gravelly beach-uplift soil near the shoreline. Viewed from the water, Canoe Cove appears to have a heavily forested watershed. The forest extends only a short distance inland, however, and is not extensive enough to be considered commercial forest land.

Most of the watershed remains in an undeveloped state. The only exceptions are the unpaved Canoe Cove Road and small portions of the airport runway and Airport Road. At the lower end of Canoe Cove Road are the remains of quonset huts used by the military during World War II. The narrow trail from the road to the shoreline runs through the poorly-drained peat soil. Even the minimal use it receives has been more than the soil could support. The result is a muddy, eroded, potholed path, badly in need of maintenance.

(4) and (5) Ownership, Jurisdiction Management Status and Use

Canoe Cove, its tidelands, offshore areas to 3000 feet (914 meters) from the low tide line and the entire watershed are held in federal trust status for the Metlakatla Indian Community. Management decisions are made by the Community (described in more detail in Chapter 8), with the Bureau of Indian Affairs having trust responsibility.

Of the three AMSA's, Canoe Cove is subject to the least intensive use. Access no doubt limits the frequency and intensity of use, since Canoe Cove Road ends about one-quarter mile above the cove, and those venturing down to the cove must follow a winding, muddy trail through muskeg and forest.

At present, the predominant use of Canoe Cove is recreation and subsistence, with clamming and crabbing supported by the abundant shellfish populations in parts of the cove. Duck and goose hunders use the cove and have constructed a blind on a small island to facilitate hunting. Several trappers use the Canoe Cove area as a location for traplines for furbearers in the winter. Fishermen also use the cove as a safe anchorage during stormy weather and before fishery openings.

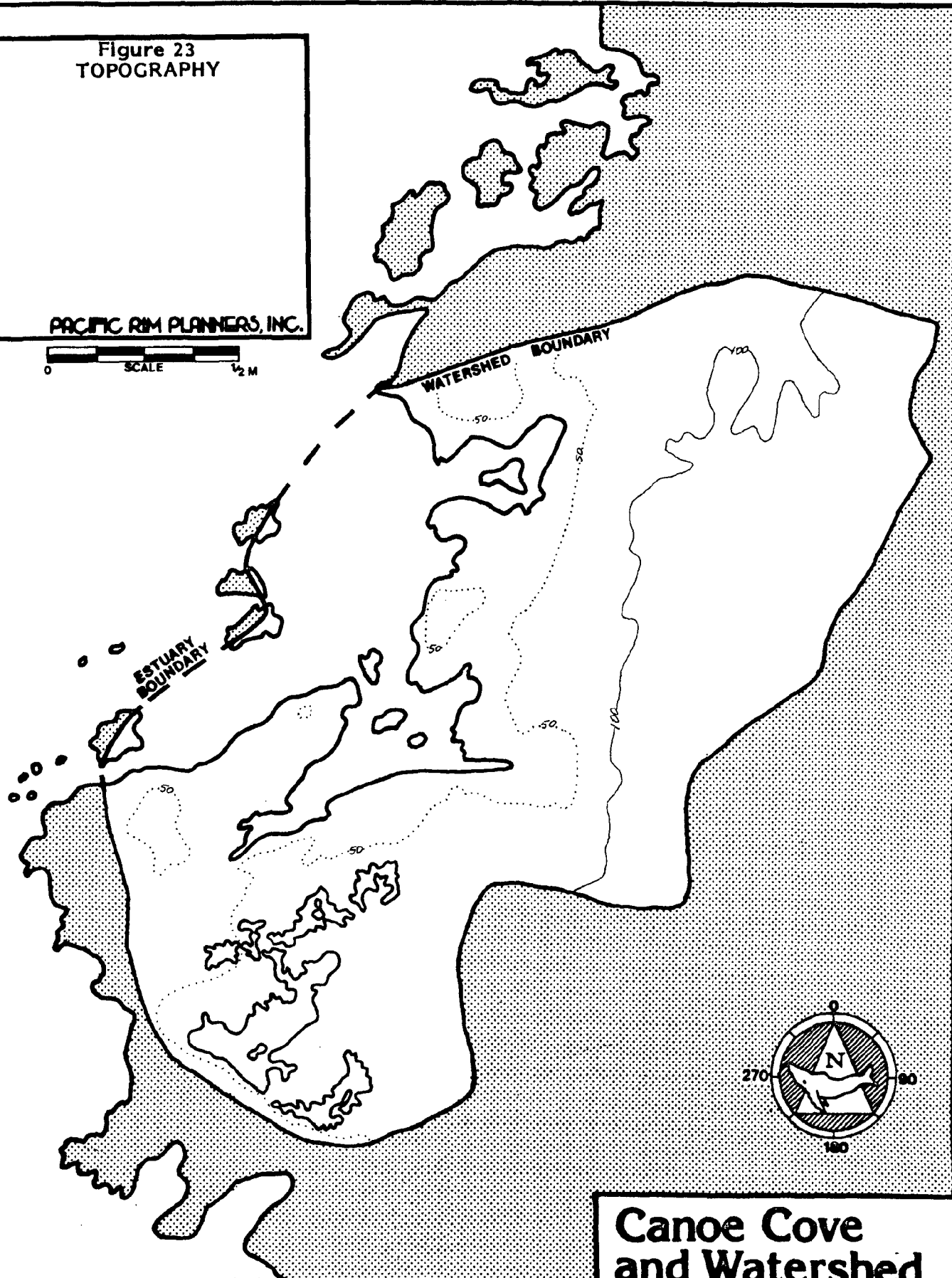
(6) Present and Anticipated Conflicts Among Uses

In 1976 the Louisiana-Pacific Corporation proposed to construct a log storage and handling facility in Canoe Cove as part of a larger project for timber processing on Annette Island. The project would have changed

Area Which Merits Special Attention

Figure 23
TOPOGRAPHY

PACIFIC RIM PLANNERS, INC.



Canoe Cove
and Watershed

the character of the cove considerably, clearing the shoreline and installing standing log booms, pilings, extensive rafts, and a new road to the shoreline. No agreement was reached between the Community and Louisiana-Pacific on the lease of land, and the project has not been constructed; however, the protected character of the cove will make it attractive as a harbor for other such uses in the future.

A good deal of evidence was presented, at the time of the Louisiana-Pacific proposal, that the log handling facility could have a detrimental effect on the water quality and fish and shellfish of the cove (PRPI, 1977a). In light of the potential for naturally-occurring water quality problems in Canoe Cove, discussed above, maintaining the estuary's natural productivity will require that any projects there be approached with caution. It is likely than any large-scale development involving vehicles, shoreline construction and a new road to the cove would conflict with the present uses of Canoe Cove for resource production and light-intensity harvest.

(7) Proposed Management Scheme

The future management and use of Canoe Cove will be based on the following policies:

Use of the Estuary:

The Community will limit those uses, particularly permanent development or intensive resource utilization, which represent potential adverse impacts upon the estuary's natural productivity.

Use of the Watershed:

The Community shall limit development of the Canoe Cove watershed to that which is compatibel with renewable marine resource production.

The uses and activities which will be considered proper and those which will be consider improper are those which are consistent and inconsistent, respectively, with these policies. These uses are listed on the following page.

As with other resource management policies on the reserve, this management scheme will be implemented by Council and BIA decisions on siting of roads, facilities, etc.

Table 10-1

CANOE COVE ALLOWABLE USES

USES AND ACTIVITIES	CANOE COVE	
	Estuary	Watershed
COASTAL DEVELOPMENT		
Residential	not allowable	allowable
Commercial	not allowable	not allowable
Landfill	not allowable	not allowable
Dredging and Dredge Spoil Disposal	not allowable	not allowable
Boat Basins	not allowable	N/A
Piers	allowable	N/A
Terminal and Storage Areas	allowable	allowable
Aquaculture Facilities	allowable	allowable
Breakwaters	not allowable	N/A
Bulkheads and Other Shoreline Protection	allowable	N/A
RECREATION	allowable	allowable
TRANSPORTATION		
Airport	N/A	existing*
Floatplane Facilities	allowable	allowable
Streets and Roads	not allowable	allowable
UTILITIES		
Hydroelectric Dams	N/A	N/A
Diesel Generators	not allowable	allowable
Fuel Offloading and Storage	not allowable	not allowable
Sewage Treatment Facilities	N/A	not allowable
Treated Sewage Outfalls	not allowable	not allowable
Water Storage	allowable	allowable
Utility Lines (water, power, etc.)	allowable	allowable
FISH AND SEAFOOD PROCESSING	not allowable	not allowable
TIMBER HARVESTING	N/A	not allowable
TIMBER PROCESSING		
Manufacturing	not allowable	allowable
Log Storage	existing*	allowable
Bark and Chip Disposal	not allowable	not allowable
MINING	not allowable	not allowable
SUBSISTENCE	allowable	allowable

N/A = Not Applicable

* existing = Facility is already located in area, but expansions or additions unlikely and inconsistent with policy.

Tamgas Harbor and Watershed

(1) Basis for Designation (under Alaska Coastal Management Act)

(A) *"areas of...scenic importance"*

Tamgas Harbor provides the viewer from Annette with a spectacular view of towering mountains and rounded glacial valleys. Local weather patterns and the northern lights are both enhanced when framing Tamgas Mountain.

