Makah

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Coastal Zone Management Program

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Coastal Zone Management Program

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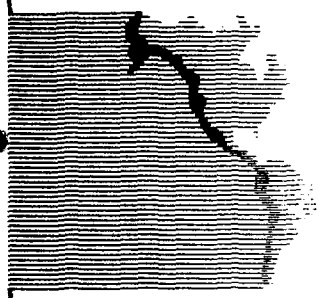

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17-06

October 1, 1978

Makah Tribal Council
Makah Planning Department
P.O. Box 115
Neah Bay, Washington 98357

Ladies and Gentlemen:

In accordance with the agreement of May 1, 1978 between the Makah Tribal Council and Pacific Rim Planners, Inc., we take pleasure in submitting The Makah Coastal Zone Management Program.

This Document inventories the Makah Reservation's land and water resources, analyses the characteristics of the population and discusses the reservation's economic climate and the opportunities it presents. Goals for the program are included, along with the objectives and policies to achieve them. The Coastal Zone Management Program integrates several previous studies completed on the reservation. Coupled with the implementation portion (scheduled for completion in fiscal year 1979), the program will form the nucleus of resource management for the Makah people.

The Makah Coastal Zone Management Program is one of the first of its kind to be developed by an Indian tribe. We feel privileged to have assisted in its development.

Sincerely,

PACIFIC RIM PLANNERS, INC.

Charles A Warsinske

Charles A. Warsinske,
Project Manager

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MAKAH

COASTAL ZONE MANAGEMENT PROGRAM

October 1, 1978

Prepared for the

MAKAH TRIBAL COUNCIL

by

PACIFIC RIM PLANNERS, INC.
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The preparation of this report was financially aided through a grant from the Washington State Department of Ecology with funds obtained from The National Oceanic and Atmospheric Administration, and appropriated by Section 360 of the Coastal Zone Management Act of 1972.

Department of Ecology
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Olympia, Washington 98504

November, 1978

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Summary

MAKAH COASTAL ZONE MANAGEMENT PROGRAM

Coastal zone management (CZM) is a process of developing and implementing policies for the use of coastal resources. The federal Coastal Zone Management Act (P.L. 92-583), which required states to develop and coordinate CZM programs, specifically excluded federal trust lands from the coastal zone. However, special funding was made available through the federal Office of Coastal Zone Management for Indian tribes to develop their own CZM programs. The Makah Coastal Zone Management Program is being funded by the Bureau of Indian Affairs and the Department of Commerce, whose "pass-through funds" are administered by the Washington Department of Ecology.

Coordination of Programs

The coastal zone management program is an opportunity for the tribe to regulate and coordinate land uses on the reservation. Throughout its development, it has been synchronized with the recommendations and findings of the Makah Land Use and Housing Plan (PRPI, 1977) and the Makah Environment Management Study (PRPI, 1978; NETL, 1977), to maintain consistency throughout tribal planning efforts.

With the completion of the implementation phase of the program (FY 1979), the tribe will have a land management package which will regulate land use on the reservation without restricting the opportunities the natural resources provide for the Makah people. This process has been started in the Land Use and Housing Plan and the Environmental Management Study by determining the suitability of the land on the reservation for general uses such as development and timber production, while recognizing natural hazard and environmentally sensitive areas. The Coastal Zone Management Program continues this process by defining appropriate uses to specific areas of the reservation. This process occurs in the implementation phase of the program. Subsequently, design or performance standards will be assigned to those uses to mitigate any adverse impacts of the use on the environment or other existing uses.

The Coastal Zone Management Program

The primary step in the development of the Makah Coastal Zone Management Program was the defining of the issues regarding the use of the shoreline and the coastal resources. These issues were initially developed in earlier studies and refined for this program through discussions with Tribal representatives. The issues were then used to formulate goals and objectives of the program.

The next step in the planning process was to define what comprised the coastal zone. This was accomplished through the assemblage of data on the traditional use of the coastal resources, the existing land use pattern, the physical features of the land, and economic conditions and forecasts. It was soon realized that the whole land base of the reservation had, in some way, interaction with the shoreline. Because there are varying degrees of interaction between the coastal waters and the rest of the reservation, the coastal zone was designated in three levels. Level I, the Marine Environment, included all waters, tidelands, and beaches up to mean higher high water (MHHW) line. Level II, Shorelands and streamways, included the area from Level I to the road running along the shoreline, streamways and their buffer strips, and primary views from the shoreline. The Uplands, Level III, was all the remaining land on the reservation.

Land use units, developed in the 1977 Makah Land Use and Housing Plan, were then analyzed as to their suitability of occurring in each of these three coastal zone levels.

From the issues and objectives, the inventory of coastal resources and their use, and the definition of the coastal zone, policies were developed which specify Tribal actions or positions on resource use. The implementation of these policies (Part 2 of the program) is the crucial phase in ensuring that the coastal resources will be managed for future use and enjoyment.

Chapter 1
BACKGROUND

The Makah Tribe has historically looked to the sea for its living. After settling on the shores of Neah Bay, the Makah derived their livelihood from the fish, shellfish, and marine mammals of the Pacific Ocean and the Strait of Juan de Fuca. With the coming of the twentieth century, the Makah's lifestyles have changed, but their orientation to the sea remains strong.

Recognition of their interdependence with the coastal environment has led the Tribe to develop an overall program for the management of coastal resources. This program is funded through the U.S. Department of Commerce, N.O.A.A., Office of Coastal Zone Management, the Washington Department of Ecology, and the U.S. Bureau of Indian Affairs.

This report summarizes the first phase of the Makah Coastal Zone Management Program (CZMP). Included is a statement of coastal management issues and goals, an inventory of coastal resources, and a set of policies, based on the inventory, developed as a guide to achieve the goals. It must be emphasized that this report is not, in itself, the program. The program is an ongoing process of development of policies, based on available information, and the implementation of those policies by the Tribe and by other agencies and parties involved in coastal resource use and management on the Makah Reservation.

The Setting

The Makah Indian Reservation covers approximately 44 square miles on the northwestern corner of the Olympic Peninsula. The reservation is bounded by the Pacific Ocean to the west and the Strait of Juan de Fuca to the north (Figure 1). Rugged, mountainous terrain, characteristic of the Olympic Peninsula, covers most of the reservation, with hills and ridges generally ranging from 500 to 1,000 feet and reaching nearly 2,000 feet at Sooes Peak. Most of the hills are forested, although two lowland valleys spread out into broad tidal marsh meadows.

The Coastal Zone

The term "coastal" is often used to refer to the narrow zone of shoreline at which the ocean actually touches the land. The federal Coastal Zone Management Act (P.L. 92-583) takes a broader view of the term, how-

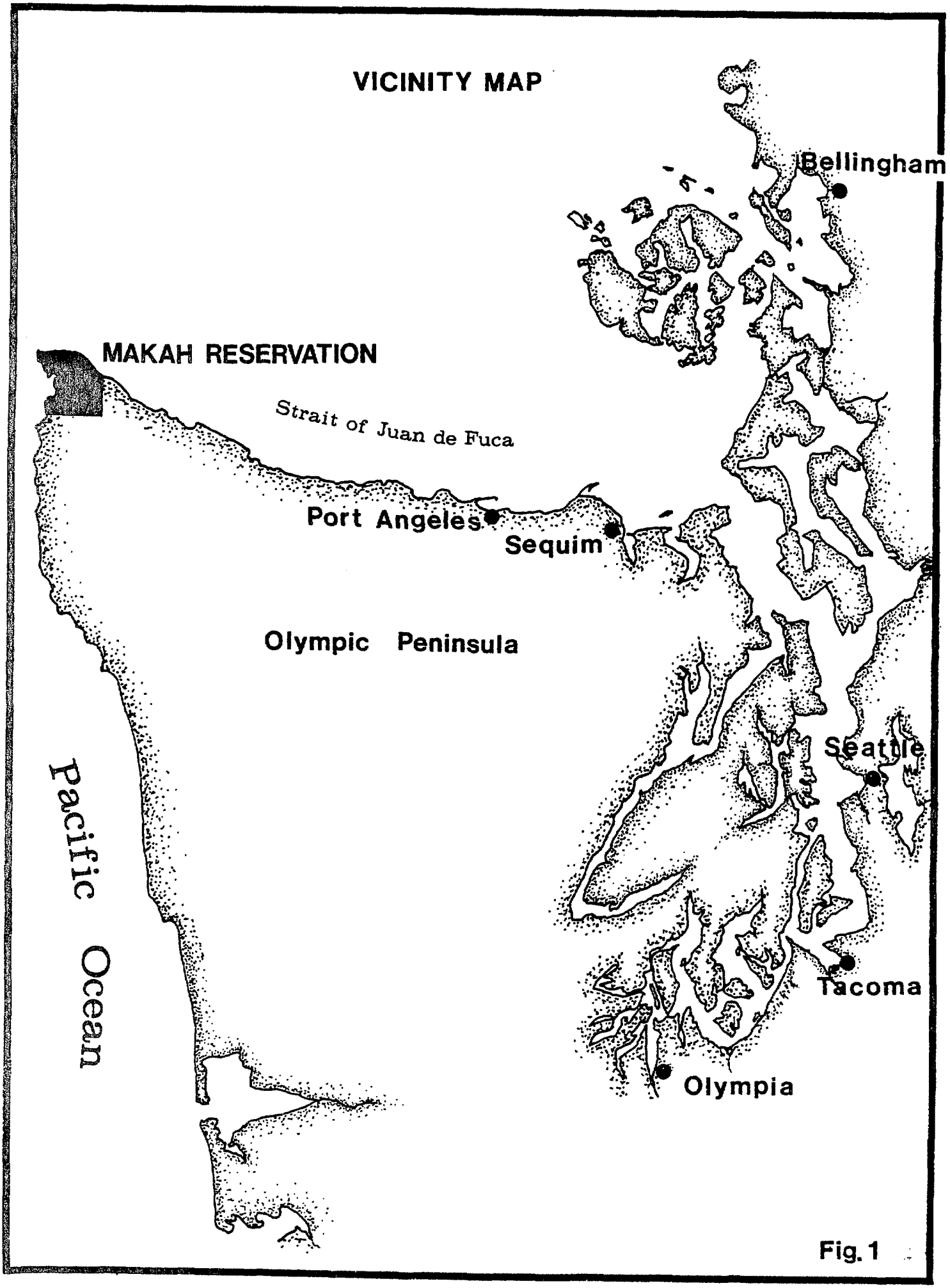

VICINITY MAP
Bellingham
MAKAH RESERVATION
Strait of Juan de Fuca
Port Angeles
Sequim
Olympic Peninsula
Pacific Ocean
Seattle
Tacoma
Olympia

Fig. 1

Chapter 1
Background

ever, defining the coastal zone in Section 304(1) as:

> ...the coastal waters (including the lands therein and thereunder) and the adjacent shorelands (including the waters therein and thereunder) strongly influenced by each other in proximity to the shorelines of several coastal states, and includes islands, transitional and intertidal areas, salt marshes, wetlands and beaches...

Such a definition, while appearing fairly all-encompassing, leaves a good deal of latitude for interpretation. The phase "strongly influenced by each other" does not set a limit of distance from the sea, but instead relies on influences--physical, biological, and even cultural--to determine the landward limit of the coastal zone.

To analyze the ways in which the land and the sea influence each other, this report examines the reservation's natural resources of the land and the sea, and discusses the human uses of those resources. The coastal zone is then defined for the reservation based on the processes by which the land and sea influence each other.

Coastal Zone Management on Indian Reservations

The definition of the coastal zone in the federal Coastal Zone Management Act (hereafter referred to as "the Act") specifically excluded federal trust land from the coastal zone. Because the Makah Reservation is made up largely of federal trust land, it therefore is not considered part of the coastal zone. This exclusion brings with it both advantages and disadvantages.

Because the Act mandates federal consistency, to the maximum extent feasible, with state CZM programs, the exclusion of the federal trust lands from the definition of the coastal zone also exempted Indian reservations (along with military installations, national parks, and other federal lands) from the requirement of consistency with the coastal zone management programs of the State of Washington or of Clallam County. But, as the Act was originally implemented, neither was the Tribe eligible for the benefits of coastal zone management, chief among which is financial assistance in program development and implementation.

With the offer by the federal Office of Coastal Zone Management of "pass-through funds," to be allocated to Indian tribes by the Washington Department of Ecology (DOE), the coastal Indian tribes are now in the position of having the best of both possible worlds. While they remain independent of state and county jurisdiction, they can receive financial assistance from the State in program development. The tribes can also develop a working relationship with DOE and the other state agencies to utilize the technical expertise of the state in implementing the programs and assisting in decision-making.

The Planning Process

The Makah Coastal Zone Management program has developed through the efforts of the Tribal Council and the Tribal Planning Office. Far from being a "product," this plan is the first step of an ongoing process, illustrated in Figure 2. Implementation and enforcement of the program, to be developed in Part 2, is the important key to the responsible management of the Makah's coastal resources. The results of Part 1 of the program are compiled in this report and consist of the issues, goals, policies, characteristics, capabilities, use of resources, and definition of the coastal zone.

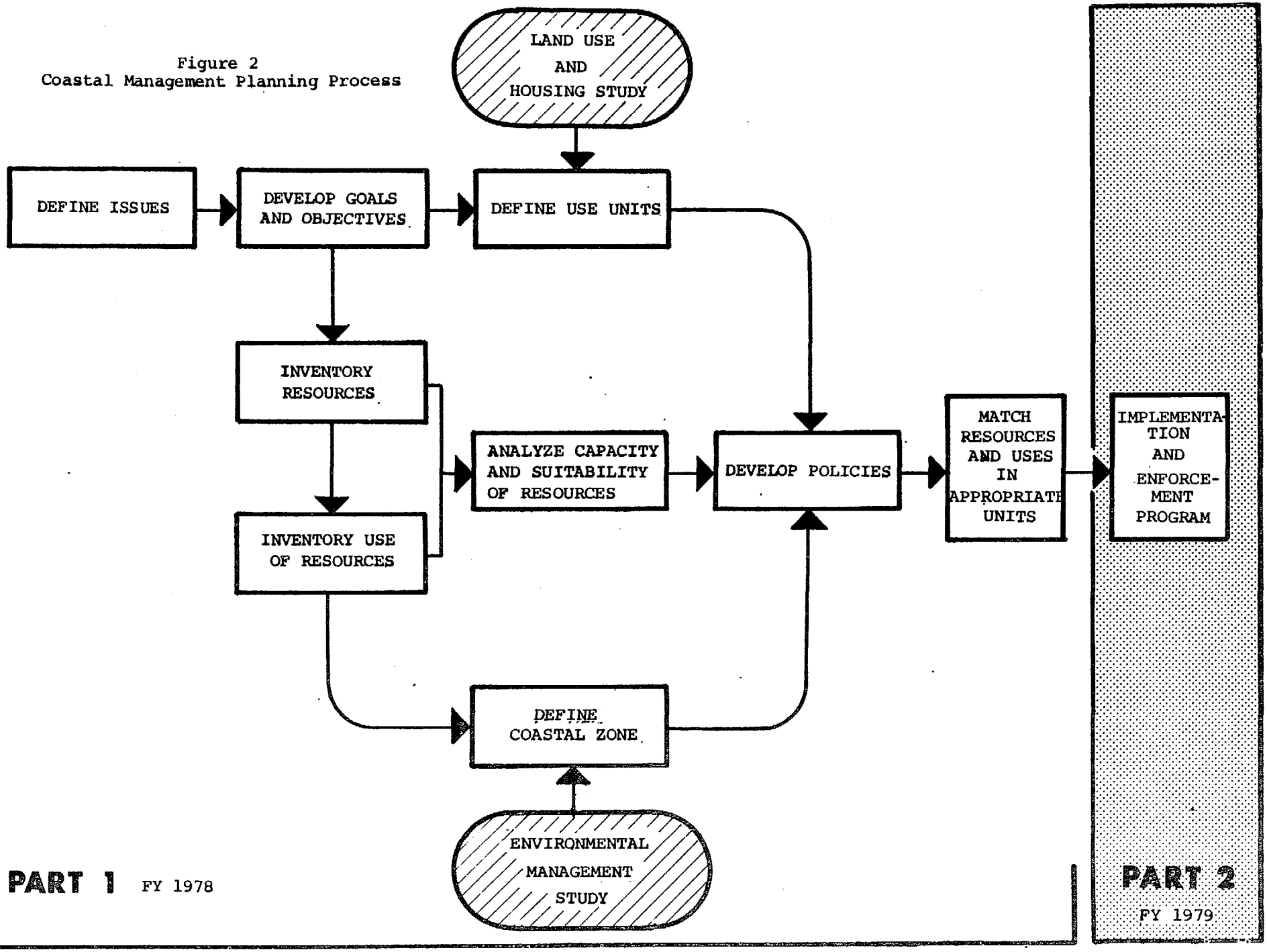
With Tribal input, issues concerning the use of coastal resources were defined. From those issues, goals and objectives were developed to guide the Tribe in effectively dealing with the issues. Some of these issues, goals, and objectives were developed in earlier studies, but refined to deal specifically with coastal resources for this program. As indicated in Figure 2, land use units were defined in the Land Use and Housing Plan, while the Environmental Management Study contributed to the development of a definition of the coastal zone levels.