(B) *"areas of high natural productivity or essential habitat for living resources"*

Tamgas Harbor's streams, particularly Tamgas Creek, are well-known on the island as important salmon producers. The tidelands are also prodigious in their production of clams and crabs, which are harvested by local residents, and other benthic organisms which feed the fish and waterfowl in the harbor.

(C) *"areas of substantial recreational value or opportunity"*

Both Purple Lake and Tamgas Lake in the watershed are accessible by trail and are well-used for recreation. The waters and beaches of the harbor itself provide island residents with opportunities for sports fishing, shellfishing, hiking and boating. Its value for small boating is enhanced by a dock and a boat ramp at Annette.

(D) *"areas where the development of facilities is dependent upon the utilization of, or access to, coastal waters"*

The salmon hatchery being constructed at the mouth of Tamgas Creek, and the temporary incubation facility now operating at Annette both depend on utilizing freshwater (for operating) and access to saltwater for releasing fish.

(E) *"areas of unique geologic or topographic significance which are susceptible to industrial or commercial development"*

While the entire Metlakatla Peninsula is a rarity as a vast expanse of flat land in mountainous southeast Alaska, the Annette area is particularly significant as developable land. Originally cleared and filled by the Coast Guard, the area has a good deal of flat land underlain by gravel, with access to roads, airport and navigable marine water.

from 6 AAC 80.160 (b) (1) *"areas important for subsistence hunting, fishing, food gathering and foraging"*

The tidelands of Tamgas Harbor, especially Hospital Bay north of Annette and Point Davison at the south end of the peninsula, are well used by Metlakatla residents for subsistence gathering of clams and crab, abalones and seaweed.

(2) Map

Tamgas Harbor and its watershed are mapped in Figures 24, 26 and 27.

(3) Description of the Area

At 5,066 acres (2051 hectares), Tamgas Harbor (defined here as all the waters to the north of a line north of Survey Point to Point Davison) is the largest estuary on Annette Island. The harbor reaches a depth of 56 fathoms (103 meters), but average depths are 20 to 30 fathoms (37 to 55 meters).

There are two smaller embayments that are noteworthy as parts of the Tamgas Harbor estuary. One, Hospital Bay, is a loosely defined cove at the mouth of Hospital Creek, north of Annette. The other, the Saltchuck, is a long narrow body of water south of Moss Point. Nearly isolated from the outside, the Saltchuck is uniquely protected from the wind and waves which pound the rest of the harbor during storms.

Tamgas Harbor's watershed, which covers an area of 14,105 acres (5710 hectares) includes slightly less than half of the Metlakatla Peninsula on the west. To the east, it includes portions of Purple Mountain, Bald Ridge, Berry Knoll, Chapeau Mountain, Davison Mountain, and Tamgas Mountain where, at 3315 feet (1020 meters), the watershed and the island reach their highest point.

Water Conditions

Tamgas Harbor's water chemistry and circulation characteristic make possible its production of fish, shellfish, waterfowl and marine mammals. These characteristics present both opportunities and limitations to development of marine resources. The following discussion is based on measurements taken in April and August, 1978, and in January, March, April and May, 1979, and on visual observations throughout the year (Appendix IV).

With the exception of the Saltchuck, which is discussed later, none of the water quality data available shows the estuary to present any definite problems in temperature, dissolved oxygen, or pH for natural fisheries production or aquaculture development. The water temperature remains cold. Never measured above 14.0°, even at the surface on a hot sunny day in August, it was safely below the upper level of tolerance (16°C.) for salmon (Bell, 1973). At the end of an extended period of subfreezing weather, the runoff from melting snow and ice and the cold air temperature cooled the water to 4.5°C on the surface and 6.0° C. at a depth of 10 meters. While these temperatures are below the optimum range for growth and survival of salmon, they are probably limited to these short-term cold spells and are more likely to limit fish growth than their survival.

Neither of the two temperature extremes measured to date is unsuitable for growth of oysters, although the summer temperatures are probably not warm enough to permit oyster spawning or survival and setting of larvae.

As might be anticipated in saltwater, the pH (acidity-alkalinity) was measured at a neutral to slightly alkaline level (7.0 to 7.6). The buffering effect of seawater tends to make the harbor alkaline; the pH might be higher were it not for the tannic acid in the muskeg runoff that enters the harbor.

Area Which Merits Special Attention

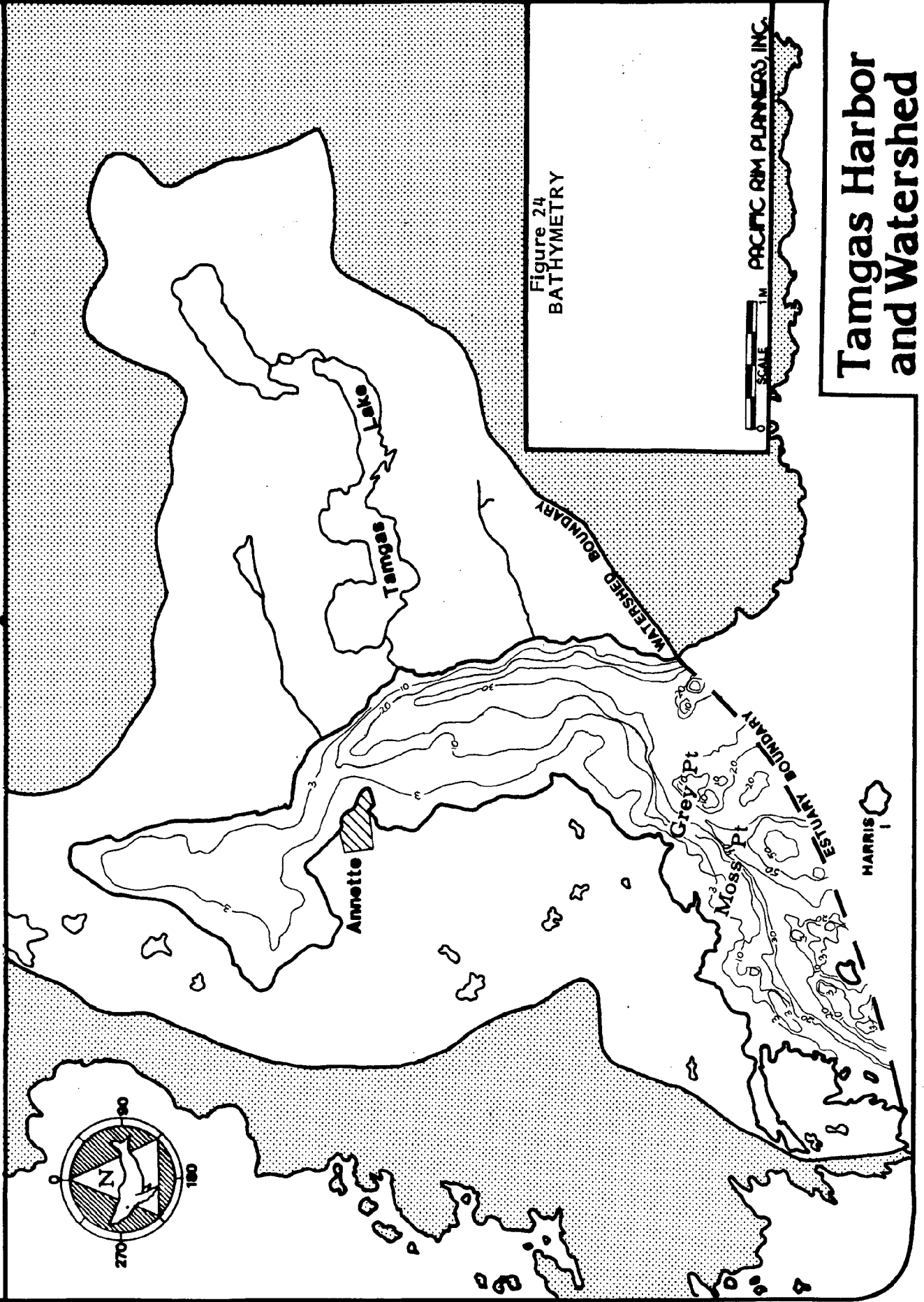


Figure 24
BATHYMETRY

SCALE 1 M. PACIFIC RIM PLANNERS, INC.

Tamgas Harbor and Watershed

Within the top 15 meters, the water in the harbor appears to be further enhanced by fairly good vertical mixing and exchange with outside waters. Although the copious freshwater runoff from the uplands tends to form a somewhat discrete layer of low density water floating above the higher density, higher salinity water, the layering effect is probably short-term. In most of the measurement the distinct layering was limited to the top few meters, and was more noticeable near the shore than in the center of the harbor. The most pronounced layering measured (with salinity of 17.0 o/oo at the surface and 24.0 o/oo at a depth of 1 meter) was at the Tamgas Dock on a flat, calm day at a time of heavy runoff from snowmelt. At the other times the salinity and temperatures exhibited a more continuous graduation from low salinity at the surface to higher salinity at depth. Tamgas Harbor has an open southern exposure, and waves generated by the frequent southeast winds probably prevent any long-term layering of shallow water masses.