The capabilities and uses of the coastal resources were inventoried and analyzed as to their suitability for use. This, along with the goals and objectives, guided the planning team in defining the coastal zone for the Makah Reservation. Policies and standards were then proposed to achieve the program's goals within the levels of the coastal zone.

Part 2 of the program, to be completed in fiscal year 1979, will deal with the implementation of the coastal management plan. This is the most difficult, but also the most crucial step in the planning process.

As indicated above, this planning effort is only one of a series of studies which have been conducted for the Makah Tribe. These studies should be considered in any further management of coastal resources. The Makah Land Use and Housing Plan of 1977 set forth land use units, based on the suitability of the land for various uses. The Environmental Management Study, completed in 1978, identified environmental problems and environmentally sensitive areas, and proposed measures and standards with which to address these problems. The Land Development Program, in progress in 1978, is designed to prepare a comprehensive inventory of reservation land status and development costs to identify sites where land development for residential use is most economically and legally feasible. Since planning programs were not conducted in isolation, the results of each affect the progress and relevance of the others.

Figure 2
Coastal Management Planning Process



Chapter 2

Issues, Goals, and Objectives

Chapter 2

ISSUES, GOALS AND OBJECTIVES

The Makah live in close association with their coastal environment. Actions which affect these coastal resources are therefore of vital importance to every Tribal member. As this program was initiated, it became necessary to enunciate the specific coastal management issues with which the plan would deal. Subsequently, the definition of various goals and objectives was developed to provide, in part, a basis for eventual policy determination.

Issues

The study team has spent a significant amount of time during the last year working with the Tribe and discussing their ideas and attitudes towards the use of their resources. On May 9, 1978, a formal meeting was held to discuss and to identify specific issues. Attending were representatives from the Tribal Council, the Tribal Planning Department, the Forestry Department, the Bureau of Indian Affairs, the Health, Education and Welfare Department, the Tribal Housing Authority, and the Resource and Economic Development (R.E.D.) Committee. The issues which were discussed were many and varied, but fell into two major categories: natural resource issues and legal issues.

NATURAL RESOURCE ISSUES

Management and Protection of Salmon Streams

The fisheries on the reservation, both sport and commercial, are critically important to the Makah. Through the protection of the spawning streams on the reservation, it is believed the fisheries can be sustained and expanded in the future.

Continued Protection of Designated Forest Preserves

The Tribal Council, through resolution, has designated areas where the timber and associated vegetation is to be preserved. Most of the reserve is located along the coast of Cape Flattery extending to the west ridge of Neah Bay. This area is to be preserved for its scenic value and its old-growth cedars used in traditional Makah art work.

Continued Maximization of the Commercial Timber Resource in a Responsible Manner

Timber is a mainstay in the Makah economy. Supplemented by other ventures, the sale of timber finances many of the Tribe's activities and provides jobs for many Tribal members. The continued management of the resources in a sustained yield manner is critical to the economy of the Tribe.

Appropriate Land Use Practices in All Environments on the Reservation

Through instigation of an Environmental Management Program, the Tribe has indicated its concern for the proper development and use of the lands on the reservation. The reservation includes many sensitive environments, such as dune lands, marsh areas, and estuaries, which the Tribe recognizes as necessary to maintain, within certain limits, to protect its natural order.

Development of a Well-Planned Marina

The Tribe, at this time, has a small, crowded marina off the breakwater in Neah Bay. A study was completed in 1977 to determine a proper site for the development of a new, larger facility.

Consideration of Offshore Resources

Although unknown at this time, the type and size of the offshore resources (oil, gas, etc.) are of concern to the Makah people. In particular, the impact of possible future exploration and extraction activities on other natural resources (e.g., fishing) and upon the community is of great concern.

Development of Land for Home Sites on the Reservation Which Allows for a Variety of Lot Sizes

At present, the reservation has few areas which can be used for home sites. A land development program is presently underway which will assist the Makah in determining the best areas for housing development. The program is considering social, economic, physical, and legal factors in this determination.

Development of Jobs on the Reservation to Ensure Full Employment

Forest products and fisheries are important employment sectors in the local economy. Both, however, are subject to wide fluctuations in supply and demand. Providing steady employment for more individuals requires the development of a broader-based economy.

Opportunities for Individual Tribal Members to Take Advantage of the Potential Tourist Trade

Facilities such as recreational vehicle parks, campgrounds, and boating facilities are in greatest demand during the summer months. Participants in the meetings believed that Tribal assistance is needed to enable individual members to successfully develop such facilities.

Expansion of the Tourist and Recreation Market on the Reservation

With the completion of the new Makah Cultural and Research Center, which will house many of the artifacts found on the Ozette portion of the reservation, a large increase in visitation to the area is expected. While tourism benefits the local economy, its impact upon coastal resources and upon local use of those resources is uncertain.

Solid Waste Management on the Reservation

The present garbage dump is unsanitary and visually unacceptable. The health hazards it poses are potentially dangerous to the community. Garbage dumping or even a sanitary landfill may not be the best method for solid waste disposal on the reservation.

Vehicle Control on the Reservation Beaches

Because of the relative isolation of the coastal areas on the reservation, there has been a tendency for the dune areas and the beach to be abused through the indiscriminate use of motor vehicles. This problem has the potential not only to damage the protective dunes but to destroy habitats for many animals.

Water Quality in Mukkaw Bay and Neah Bay

With increasing commercial, recreational, and industrial use of Neah and Mukkaw Bays, the water quality has been impaired in the last few years. The responsible use of these bays on the reservation is desired.

LEGAL ISSUES

Land Leases

The procedures for negociating, writing and granting land leases on the reservation are not defined at present. This causes a lack of consistency in the existing leases and some confusion among lease holders over terms and conditions. A standardization of these procedures is desired.

Fractionation of Allotted Lands

The fractionation problem (multiple ownership of single plots of land caused by complex inheritance laws and procedures of the BIA) is one which has plagued the Makah for over a hundred years. It has caused the community to develop in a haphazard manner and continues to stifle commercial and industrial development.

Relations With Those Agencies Who Are Charged With Assisting the Tribal Members

Several state and federal agencies assist the Tribe in their activities. Coordination between these agencies and the tribal program would benefit all parties involved.

Goals and Objectives

The preceding issues, as diverse as they may appear, are all interrelated in that they are all affected by the use of the Tribe's coastal resources. In order to help resolve these issues, the planning team, in close coordination with the Tribal Council and its staff, developed a set of goals for the coastal zone management program. These goals are statements of the conditions that the Tribe wishes to strive for in its resource use.

The goals are fairly general, however, and do not set forth a clear pathway toward achieving the desirable condition; therefore, each goal is accompanied by one or more objectives. These objectives help chart the course to follow in achieving the goal.

Goal 1: Resource management to encourage employment on the reservation and ensure the responsible use of the resources.

Objectives:
- o Manage and protect salmon streams.
- o Continue to maximize the commercial timber resource in a responsible manner.
- o Develop jobs on the reservation to ensure full employment.
- o Manage reservation resources to provide a balanced maximum economic return.
- o Ensure responsible land use practices in all environments on the coastal zone.
- o Seek avenues to check the continued fractionation of allotted lands.
- o Effectively utilize the lands along the shorelands of Neah Bay.

Goal 2: Maintenance of the Makah culture.

Objectives:
- o Protect historical and archeological sites.
- o Protect designated forest preserve.

Goal 3: Appropriate siting of various marine and marine-related development.

Objective:
- o Develop a well-planned marina.

Goal 4: Availability of low-cost, quality, environmentally-sound reservation housing for tribal members.

Objectives:
- o Encourage the development of housing areas which are environmentally sound and aesthetically pleasing.
- o Rehabilitate dwellings in need of repair.
- o Continue existing housing programs.

Goal 5: Preservation of present character and environment of the reservation

Objectives:
- o Responsibly manage solid wastes.
- o Control vehicles on the reservation beaches and dunes.
- o Maintain water quality in Mukkaw Bay and Neah Bay.
- o Protect natural features and sites from indiscriminate use.

Goal 6: Tribal benefits from, and influence over potential development of off-shore resources.

Objectives:
- o Obtain benefits for tribal members from offshore resource development without jeopardizing other sensitive resources.
- o Assure tribal input into and influence over decisions regarding use of off-reservation resources which may affect the Tribe.

Goal 7: Standardization of land leasing procedures on the reservation.

Objective:
- o Review present land leases, their terms and conditions.
- o Prepare a standard procedure for developing land leases.

These goals indicate a strong concern on the part of the Makah Tribe for a balanced use of coastal resources on the reservation--a use of timber, fish, water and land in a manner that will benefit tribal members, while retaining the resources, and the option to use them, for future generations. The objectives for each goal can be viewed as the course the tribe has chosen to follow to attain the goal.

Since these goals, and their objectives, generally involve the management of coastal resources, the fulfillment of the CZM program will require a background in the character of those resources and their use. The following three chapters of this report inventory the natural resources of the reservation, analyze the nature of the people using them, and discuss the types and patterns of resource use on the reservation.

Chapter 3
The Natural Resources

Chapter 3
THE NATURAL RESOURCES

The Makah people have traditionally used coastal resources for their livelihood, and continue to do so today. Some of those resources are strictly coastal: the fish from the ocean, and shellfish from the shore, but there are other resources which are intimately connected with those of the marine environment, even though not in close proximity to the shoreline. Small streams high in the hills and miles from salt-water provede critical spawning habitat for the salmon which are caught offshore, while the tideflats of the Sooes River produce food for the young salmon. Even the vegetation near the streams is an important contributor to the productivity of the stream.

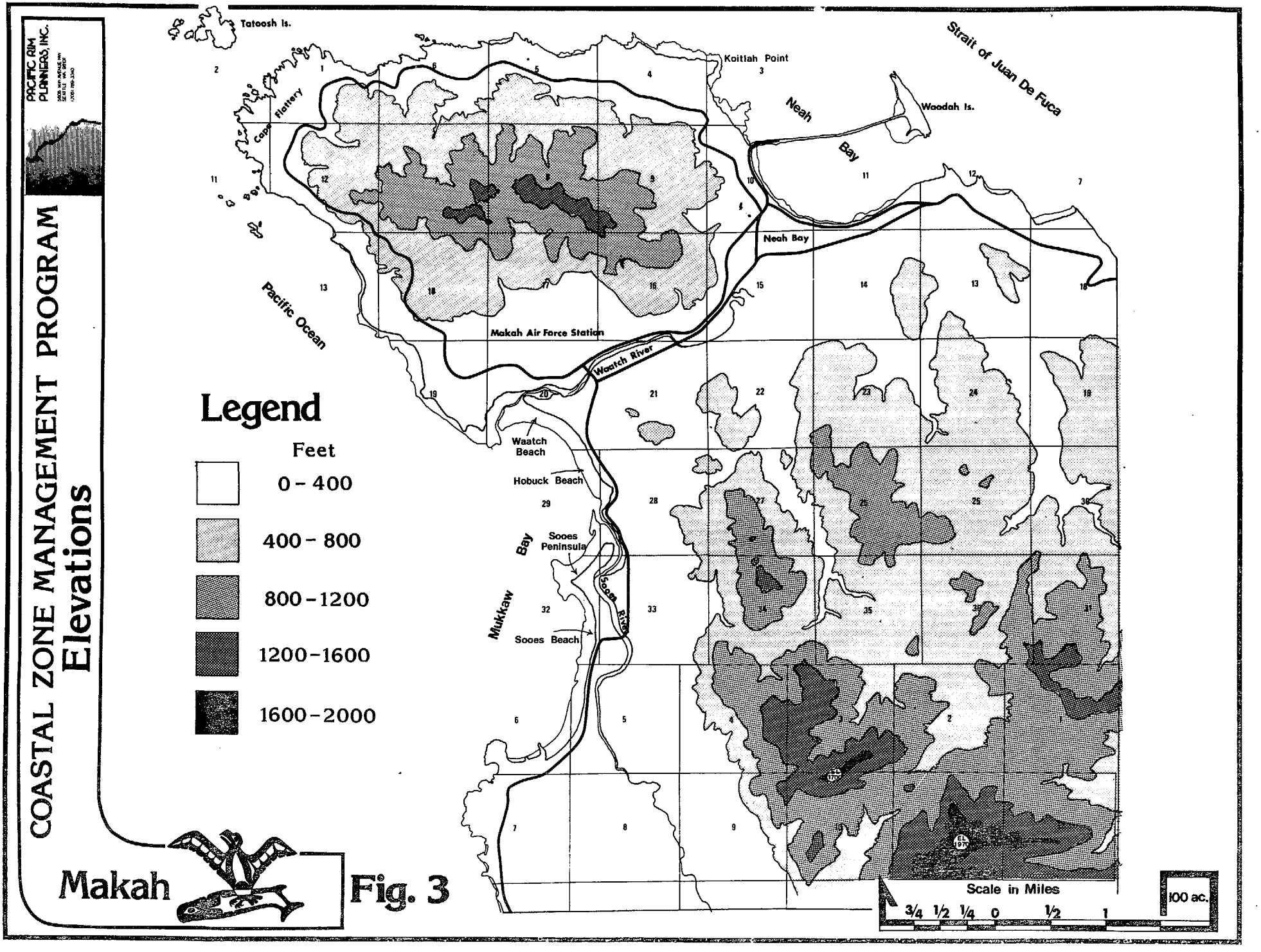
The streams serve to connect the resources of the land with those of the sea, transporting not merely water, but nutrients, sediments, plants and animals. The management of coastal resources, therefore, must take into account the resources of the land. This chapter describes the natural resources of the Makah Reservation beginning with the uplands that drain into the sea, including the freshwater environment, and concluding with the marine resources of the reservation's shoreline.