Little data is available on the deeper waters of the harbor. One sample taken south of Moss Point near the bottom at a depth of 21 meters showed a distinct difference in temperature, salinity and dissolved oxygen between the bottom and the waters above 15 meters in depth. This water was not confined inside the harbor, but it presents the possibility that water near the bottom inside the harbor has also formed distinct masses of high salinity and low oxygen. Inside the harbor, such water masses might remain stagnant until the oxygen is nearly consumed. While there are no deep holes in the harbor to confine high-density water masses, there is a partial sill extending from Grey Point to Survey Point that probably restricts somewhat the circulation of water below 20 fathoms (37 meters) in depth. If deep high-density water does become stagnant and low in dissolved oxygen, it could impair the productivity of the deeper waters.

Another significance of deep water masses is that they are very likely rich in organic nutrients needed near the surface for primary production by phytoplankton, macroalgae and eelgrass. Although no water has been analyzed for nutrients, it is probable that dead marine plants and animals settle and decompose near the bottom. The resultant inorganic nutrients accumulate in areas of slow water exchange. If these nutrients mix with the surface water, they could induce a bloom of production by phytoplankton followed by an increase in zooplankton, which in turn would be available as food for juvenile fish. A bloom of phytoplankton could also be used as food by shellfish. Determination of the extent and timing of nutrient availability would be valuable in the siting, design and operation of aquaculture facilities.

Benthic Habitats

As it does elsewhere on Annette Island, the distribution of sediments in Tamgas Harbor reflects the degree of exposure of the shoreline to storm waves. In addition, the many streams entering the harbor carry sediment which is reworked and transported by the waves and currents.

The resulting shoreline supports rich and diverse communities of benthic organisms, animals and plants living on and in the bottom. Figures 10 and 11 in Chapter 5 show the location of each of three major types of benthic habitat in Tamgas Harbor.

The hard-surfaced habitat, mapped as "Rock" in Figures 10 and 11, includes solid bedrock outcroppings and boulders. This habitat dominates the outer portion of Tamgas Harbor, particularly on the east side, and on the west side between Grey Point and Point Davison.

Just as the force of the waves created the hard-surfaced habitat by scouring away any fine sediments, it also creates a community of benthic organisms adapted to withstand the pounding of the waves. As described in more detail in Chapter 5, this habitat supports attached organisms (such as barnacles, mussels, tube worms, anemones, sponges, etc.) and clinging organisms (such as starfish, chitons, or gumboots, abalones, snails, etc.)

The fine-sediment habitat (mapped as "Fine") is found largely in coves protected from south winds and at stream mouths. Hospital Bay is perhaps the best example of this habitat. Sheltered by Tent Point and fed by several streams, this cove has broad sweeping tideflats of mud, sand, and gravel, with eelgrass beds in much of the lower intertidal zone.

The fine-grained sediment provides no surface for attached or clinging organisms, as the rocky shoreline does, but instead supports many burrowing organisms, including clams, crustaceans, and polychaete worms. Dungeness crabs and several species of clams thrive in this habitat, where they support a subsistence fishery.

The third major type of benthic habitat is the mixed-coarse sediment shoreline. Composed of a mixture of cobbles and gravel, (and mapped as "Coarse"), this habitat is common much of the harbor's shoreline north of Tent Point. Being a mixture of sediments of different sizes, it provides a rich habitat to both the burrowing organisms and the attached organisms described above.

Fish

At least 12 streams tributary to Tamgas Harbor have been documented as producing salmon. Pink salmon can be found in nearly all the streams. Chums are native to five streams and have been introduced into Tamgas Creek annually since 1977. Coho salmon spawn and rear in six streams, while sockeye spawn and rear in Tamgas Lake.

The harbor is used by king and coho salmon for feeding, and is therefore a popular bay for trolling.

Yellow Point, on the harbor's east side, has been used by herring as a spawning ground, although the fish do not appear to use it in large numbers.

Saltchuck Water Conditions

Located near the southern end of the Metlakatla Peninsula the Saltchuck is nearly cutoff from Tamgas Harbor, and is well protected from storm waves from all directions. This enclosed condition is an asset in the often turbulent Southeast Alaska weather, but it has drawbacks in its effects on

water quality of the Saltchuck. This analysis is based on data collected in August, 1978, and is therefore limited in seasonal perspective.

As is common in Southeast Alaskan estuaries, the Saltchuck exhibited a slight layering of water masses, with the surface water one to two parts per thousand less saline than the deeper water. This layering is reflected in the temperature as well, which was several degrees warmer at the surface than on the bottom.

Contrary to what might be expected from the acidic muskeg runoff, the pH of the water was at or near that of freshwater (7.0 on the surface; 7.4 at 13 meters in depth); however, the surface pH was lower (more acidic) than usual for seawater, which is generally slightly alkaline. This pH level reflects the influence of the runoff but was within safe limits for most marine animals and plants.

Circulation in the Saltchuck is less than ideal, however, and appears to lead to problems with the level of dissolved oxygen. Estuarine circulation is driven by three major forces: freshwater inflow, wind, and tides. All have deficiencies in circulating water in the Saltchuck.

The Saltchuck receives runoff from the surrounding muskeg and forest freshwater, but does not have any major tributary streams as the other bays on the island have. The Saltchuck has a fairly small drainage basin, and freshwater runoff is probably not a major force in its water circulation.

As mentioned earlier winds also have a minimal effect on the Saltchuck. Not only is it protected from the southeast waves which pound the shoreline outside, but the tall trees around its shoreline act as a screen, attenuating the wind's ability to generate waves in the Saltchuck.

Tidal circulation joins the Saltchuck with outside waters by drawing its water through two very narrow, constricted channels, which can carry only a limited volume of water. At full ebb or flow, the tidal current in these channels is impressively swift, but the channels are very shallow, and the water that is exchanged is likely from near the surface. Even if the current reached 10 knots, however, the channels, which have a cross-sectional area of no more than 14 square meters when full, could probably not draw the water down more than 2 meters (6 feet) in the Saltchuck.

The limited surface outflow appears to confine the deeper water in the Saltchuck for longer periods of time. During that confinement, respiration of benthic organisms and bacteria consumes dissolved oxygen from the water. The turbidity of the water does not allow sunlight to penetrate to the bottom (at 5 to 13 meters deep), so plants cannot photosynthesize and reoxygenate the water. The result is a seriously low dissolved oxygen level--between 1 and 2 ppm at a depth of 13 meters near the mouth, and 5 ppm at a depth of 5 meters near the head.

These low dissolved oxygen levels would be unsuitable for intensive culture of fish or shellfish, which would only exacerbate the situation in deep water. An aquaculture installation floating in the surface water layer (perhaps down to 3 meters in August) would likely remain out of the stagnant layers and might be safe from low dissolved oxygen levels, but

surplus food and the metabolic wastes of the animals, would likely sink to the bottom and further consume dissolved oxygen in the deeper water.

An additional phenomenon might play a role in the Saltchuck's circulation patterns. In the fall, when the air cools below the temperature of the surface water, it cools the water too. When the surface water reaches a temperature lower than that of the deep water, it may be more dense, and may sink, forcing the deep water up to the surface. If the deep water is low in oxygen at that time, it could be dangerous for any organisms confined in the Saltchuck. This possibility is speculative, however, since no data has yet been collected there in cold weather.

Watershed

Tamgas Harbor's watershed is perhaps the most diverse on the island, in terms of both habitats and human uses of resources. The habitats range from the low-lying sodden muskegs of the Metlakatla Peninsula, to the craggy peak of Tamgas Mountain. Higher elevation muskegs carpet a small amount of land east of the harbor, and forest cover the slopes of the mountains.

The freshwater habitats include Tamgas Lakes (Upper and Lower) and the smaller Tent Lake. Numerous muskeg lakes and ponds drain from the peninsula into the harbor. Among these is Yellow Hill Lake, the largest muskeg lake on the island, and the water supply for the Annette area. The harbor is also fed by at least 12 streams draining the muskegs to the west and the mountains to the east.

(4) and (5) Ownership, Jurisdiction, Use and Management

As with the other lands and waters of the Reserve, Tamgas Harbor and its watershed are held in trust status by the federal government for the Metlakatla Indian Community. The Metlakatla Community Council has jurisdiction over the area, with the Bureau of Indian Affairs exercising trust responsibility.

The uses of the harbor and watershed are remarkably varied. At the light-intensity end of the spectrum are the subsistence uses, fishing, shell-fishing and hunting which are popular here because of the road access to several points. Commercial trollers use Tamgas Harbor to a limited extent, but net fishing is prohibited inside the harbor.

A 3-million egg salmon hatchery is operating in the Annette area, using water from Yellow Hill Lake, and a larger hatchery, with capacity for 10 to 20-million eggs, is under construction at the mouth of Tamgas Creek.