Physical Features

The 44-square mile Makah Reservation, located in the northwest corner of the Olympic Peninsula, is characterized by rugged topography. Although it has two large low-lying valleys, those of the Waatch and Sooes Rivers, the reservation is generally mountainous. Sooes Peak, just under 2000 feet in elevation, is the highest point on the reservation, but there are many smaller hills and ridges from 500 to 1,000 feet in elevation (Figure 3).

The abundant rainfall in the area has created numerous small stream courses,which over the centuries have eroded the mountains into distinct drainage basins. Two of these watersheds, those of the Sail and Sekiu Rivers, drain into the Strait of Juan de Fuca outside the reservation. Of the remaining four, the Waatch and Sooes drain most of the land area, emptying into Mukkaw Bay on the reservation's west coast. Cape Flattery is not a true drainage basin, but is drained by a number of small streams in a radial pattern into the Strait and the ocean. The Neah Bay basin is relatively small, flowing through a small creek into Neah Bay.

The mountainous topography, deeply cut by the stream erosion, presents fairly steep slopes. A good deal of the reservation has slopes steeper than 70% which are generally unstable and subject to slides or other soil


PACIFIC RIM PLANNERS, INC.
COASTAL ZONE MANAGEMENT PROGRAM
Elevations
Makah
Fig. 3
Tatoosh Is.
Strait of Juan De Fuca
Koitlah Point
Cape Flattery
Neah Bay
Waadah Is.
Pacific Ocean
Makah Air Force Station
Waatch River
Waatch Beach
Hobuck Beach
Sooes Peninsula
Sooes River
Sooes Beach
Mukkaw Bay
Legend
Feet
0 - 400
400 - 800
800 - 1200
1200 - 1600
1600 - 2000
Scale in Miles
3/4 1/2 1/4 0 1/2 1
100 ac.

movements. A great majority of the land is steeper than 15% slope and is therefore not suitable for development. Low-lying flat land on the reservation is limited to small strips of land running parallel to the shoreline at Neah Bay and Mukkaw Bay, and to the valleys of the Waatch and Sooes Rivers.

Climate

If one element in the climate were selected as a major controlling factor on the reservation, the most likely would be the influence of the sea. The sea provides a vast, unimpeded path for the prevailing southwest winter winds which pick up moisture from the warm Japanese current in the winter. When these warm, moisture-laden winds encounter the cooler land mass of the Olympic Peninsula, they are unable to continue holding the moisture, which precipitates out in the form of rain, or, occasionally, snow. The mean annual precipitation level at Tatoosh, the northwestern-most point of the reservation, is nearly 80 inches per year, with most of that precipitation falling in the fall, winter and spring.

Besides bringing moisture, the marine winds moderate the temperature on the reservation. In the coolest month of the year, the mean daily temperature is a comparatively mild 39°F, while in August the mean daily temperature is only 56°F.

In the summer, the prevailing winds shift, coming from the east. During this time, the air is drier and the level of precipitation is sharply reduced.

This mild, moist weather pattern has promoted the lush forest growth characteristic of the Washington Coast (Franklin and Dyrness, 1973) and made possible an ideal year-round setting for the Makahs who first settled at Neah Bay and several other villages in the area.

Geology

A glance at the settlement patterns on the reservation reveals the importance of geology and the geomorphological (earth-forming) processes to the people who live there. While major features, such as mountains and valleys, have been prime determinants of land use, there are more subtle aspects of the reservation's geology which can help in selecting the optimum use for a given area of land.

Some of the geologic features on the reservation were formed over 50 million years ago. These have been studied by geologists from the U.S. Geological Survey (preliminary map by Parke D. Snavely, Jr., Norman McLeod, and James Pearl, U.S.G.S.) and described by McKee (1972). The following discussion is based on information derived from these sources.

Some sixty million years ago the Pacific Ocean extended to the west slopes of the Cascade Mountains, and the area which is now the Olympic Peninsula was submerged. Erosion from the Cascades carried sediment out

into the ocean, where it accumulated in the shallow waters of the continental shelf. Some of these sediments were compressed under their own weight to form the sedimentary rocks, the sandstones, siltstones, and shales, of the Soleduck formation.

The Coast Range region underwent volcanic activity during that time as well, and some volcanic rock resulting from that activity is also incorporated into the Soleduck formation. These rocks, from 25 to 58 million years old, are found in the southwestern part of the reservation, although they were not necessarily formed there. McKee (1972) notes that this formation appears to have been emplaced under the Crescent formation by slow gradual movement. The thrust-faulting found in the southwestern part of the reservation is the location at which these formations contact each other, and at which the marine sedimentary and volcanic rocks of the Soleduck formation moved under the Crescent formation (Figure 4).

The Crescent formation, some 50 to 58 million years in age, is composed of marine basalt, from volcanic lava erupted underwater. It extends in a narrow band parallel to the northern shore of the Olympic Peninsula. The Crescent formation reaches its minimum width on the Makah Reservation, where it is a one-mile-wide band running parallel to the Sooes River.

Between 15 and 40 million years ago, with the Olympics still submerged by the ocean, continued accumulation of marine sediments led to the formation of the sedimentary rocks underlying the northern and eastern part of the reservation. It is these rocks, sandstone, siltstone, and conglomerate, that make up the foundation for most of the reservation. There is a steep fault in this formation which, because of its erodability, became the course of the Waatch River and the flat valley now used for grazing livestock.

Thirteen million years ago much of the shallow continental shelf had been filled with sediments. This filling, combined with a major gradual uplift, resulted in raising the Olympic Peninsula far enough above sea level so that it has not been submerged since.

More recent actions, including erosion and deposition of sediments by glaciers and streams in the last million years, have created the ridges and valleys which stand out as prominent physical features on the reservation.

Because of their different compositions, the rock formations on the reservation behave differently when subjected to erosion by the heavy rain on the reservation. The basalt of the narrow Crescent formation presents a low erosion hazard, while the sedimentary rocks present a moderate erosion hazard (U.S.D.I., Federal Water Pollution Control Administration, 1970). The preliminary geologic map of the reservation notes the presence of tuff and tuffaceous siltstone, formed of compressed volcanic ash, located in a northwest-southeast oriented band east of Mukkaw Bay. This rock presents a high erosion hazard. Activities such as road construction and other earth-moving projects expose the soil and geologic substratum to erosion, and are best located in areas with only low or moderate erosion hazards.