Another user of the abundant water resources of this watershed is the Purple Lake Power plant, operated by Metlakatla Power & Light. Although this plant does not supply all the energy needs of the Community, it is the major source of electricity on the island. The hydro power is supplemented during low flow periods by a diesel generator on the west

Area Which Merits Special Attention

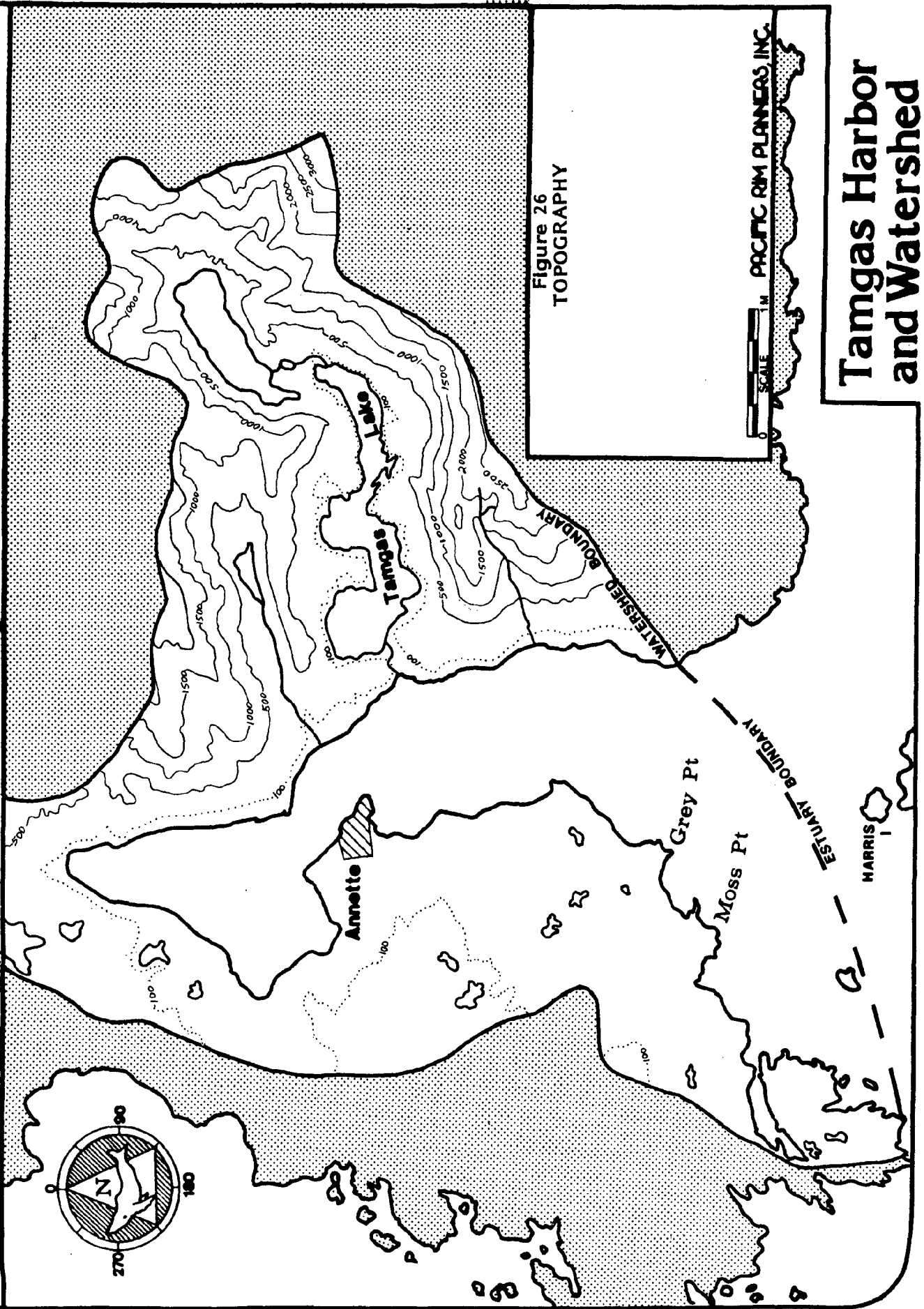


Figure 26
TOPOGRAPHY

SCALE 1 M PACIFIC RIM PLANNERS, INC.

Tamgas Harbor and Watershed

side of the harbor. Oil storage tanks for this facility are located near the shoreline at the head of the bay, and supplied by barge. Another group of oil storage tanks, adjacent to the Tamgas Dock at the Annette area, supplies heating oil to the island.

A major housing area is located at Annette. Formerly used by employees of the Federal Aviation Administration and Western Airlines, these nine buildings house about 25 families. Several other buildings are located in this area, including the former Annette School, the Community bowling alley, an auto maintenance shop, and a number of abandoned Coast Guard structures.

The other reminder of Coast Guard presence in the watershed is the Annette Airport, which perches on the drainage divide for the peninsula. The airport includes two runways, a large hanger, an active station of the National Weather Service, a gas station, and the former Coast Guard barracks, which now house the offices for a number of Community functions.

(6) Conflicts Among Uses and Activities

At the present time, conflicts among uses and activities in Tamgas Harbor and its watershed attract the attention of only a few local residents. As the resources of the harbor are developed further, however, it can be expected that more people will become involved in resource use, and that some activities will become more controversial.

One problem which became apparent several years ago is the offloading and storage of oil near the shoreline. A 1975 oil spill near the head of the bay (cleaned up by local and Coast Guard personnel) led to some concern about the advisability of operating oil transfer facilities at the inside of a semi-enclosed body of water. Both the diesel tanks and the heating oil tanks have leaked oil into the harbor at least once.

Another problem of more recent concern has been the disposal of bark chips from the Annette Hemlock Mill. One of the two sites used by the mill is near Hospital Creek in the watershed, and several Community members are concerned about the potential for damage to the harbor's fishery resources.

Other conflicts are likely to become noticeable when the access road is constructed to the Tamgas Creek Hatchery. During construction, the earth-moving and excavation will probably introduce some sediment into Tent Creek, but this problem should be short-lived. A more long term effect of the road will result from the increased access it provides to the east side of the harbor. Tamgas Lake, now accessible only by boat and primitive trail, will be opened up with vehicle access to the mouth of the creek, and an excavated trail, needed to install the hatchery's water intake line. Intensive public use of the lake may not be compatible with its function as a water supply for the hatchery.

The future of the Annette area and the airport is uncertain, but the use of either might have a profound effect upon the character of the watershed. Both areas have vacant buildings and a good deal of developable land. Since developable land is a scarce commodity in the region, these areas must be considered likely sites for future development on the island. Policies

concerning the types of uses, and the allowable effects of those uses, will be important in shaping the future of the watershed, the harbor, and the Community's resources.

Proposed Management Scheme

The future management of Tamgas Harbor and its watershed will be based on the following policies:

Use of the Estuary -

The Community shall allow a variety of water-related uses in Tamgas Harbor, provided that the uses are compatible with marine resource production, development and us.

Use of the Watershed -

The Community shall encourage further uses and development of presently and previously developed areas of Tamgas Harbor's watershed, provided that the uses and activities have no detrimental effect on the productivity of the harbor.

The uses and activities which will be considered proper and improper are those which are consistent and inconsistent, respectively, with these policies. These uses are summarized on the following page.

As with other policies for resource management on the reserve, these will be implemented by Council and BIA decisions or siting of roads, facilities, etc.