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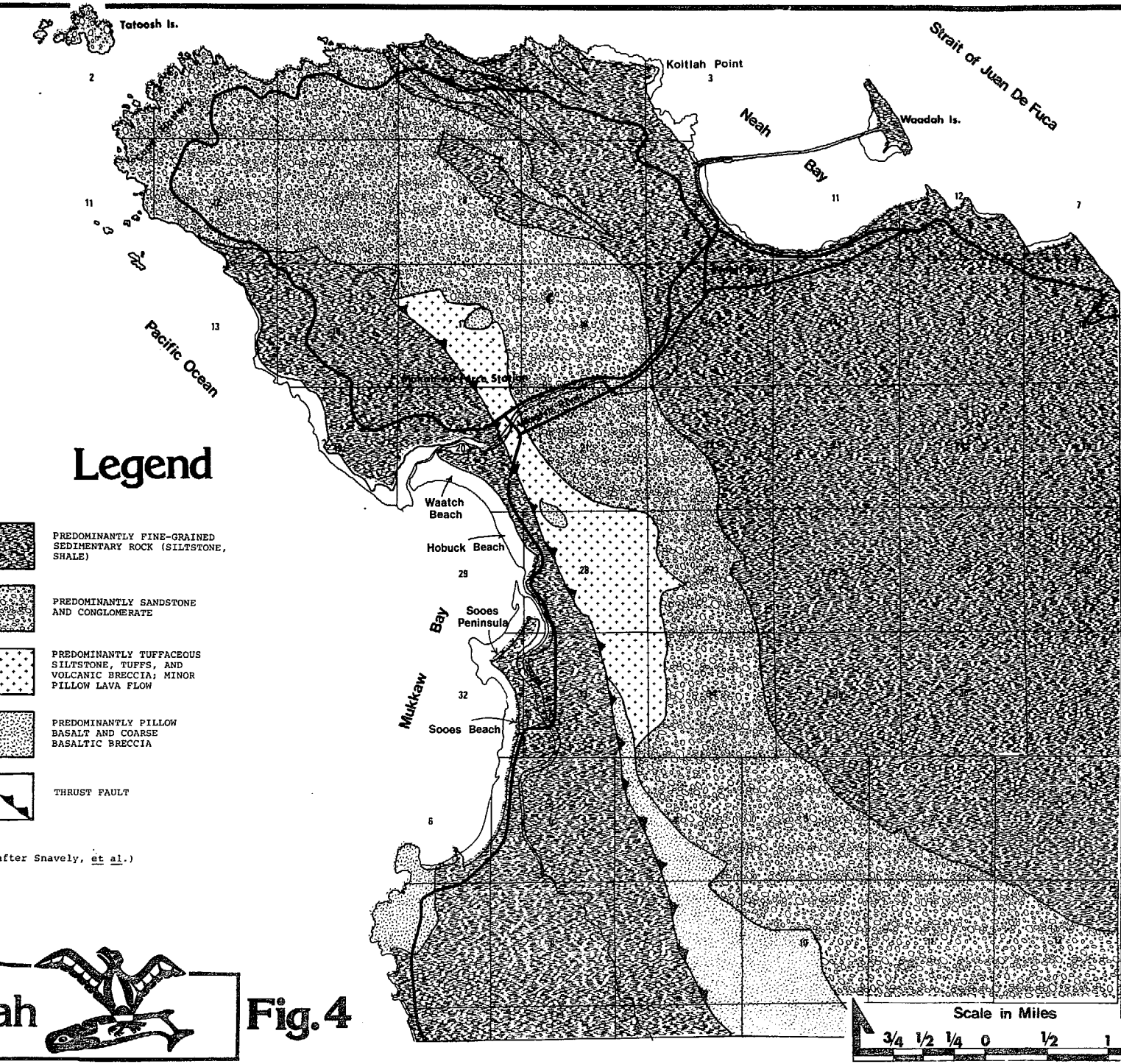
COASTAL ZONE MANAGEMENT PROGRAM
Geology



Makah

Fig. 4

Soils

Any human use of the land is controlled to some extent by the characteristics of the soil. The construction of buildings or roads and other activities are affected by such soil characteristics as slope, drainage, and structural stability. The development of natural systems is also dependent on soil types, with different communities of vegetation and wildlife occupying areas underlain by different soil types. An analysis of the soil on the reservation will facilitate the planning of resource utilization in a way that is compatible with the soil. This would work to minimize adverse effects of the use on the soil, or of the soil on the use.

The soils on the Makah Reservation are inventoried and mapped on a general level in the Soil Survey for Clallam County (U.S. Department of Agriculture, 1951) and surveyed in much greater detail by McMurphy (1974) for the reservation. The two reports use different terminology for the soils, but McMurphy's deals specifically with the suitability of soils for specific uses and is the major source for this discussion.

As the geology map (Figure 4) shows, the bedrock on the reservation includes both sedimentary rock and volcanic rock. Glacial activity within the last million years has modified this rock on much of the reservation. The capabilities of the soils vary with the rock, or "parent material," from which they were formed, and also with the slope of the landforms they now occupy.

The soils in the eastern part of the reservation, as well as some in the northwest part, are clays derived from fine-grained shale and siltstone. These soils are subject to sliding, particularly when located on steep slopes. Buildings located on these soils would be in danger of structural damage from sliding or from settling of the clayey soils.

Soils derived from volcanic material, such as those which dominate the area northwest of Neah Bay, are more likely to have the necessary structural integrity to support buildings, but these soils in many cases are found on steep slopes. As mentioned earlier, only a small fraction of the reservation has slopes of less that 15 percent, which is generally considered the steepest slope suitable for siting buildings. Since most of the reservation is not suitable for building, it is now used largely for commercial timber production.

Of the 20 soil types described by McMurphy, 15 are suitable for growing hemlock, spruce and/or Douglas fir. The remaining types are the peat soils of the swamps and bogs, and dune sand (none of which can be successfully planted with trees of commercial value), and the alluvial soil of the river valleys and the poorly-drained terrace depressional soils, both of which can grow cottonwood or red alder, but not coniferous trees. Figure 5 indicates the suitability of soils for growing coniferous trees commercially.

For harvesting of timber, however, the soils present other problems. A major impact of logging operations is loss of soil. Figure 6 shows the erosion hazard presented by the surface soil. As can be seen, the soils