Area Which Merits Special Attention

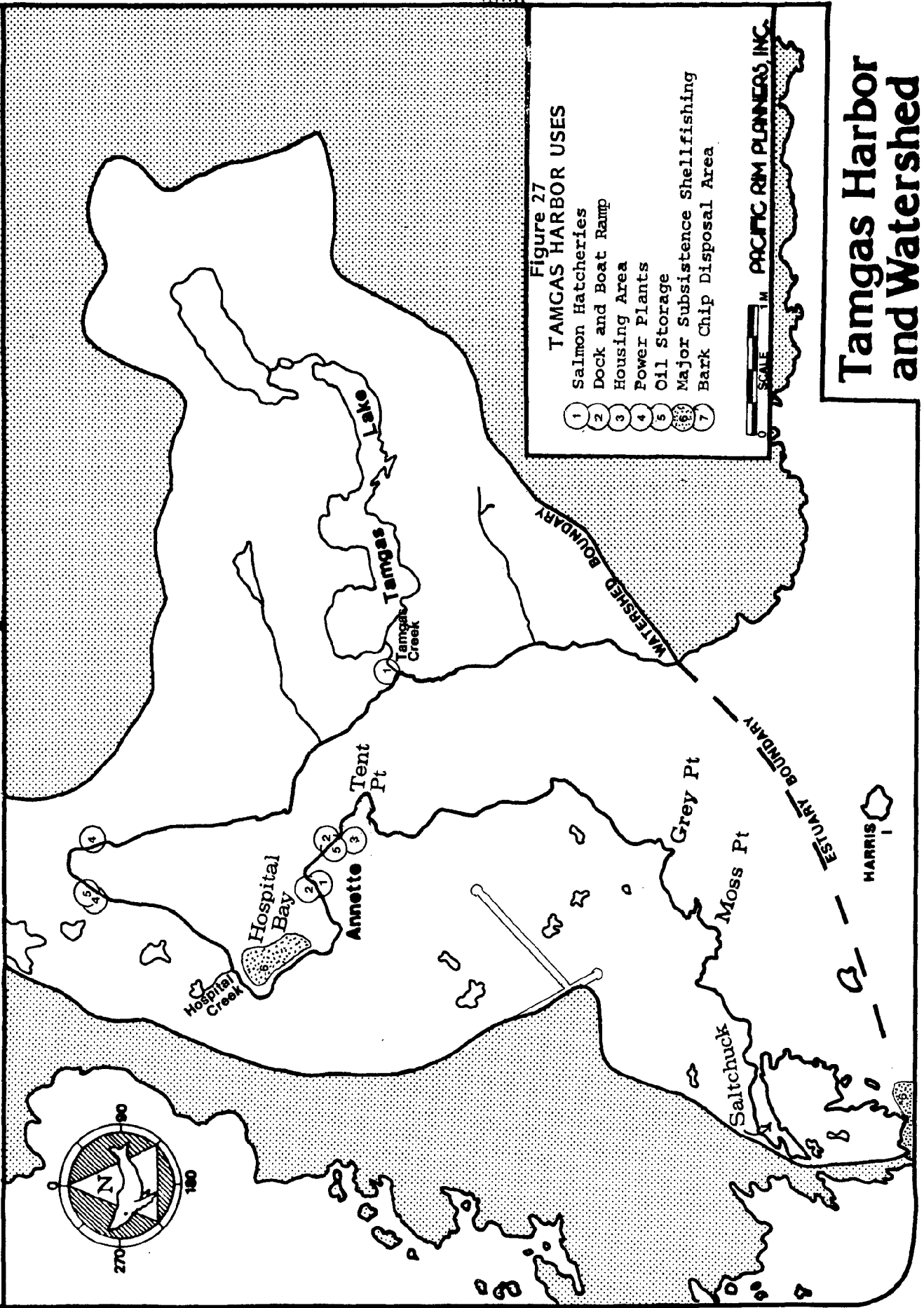


Figure 27
TAMGAS HARBOR USES

- 1 Salmon Hatcheries
- 2 Dock and Boat Ramp
- 3 Housing Area
- 4 Power Plants
- 5 Oil Storage
- 6 Major Subsistence Shellfishing
- 7 Bark Chip Disposal Area

Tamgas Harbor and Watershed

PACIFIC RIM PLANNERS, INC.

Table 10-2
TAMGAS HARBOR ALLOWABLE USES

USES AND ACTIVITIES	TAMGAS HARBOR	
	Estuary	Watershed
COASTAL DEVELOPMENT		
Residential	not allowable	allowable
Commercial	N/A	allowable
Landfill	not allowable	not allowable
Dredging and Dredge Spoil Disposal	not allowable	not allowable
Boat Basins	allowable	N/A
Piers	allowable	N/A
Terminal and Storage Areas	allowable	allowable
Aquaculture Facilities	allowable	allowable
Breakwaters	allowable	N/A
Bulkheads and Other Shoreline Protection	allowable	allowable
RECREATION	allowable	allowable
TRANSPORTATION		
Airport	N/A	existing
Floatplane Facilities	allowable	allowable
Streets and Roads	N/A	allowable
UTILITIES		
Hydroelectric Dams	N/A	existing
Diesel Generators	N/A	existing
Fuel Offloading and Storage	existing	existing
Sewage Treatment Facilities	N/A	existing
Treated Sewage Outfalls	allowable	allowable
Water Storage	allowable	allowable
Utility Lines (water, power, etc.)	allowable	allowable
FISH AND SEAFOOD PROCESSING	not allowable	not allowable
TIMBER HARVESTING	N/A	not allowable
TIMBER PROCESSING		
Manufacturing	not allowable	allowable
Log Storage	not allowable	allowable
Bark and Chip Disposal	not allowable	existing
MINING	not allowable	allowable
SUBSISTENCE	allowable	allowable

N/A = Not Applicable

existing = Facility is already rated in area, but expansion of addition unlikely and inconsistent with policy.

Port Chester and Watershed

(1) Basis for Designation: (under Alaska Coastal Management Act)

(A) *"areas of historical significance, or scenic importance"*

Once the site of a seasonal camp for the Tlingit Indians, Port Chester was selected in 1887 by Father Duncan and the Tsimshean landing party as the location for the town of Metlakatla. The waterfall from Chester Lake to the east and the towering Purple Mountain to the south are both scenic landmarks which provide a backdrop for the town. For the more adventurous, a hike to Chester Lake is rewarded by a panoramic view of the town nestled in Port Chester, with Nichols Passage and Clarence Strait beyond, and Gravina Island and Prince of Wales Island in the distance.

(B) *"areas of high natural productivity or essential habitat for living resources"*

The slopes of parts of Port Chester's watershed are highly productive of timber. At least 10 streams and one lake produce salmon and are essential spawning habitat for those salmon.

(C) *"areas of substantial recreational value or opportunity"*

The beach along the Western Avenue shoreline and the reefs offshore in Port Chester are frequently used by Metlakatla residents for picnicking, clamming, etc.

(D) *"areas where development of facilities is dependent upon utilization of, or access to, coastal waters"*

The cannery, floatplane docks, sawmill, boat harbor and ferry terminal are the predominant water dependent facilities on Port Chester's shoreline. Siting and re-siting of additional facilities is likely in the future, and will depend on how much of the Metlakatla waterfront remains available for development.

(E) *"areas of unique geologic...significance which are susceptible to industrial or commercial development"*

The Sylburn Peninsula-Driest Point area is underlain by developable deposits of the mineral barite.

(2) Map

Port Chester and its watershed are mapped in Figures 28, 30 and 31.

(3) Description of the Area

Port Chester, defined here as the waters south and east of a line between Driest Point and the Metlakatla Cemetery, along with Japan Bay to the north of Driest Point, is a 4720-acre (1911-hectare) bay off Nichols Passage. With the exception of a few shoals, such as near the mouth of

Tain Creek, behind Hemlock Island, and around the reefs north of Metlakatla, most of the bay is very deep. The bottom drops off steeply from the shoreline to depths averaging 100 to 200 feet (30 to 60 meters) and reaching over 240 feet (73 meters) deep.

Although Port Chester is enclosed by mountains to the east and south, it is not completely sheltered from the area's violent southeastern storms. The nearby mountains appear to channel the storms down into the bay, creating winds and waves more formidable than would be expected in such a harbor.

Water Conditions

The data, taken during the winter and spring of 1979, show the waters of Port Chester to be exceptionally well mixed, both in the exposed areas and in the somewhat more protected areas near stream mouths. The inflowing freshwater from Tain Creek and Hemlock Creek was detectable by only a shallow layer (less than 3 meters) of slightly lower salinity water in Tain Bay and Hemlock Bay. Even at these locations, the water at 3 meters and deeper was nearly identical in comparative, salinity and dissolved oxygen content to the water in the more exposed parts of Port Chester. That water, in turn, appears to be influenced more by the massive tidal flows through Nichols Passage than by the relatively insignificant inflow from Port Chester's watershed.

The circulation and mixing in Port Chester therefore appear to be mostly the result of the swift tidal currents of Nichols Passage. Either the currents cause a flow in the same direction in Port Chester, or they may create a eddy inside the harbor. Investigations into the current patterns may answer this question, and provide information which can be used in siting of any future effluent discharge. In any case, the currents appear to mix the waters of the bay sufficiently to prevent any but perhaps very localized water quality problems.

In all measurements, the data collected shows the waters to be within the requirements for survival and growth of salmon and shellfish, although the dissolved oxygen was not as high as would be desirable for intensive salmonid propagation.

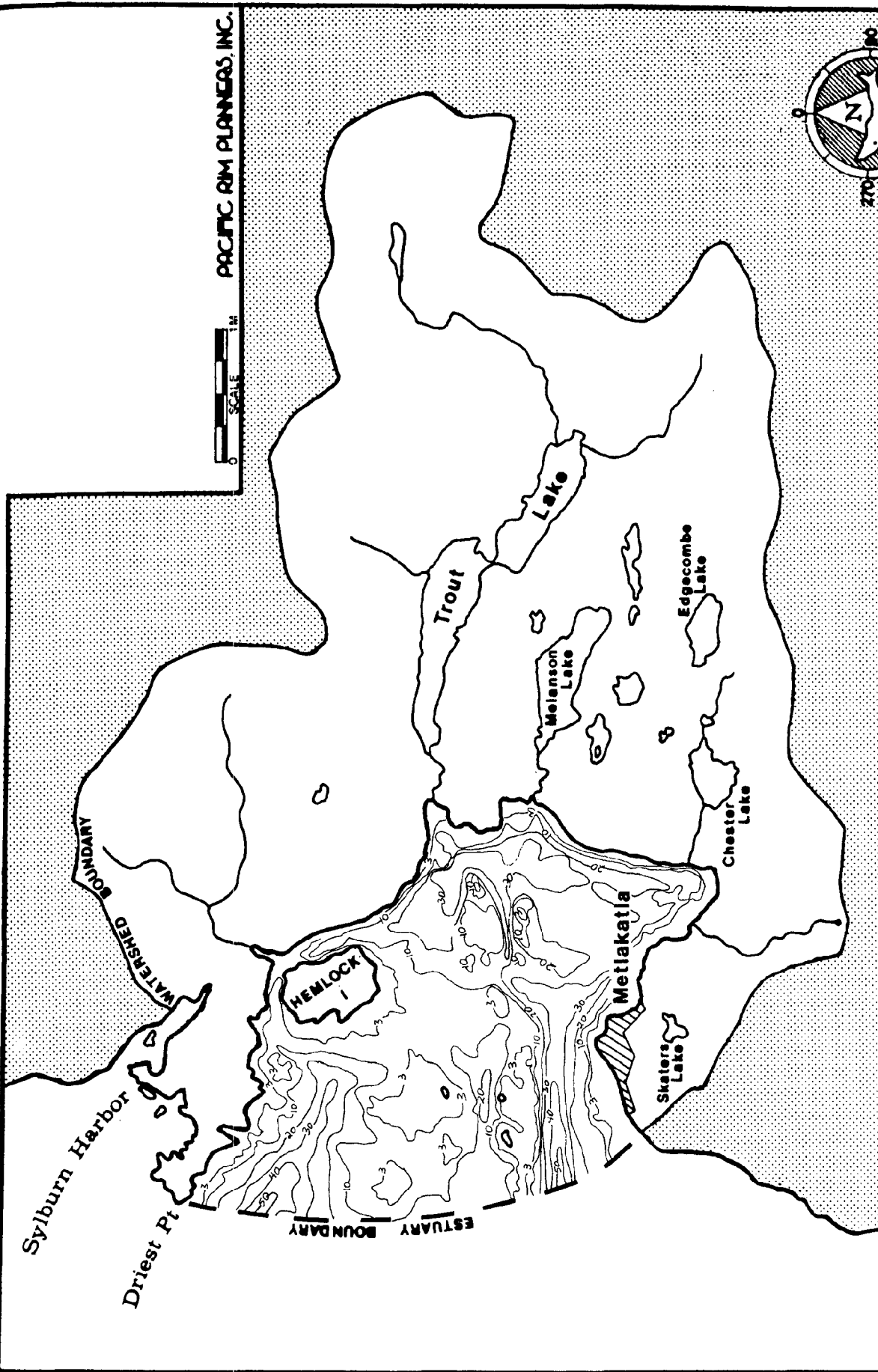
Sediments and Shoreline Habitats

The tidal currents and waves in Port Chester are great enough that, in most places, they scour away the fine sediments, leaving only mixed-coarse sediments and rocky shores.

The east shoreline of the bay, dropping down steeply from the mountains, is mostly rocky, providing habitat for attached animals (such as barnacles, muscles, tube worms and sponges), clinging animals (such as starfish, snails and gunboats) and algae. Along the shore from downtown Metlakatla to the southernmost point in the bay, the beach is composed of mixed-coarse sediments. Here the mixture of gravel and cobble supports fewer attached and clinging animals, but allows burrowing animals (such as clams and worms) to inhabit the beach.

Area Which Merits Special Attention

Figure 28
BATHYMETRY



Port Chester and Watershed

The only extensive areas of fine sediment beach are the shoreline to the west of Metlakatla, and the northern part of Hemlock Bay. In these areas the water is calm enough to allow the accumulation of a gravel-sand mixture. Both of these beaches support burrowers, particularly clams. The beach near the town is fairly heavily used for gathering clams, cockles and crabs.

Below the intertidal zone, the fine sediment habitat is apparently more widespread. A 1977 diving survey there found a sand and silt bottom with rock outcroppings and ledges. Both geoducks and horseclams inhabit the bottom at depths of about 15 to 30 feet (5 to 9 meters), and the horse clams appear in commercial numbers. Other species of commercial value observed offshore were sea cucumbers and sea urchins.

Fish

Port Chester's watershed includes one of the two most productive lakes and one of the most important streams on the island in terms of salmon production. Trout Lake and creek is used for spawning and rearing by coho and sockeye salmon. Hemlock Creek supports some of the island's largest runs of pink and chum salmon. Pink salmon use at least 5 other streams in the watershed, three of which also support chums. The bay is also used by king and coho salmon migrating through Nichols Passage and is therefore a favorite fishing area for many of the island's trollers.

Herring also make use of Port Chester. Immature herring can be found in the bay throughout most of the year, and adults are present before spawning in the spring. Hemlock Bay is reported to be a former herring spawning ground, but does not appear to have been heavily used in recent years.

Watershed

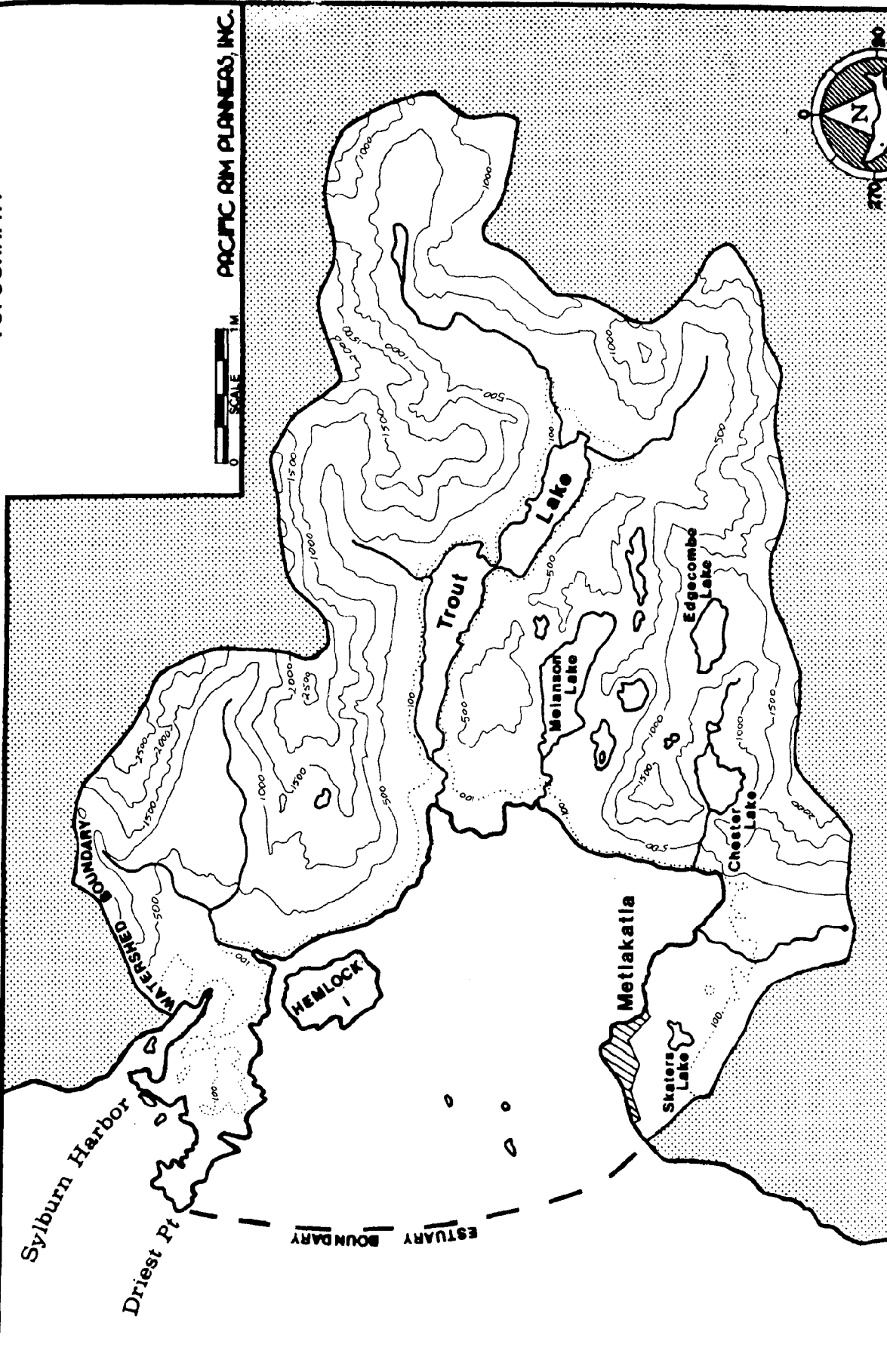
Port Chester's 15,600-acre (6,316-hectare) watershed includes the northern part of the Metlakatla Peninsula and a good deal of mountainous land. The largely muskeg peninsula drains into the estuary through several small streams, while the runoff from the mountains flows through small and large streams.

Much of the bay's watershed is forested with hemlock, spruce and cedar, although the Chenango Mountain area was logged within the last several years. Some of the flat benches and even some steeper terrain is covered with muskeg, and alpine vegetation grows sparsely around Chester Lake and Purple Mountain. Because of the extensive areas of high elevation, this watershed also contains a great deal of bare rock.

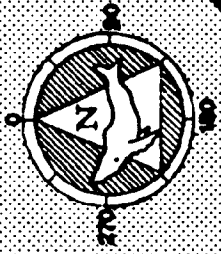
Several lakes also occupy substantial areas of the watershed. Trout Lake, the largest of these, has the distinction of receiving drainage from the largest sub-basin on the island. Melanson Lake is smaller, but lies higher in elevation. Still higher, at over 800 feet above sea level is Chester Lake, the source of Port Chester's cascading waterfall and Metlakatla's drinking water supply. Besides the three streams connecting these lakes with the bay, Port Chester is fed by at least seven other perennial streams.

Area Which Merits Special Attention

Figure 30
TOPOGRAPHY



0 1 M SCALE PACIFIC RIM PLANNERS, INC.