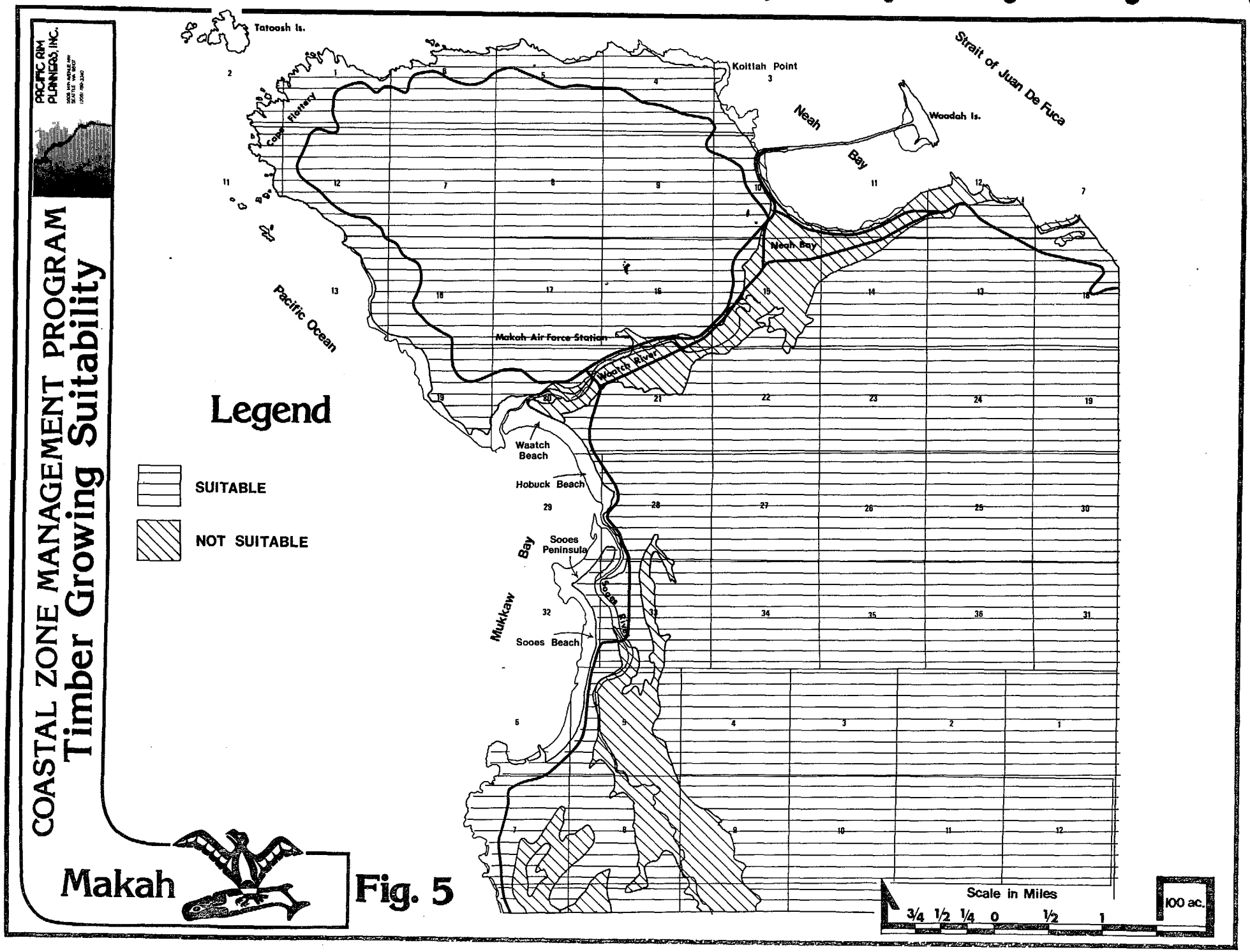

COASTAL ZONE MANAGEMENT PROGRAM
Timber Growing Suitability
PACIFIC RIM PLANNERS, INC.
Makah
Legend
SUITABLE
NOT SUITABLE
Tatoosh Is.
Cape Flattery
Koitlah Point
Strait of Juan De Fuca
Neah Bay
Waadah Is.
Pacific Ocean
Makah Air Force Station
Waatch River
Waatch Beach
Hobuck Beach
Sooes Peninsula
Mukkaw Bay
Sooes River
Sooes Beach
Scale in Miles
3/4 1/2 1/4 0 1/2 1
100 ac.

Fig. 5

COASTAL ZONE MANAGEMENT PROGRAM
Soil Erodability

Tatoosh Is.

Koitlah Point

Strait of Juan De Fuca

Neah Bay

Waadah Is.

Cape Flattery

Pacific Ocean

Makah Reservation

Waatch River

Waatch Beach

Hobuck Beach

Sooes Peninsula

Mukkaw Bay

Sooes Beach

Legend

- SLIGHT
- MODERATE
- SEVERE

Scale in Miles

3/4 1/2 1/4 0 1/2 1

100 ac.

Makah

Fig. 6

on most of the reservation are subject to severe erosion hazards, and any operation on these soils will require, according to McMurphy (1974), "intensive treatments, specialized equipment and special methods of operation....to minimize soil loss." It should be noted that of the few soils with only slight erosion hazard, most of them are not suitable for growing timber. Thus, while timber may be grown on most of the reservation, logging operations must be carefully planned and engineered.

Another consideration of soils in land use planning is their suitability for roads. The steep topography on the reservation requires that any road construction include a good deal of cutting into the slopes. Figure 7 shows that most of the soils have a high probability of failure of road cuts. Specifically, these include the soils formed on sedimentary rock, which cover much of the eastern part of the reservation. In most, but not all, cases, the soils with a high probability of failure of road cuts have the same high probability of failure of road fills. Construction of roads in much of the reservation, therefore, must be carried on under these extreme limitations, whether those roads are used for access to logging operations, recreation facilities, or housing.

In general, then, an examination of the geology, topography, and soils of the reservation suggests a minimal development potential, with most of the reservation managed for timber production, but harvested with extreme caution to prevent erosion.

Upland Ecological Communities

The vegetation of the reservation, besides being a major component of the scenic beauty of the area, plays its own part in determining the use of the land. It is strongly influenced by, and can therefore be taken as an indicator of, physical conditions, such as climate, soils, slope, and drainage. It provides the food and cover to support wildlife in the area. It has long-term commercial value, if managed on a sustained-yield basis, by providing the raw materials for the forest products industry.

The reservation is in an area which plant ecologists refer to as the Sitka Spruce Zone (Franklin and Dyrness, 1973). This zone extends in a narrow band along the coast of the Pacific Northwest from Oregon to Southeast Alaska. Here the combination of the wet, mild climate, fine forest soils, and a minimum of urban development have allowed the growth of large areas of highly productive coniferous forests (Figure 8).

FOREST AND TRANSITIONAL COMMUNITIES

With no disturbance over several hundred years, these forests gradually progress towards a dominance of western hemlock. Undisturbed sites are rare, however. Fires, slides, and logging interrupt the process of vegetational succession, resulting in diverse plant associations. After land is cleared, dense, shrubby thickets are often the first vegetation type to appear. These are dominated by salmonberry, red elderberry, several species of huckleberries, salal, and sword fern.

COASTAL ZONE MANAGEMENT PROGRAM
Probability of Road Failure

Tatoosh Is.
Koitlah Point
Strait of Juan De Fuca
Neah Bay
Waadah Is.
Cape Flattery
Pacific Ocean
Makah Air Force Station
Waatch River
Waatch Beach
Hobuck Beach
Sooes Peninsula
Bay
Mukkaw
Sooes River
Sooes Beach

Legend

- LOW
- MODERATE
- HIGH

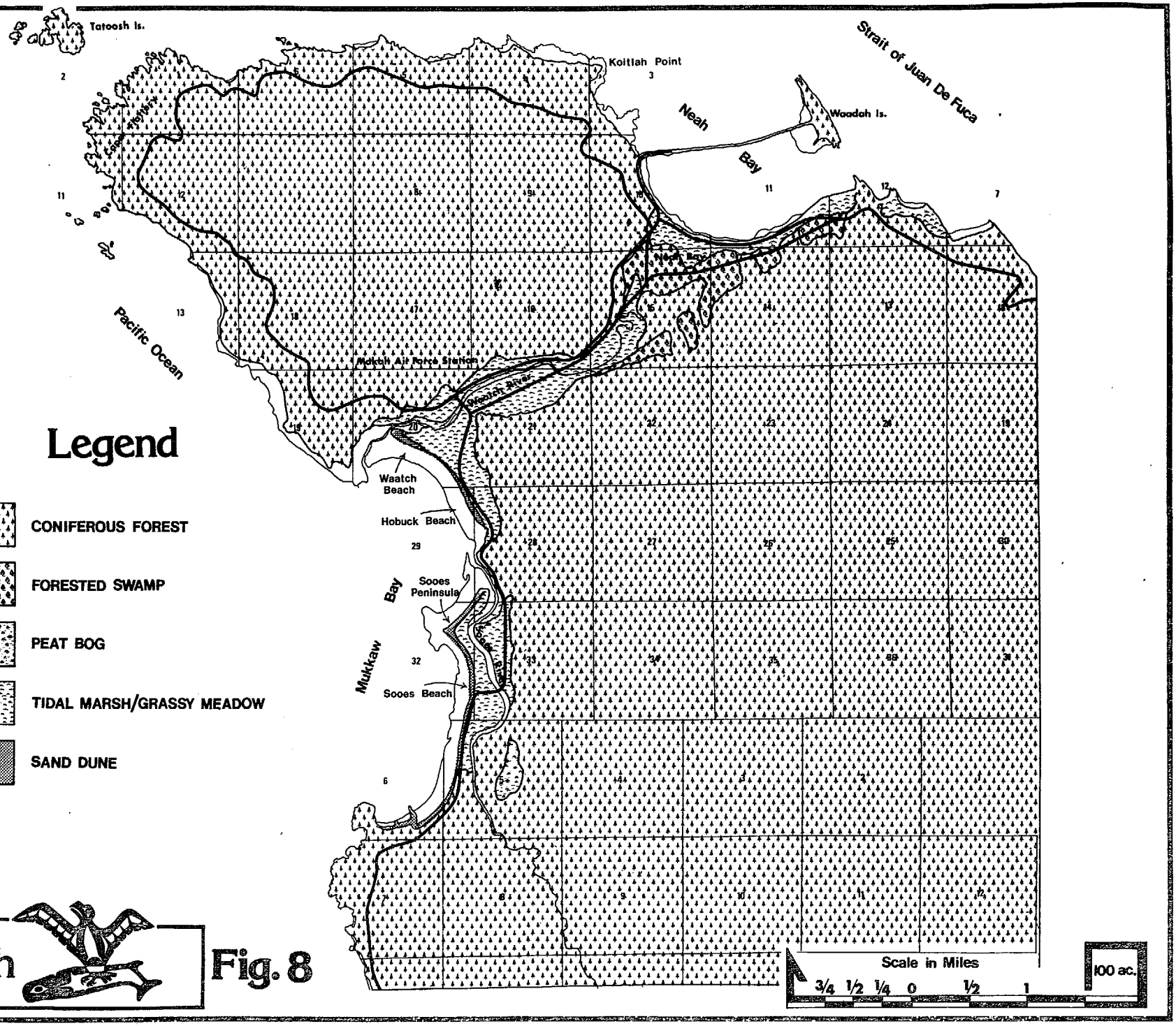
Scale in Miles
3/4 1/2 1/4 0 1/2 1
100 ac.