Port Chester and Watershed

(4) and (5) Ownership, Jurisdiction, Management and Use

As is the case with the rest of the reserve, Port Chester and its watershed are held in federal trust status for the Metlakatla Indian Community. Management of the lands and waters is by decisions of the Community Council, with the Bureau of Indian Affairs having final trust responsibility.

Both the estuary and the watershed are among the most intensively used areas of the reserve. Over 90% of the residents of the reserve live in the town of Metlakatla, all within a quarter-mile of Port Chester's shoreline. Most of the commercial, institutional and industrial activity on the island is also carried on in the town.

Outside the town, the watershed's uses are also remarkably varied. A major timber sale was logged on Chenango Mountain early in the 1970's. A sale in the Trout Lake drainage was recently contracted and logging is scheduled to begin in 1979 or 1980. These areas have been, and will be, accessed by logging roads. Chester Lake, accessible only by trail, supplies the town's drinking water and has been proposed as a site for a hydroelectric dam.

The Metlakatla shoreline is the site of the most intensive uses of the estuary. The Community-owned Annette Island Packing Company has operated a cannery here for over 50 years, and more recently has operated a cold storage plant as well. The sawmill, owned by the Community and leased to the Louisiana Pacific Corporation, occupies several acres of uplands, and uses a portion of the bay for log rafting. Marine-oriented transportation is another important use of Port Chester's shoreline, including two floatplane docks, a small boat harbor, an oil dock, a barge ramp and a ferry terminal, as well as mooring and loading facilities for oceangoing log ships.

These industrial uses of Port Chester have not precluded the light intensity uses. The town's Western Avenue beach is used for subsistence gathering of clams, cockles and crabs. The reefs offshore are favorite sites for picnicking, and occasionally for catching octopus. Hemlock Bay, too, is used for shellfish gathering. Trollers fish for salmon in Port Chester, and other Community members catch bottomfish from the docks.

To summarize, this estuary and its watershed support a diversity of uses: high-intensity and low-intensity, consumptive and non-consumptive. If managed carefully, it should have the capability to support expanded development without precluding the subsistence uses.

(6) Present and Anticipated Conflicts Among Uses

Port Chester's water characteristics are apparently good enough to minimize many of the "development vs. subsistence" conflicts which are common in other parts of Southeast Alaska. The conflicts which can be anticipated here are likely to be focused in the more sensitive areas of the uplands, the streams and the inner portions of the smaller embayments.

The Trout Lake timber sale has aroused the concern of some, particularly fishermen, who fear that the logging and accompanying roadbuilding will be detrimental to fish production. The logging will also bring about an aesthetic impact by clearcutting a slope in full view of the town.

The view of Driest Point, too, may be marred if the barite deposit there is mined. No definite plans to mine it have been developed, but any barite extraction would likely involve open-pit mining. In addition to the aesthetic impact there is the danger of sedimentation into two bays (Hemlock Bay and Sylburn Harbor-Japan Bay) which serve as rearing and feeding areas for pink and chum salmon fry. The sheltered nature of these small bays allows them to produce benthic organisms suitable for consumption by the salmon fry, but it might also allow sediment from mining operations to accumulate in excessive quantities and bury the salmon's food supply. Although some aesthetic impact might be unavoidable, strict design standards could minimize the effect on the town's view. Performance standards in mining contracts or leases can also be used to minimize the effect upon water quality and fisheries.

Activities related to timber processing are also causing concern among local residents. Bark chips, by-products of the sawmill, have been deposited in the muskeg near Skater's Lake since 1977, and leachates from that material may be harming water quality both in the lake and in its outlet stream. The problem will be mitigated somewhat by Louisiana Pacific's decision to remove new chips to Ketchikan, but the deposits accumulated over two years remain, and will likely leach into the stream for some time after dumping ceases. Removal of this accumulation for use as fuel in Ketchikan is one possible solution under investigation.

Log rafting is the other activity which might conflict with fish production. The logs rafted near the sawmill probably do not cause any but the most localized problem. Logs were stored in Hemlock Bay during the Chenango Mountain logging, and the site is a likely one for rafting after logging begins in the Trout Lake drainage. Log rafting and dumping have been documented as having negative effects on water quality, fish, and benthic marine life. Although it might be unfeasible to prohibit log dumping and rafting in Hemlock Bay, some performance standards might help minimize its impact.

Other conflicts in this area revolve around Chester Lake. The town's water supply is untreated, and is open and vulnerable to contamination in several locations. Apparently no problems have resulted from this vulnerability, but excessive public use of the Chester Lake area might conflict with the maintenance of clean water in the future.

Finally, the proposed hydroelectric dam at Chester Lake will interfere with the flow of the waterfall, certainly in the short-term during construction and raising of the lake, and possibly during the long-term as well. Balanced against the loss of the aesthetic resource is the increased dependence upon oil to supply power for the Community. While neither alternative is a pleasant prospect, the hydroelectric power is a renewable resource, and one which can increase the Community's self-sufficiency.

(7) Proposed Management Scheme

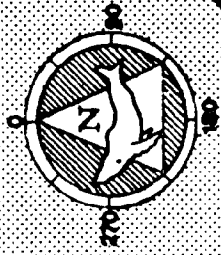
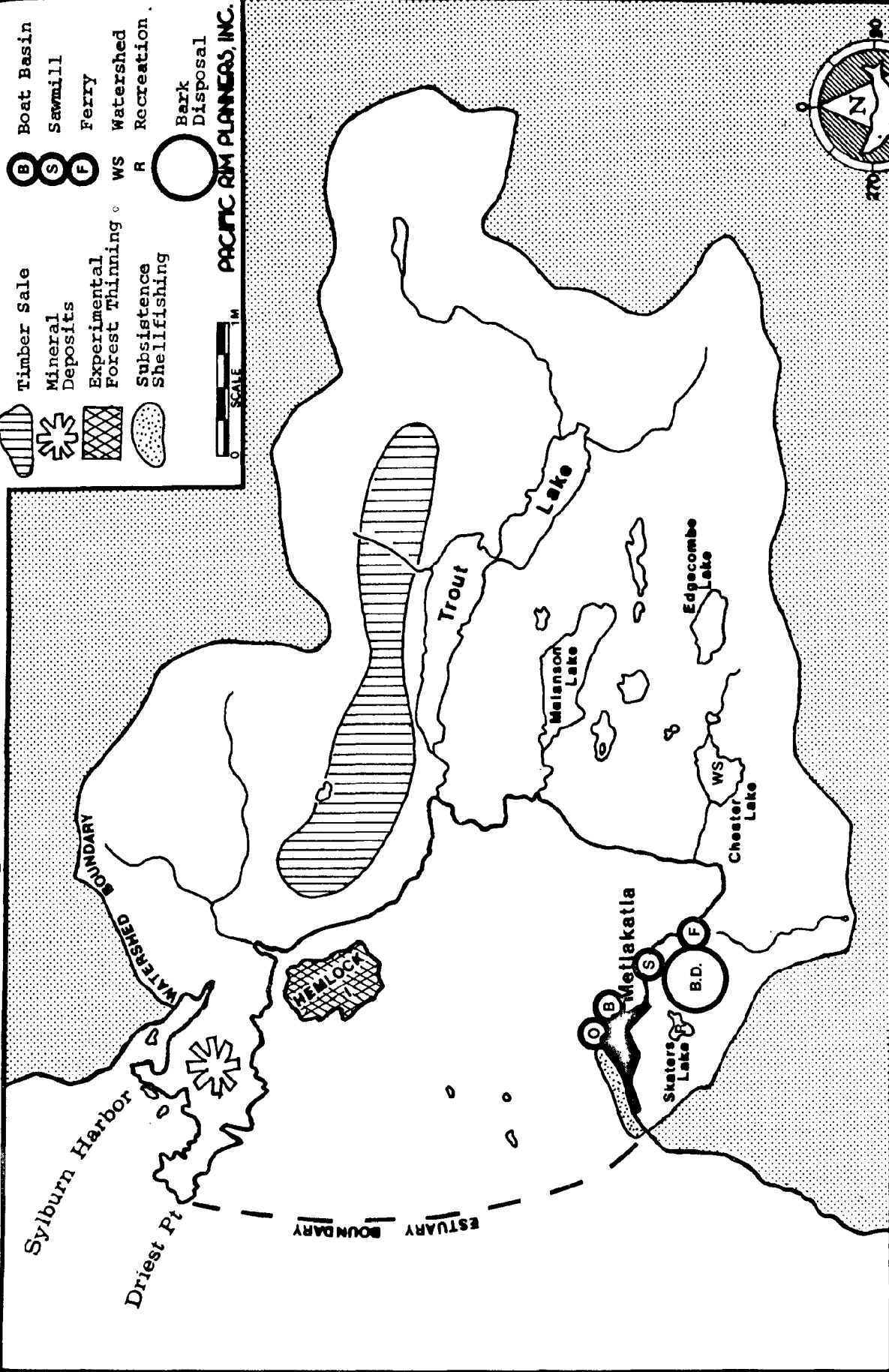
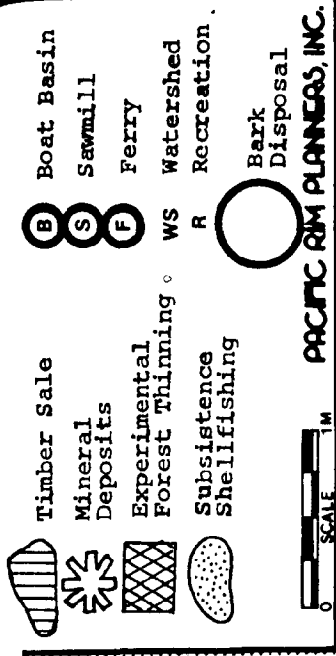
The future management and use of Port Chester will be based on the following policies:

Use of the Estuary

The Community will encourage shoreline development to locate on Port Chester and will give priority to those activities requiring waterfront access, provided that they do not impair the long-term potential of the bay for production of fish, shellfish and waterfowl.

Area Which Merits Special Attention

Figure 31
PORT CHESTER/WATERSHED USES



Port Chester and Watershed

Use of the Watershed:

The Community will encourage residential, commercial and industrial development to locate within the limits of Metlakatla, and will permit resource development in other areas of the watershed, provided that the best practicable technology is used to minimize damage to renewable resources.

As with other policies for resource management on the reserve, these will be implemented by Council and BIA decisions on siting of roads and facilities, and on timber sales, land assignments and leases.

Table 10-3
PORT CHESTER ALLOWABLE USES

USES AND ACTIVITIES	PORT CHESTER	
	Estuary	Watershed
COASTAL DEVELOPMENT		
Residential	not allowable	allowable
Commercial	water-dependent	allowable
Landfill	not allowable	allowable
Dredging and Dredge Spoil Disposal	allowable	allowable
Boat Basins	allowable	N/A
Piers	allowable	N/A
Terminal and Storage Areas	allowable	allowable
Aquaculture Facilities	allowable	allowable
Breakwaters	allowable	N/A
Bulkheads and Other Shoreline Protection	allowable	allowable
RECREATION	allowable	allowable
TRANSPORTATION		
Airport	N/A	N/A
Floatplane Facilities	allowable	allowable
Streets and Roads	N/A	allowable
UTILITIES		
Hydroelectric Dams	N/A	allowable
Diesel Generators	N/A	allowable
Fuel Offloading and Storage	allowable	allowable
Sewage Treatment Facilities	N/A	allowable
Treated Sewage Outfalls	allowable	allowable
Water Storage	allowable	allowable
Utility Lines (water, power, etc.)	allowable	allowable
FISH AND SEAFOOD PROCESSING	allowable	allowable
TIMBER HARVESTING	N/A	allowable
TIMBER PROCESSING		
Manufacturing	N/A	allowable
Log Storage	allowable	allowable
Bark and Chip Disposal	not allowable	allowable
MINING	not allowable	allowable
SUBSISTENCE	allowable	allowable

N/A = Not Applicable

water dependent = Facilities should be allowed on overwater structures only when they depend on access to water.

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MINUTES OF PUBLIC HEARING
on
ANNETTE ISLANDS RESERVE
COASTAL MANAGEMENT PROGRAM

June 14, 1979

Metlakatla Municipal Building

Present at the Meeting were:

Councilman Richard Johnson, Chairman
Councilman Leo Guthrie
Councilman Harris Atkinson
John Leask
Fred Bolton

Staff members of the Metlakatla Indian Community:

Greg Argel, Director of Natural Resources
John Peeler, Annette Island Forester
Ray RaLonde, Director of the Aquaculture Technician Program
Larry Crump, Social Worker.

Agency Personnel:

Mary Jo Waits, Department of Community and Regional Affairs
Forrest Blau, Alaska Department of Fish and Game.

Consultants:

Hap Leon, Pacific Rim Planners, Inc.
and Cathy Rose.

Councilman Richard Johnson opened the hearing at 7:15 P.M.

Mary Jo Waits gave a brief introduction to the Federal and State Coastal Management Programs.

Hap Leon introduced the local Annette Islands Reserve Coastal Management Program and opened discussion of the first goal of fishery management.

Forest Blau pointed out that it was not clear to him who carried out actions in implementing the program.

Richard Johnson explained that the Metlakatla Community Council is responsible for all actions, contracts etc. and acts through the Mayors office and the Annette Natural Resource Center.

John Leask commented on fisheries habitat enhancement. He pointed out that the island's natural streams could be alot more productive if logs, culverts, etc. were removed. He suggested these measures might be more productive than hatchery construction and operation.

Ray RaLonde suggested that any action interfering with watershed or water movement should be checked out first with the fishery manager on Annette Island.

John Leask agreed with him, cited actions connected with logging on Prince of Wales Island and the damage those have caused to streams and to fish production.

Ray RaLonde suggested crab should be added to objective 1.7. He was concerned about damage to egg-bearing female crabs by beach harvesting. John Leask pointed out that he didn't think that regulations would help in this matter since people have harvested crab on the beaches for years. Richard Johnson said that there hadn't been a commercial fishery on the island for a long time and that he wouldn't want a commercial crab fishery. Ray RaLonde emphasized the need for data to recognize changes in the resource, particularly the crab resource, for which there is no data.

Richard Johnson pointed out that a few years ago crab pots were made illegal because stocks were low. He said that similar action was taken when the subsistence fishery for sockeye was closed on Tain Creek when the socks were low there. Also the herring roe fishery was closed in 1978. He explained that he was glad to see a Coastal Zone Management Program because the Community needs basic data to avoid depleting the stock. He pointed out that this is the first step, but it was a major step, in obtaining this data.

Forrest Blau asked whether the Community had a policy regarding culverts, roads etc. to allow free fish passage.

Greg Argel, John Peeler and Richard Johnson all mentioned that the Community has such a policy.

Richard Johnson asked whether if culverts were repaired or replaced, streams could be restocked with Coho, referring specifically to the stream flowing out near the sawmill. Ray RaLonde mentioned that it is possible to transplant eyed eggs, but that it was important to check out the stream for all possible reasons for the decline in the fish (not just faulty culverts, or road building).

Hap Leon asked whether there were any problems with allocating the fish catch among gear types.

John Leask said he thought allocation was a problem with herring, particularly since seines take a great deal of young herring which are not valuable in the roe fishery. He suggested that even tests sets should be done with gillnets only, not with seines.

Richard Johnson mentioned that we have learned with the roe fishery that we have to be careful in managing a fishery, and that it would be wise to have a fishery manager on the island.

The meeting took a short break before returning to the subject of forestry.

Hap Leon reviewed the objectives and the policies under Goal 2 Forest Resources.

Richard Johnson asked whether the Community had overcut timber on Annette Island. John Peeler pointed out that quite a bit more has been taken and could be taken under the sustained yield program. John also reviewed some of the principles of the sustained yield and discussed with Richard Johnson and John Leask some of the assumptions of sustained yield at Annette Island.

Ray RaLonde asked whether there should be standards for dumping wood waste. Hap Leon said that the program would have included one, but Louisiana-Pacific said that they would haul wood chips to Ketchikan, so dumping became a moot point. John Leask requested that there be studies on the effects of wood waste dumping, and mentioned that the fishermen are concerned about the effect of wood waste on the streams. Greg Argel asked whether Louisiana-Pacific had made a commitment to take the wood chips to Ketchikan. Richard Johnson agreed that they had, but suggested that there be a standard for wood waste dumping anyway, to make sure its covered.

John Leask asked whether wood chips could be used for energy, rather than wasted. Richard Johnson agreed they could, and pointed out that in Ketchikan it was economically possible but with the volumes produced in Metlakatla it didn't appear feasible right now. He mentioned that it might be possible in the future to reclaim the bark chips from the present dumps, and he requested that PRPI as consultants propose alternative solutions to the problem of dumping bark chips and discuss the effects of those solutions.

Hap Leon introduced the Mineral Development section. He discussed the objectives of the program for mineral development. Harris Atkinson mentioned that a study from a Anchorage geologist said that Annette Island doesn't have much in the way of commercially valuable minerals.

Richard Johnson stated that standards should be set up in advance anyway, even if there were no known reserves of minerals on Annette Island. There was no further discussion of mineral development.

Hap Leon introduced the section of land and water development on Annette Island. And discussed some of the objectives and policies for land and water development.

Ray RaLonde asked whether it was a community policy towards removing dilapidated buildings, referring specifically to buildings left by the Coast Guard and the Army in the south part of the Metlakatla Peninsula. Richard Johnson said the Community was pursuing the Coast Guard and other agencies to remove these structures.

The subject turned to the area of Economic Development. Ray RaLonde suggested that shellfish aquaculture be added to action 5.1.5.3 under Economic Development. He also suggested that training be added to economic development enterprises to encourage on-island personnel to be trained for new enterprises. He emphasized that this training should be aimed at the local schools.

In general discussion the group agreed that there should be a policy for re-forestation and that the timber (BIA) operating manual should be referred to for standards for log and dumps and other forest related policies.

Cathy Rose gave a brief description of her work and research on the studies of the wildlife habitats on Annette Island.

Leo Guthrie asked if the plan should address drinking water. Richard Johnson mentioned that drinking water is addressed in the Tribal Specific Health Plan, which has specific standards for drinking water.

Richard Johnson adjourned the meeting at approximately 9:30.

**The following appendices are available
from the Annette Natural Resource Center:**

Appendix A - Estuarine Water Condition Data

**Appendix B - Wildlife Resource and Habitat Inventory
of Annette Islands Reserve**

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