Makah

Fig. 7

PACIFIC RIM PLANNERS, INC.

COASTAL ZONE MANAGEMENT PROGRAM
Ecological Communities



Makah

Fig. 8

The tender shoots of the brush provide browse for blacktailed deer and occasionally for Olympic (or Roosevelt) elk. Berries growing in these thickets attract black bear in the summer and fall. Small mammals here include the deer mouse and northern redback meadow mouse. A wide diversity of songbirds utilizes this habitat, including swallows, thrushes, warblers, finches, and sparrows.

Red alder is often an early colonizing tree. It grows rapidly on cleared soil, growing into a thicket within four or five years, and into a broadleaf forest not long after that. Where alder grows thickly with a dense understory of salmonberry and other shrubs, it can shade out the coniferous seedlings, slowing vegetation growth of the coniferous forest, by producing a broadleaf forest overstory.

The blacktailed deer and black bear, common in the shrubby thicket, are also common in the broadleaf forest. Raccoons are also abundant in the trees and hollow logs of the broadleaf forest. Mountain beaver and several species of smaller mammals use the forest floor for burrowing.

The alders improve the soil by fixing nitrogen into it and building up the humus layer. When the alder forest opens up and the brush is less thick, the coniferous species can regenerate. Although the exact species composition varies with local site conditions (soil, slope, drainage, exposure, etc.), it generally is dominated by western hemlock, with Sitka spruce, and western red cedar varying in their occurrence. Douglas fir and grand fir are also present but not abundant. The coniferous forests in the Cape Flattery area are dominated by western red cedar, much of which is large old-growth.

The thick forest canopy shades the understory, so the shrubs and ground cover are very sparse in much of the coniferous forest. Among the shrubs growing in these shady conditions are salal, tall blue huckleberry, red huckleberry and devil's club. Common ground cover species are sword fern, lady fern, deer fern, and several species of mosses.

Of the remaining old-growth forests, the Makah Forestry Department estimates that 80% is composed of western hemlock, 10% of cedar, 5% of Sitka spruce, and 5% of alder. In the second-growth forests, hemlock remains dominant, comprising 75% of the forest. Alder, as an early successional species, makes up 20% of the second-growth forest, while Sitka spruce and Douglas fir total only 5%. The timber resource is discussed further in Chapter 5.

The Freshwater Environment

It is the flow of freshwater, more than any other factor, which joins together the coastal resources of the Makah Reservation. Falling as rain from clouds blown in from the Pacific Ocean, freshwater drips from the branches of the trees, nourishing the dense forests. As groundwater, it seeps through the soil and sometimes into the underlying rock, transforming them both. Moving slowly downhill it emerges, slowly trickling, joining other trickles to form a creek. Where several creeks flow together, they form one large creek, 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. Bear, mink, and other wildlife feed on the fish where the streams flow through the forest. As it approaches the sea and opens into a broad valley, the stream provides food for eagles, herons, and a variety of waterfowl.

By supporting plants and animals used by people, the streams support the reservation's people as well. As a review of the functioning of the freshwater environment, this section discusses the physical and biological characteristics of the streams and freshwater wetlands.

STREAMFLOW AND WATER QUALITY

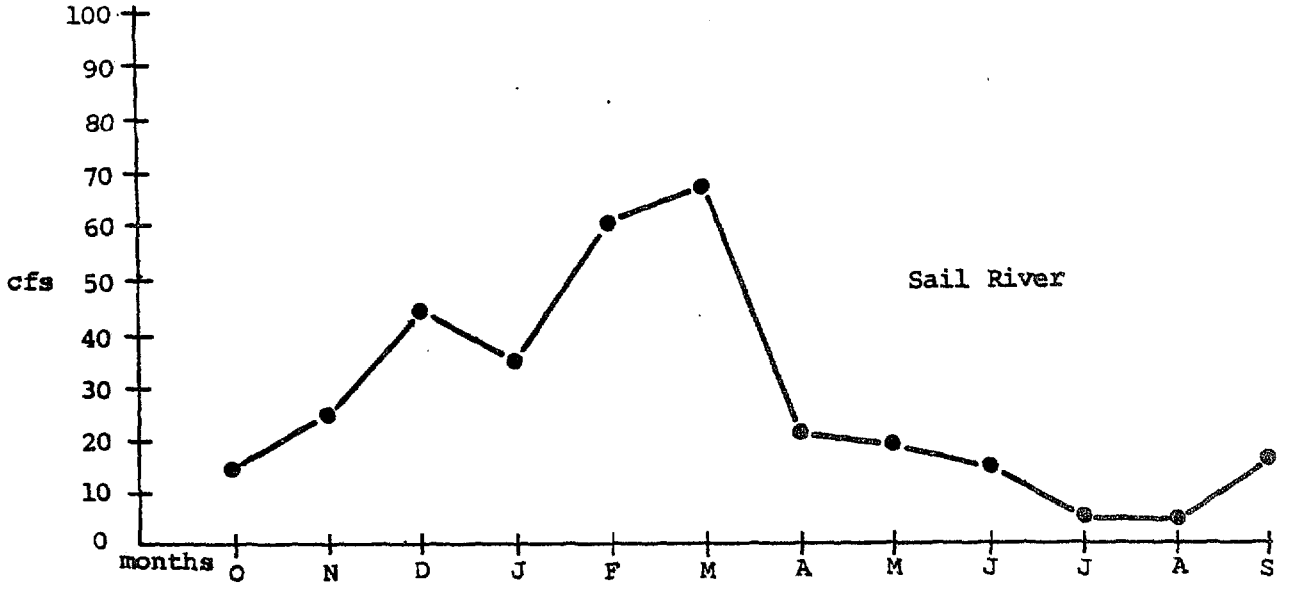
The suitability of a stream as habitat for fish and wildlife as well as its ability to transport sediment, nutrients, and organisms depends on a number of physical and chemical properties. Perhaps most important in determining the character of the stream is its flow rate, although related properties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

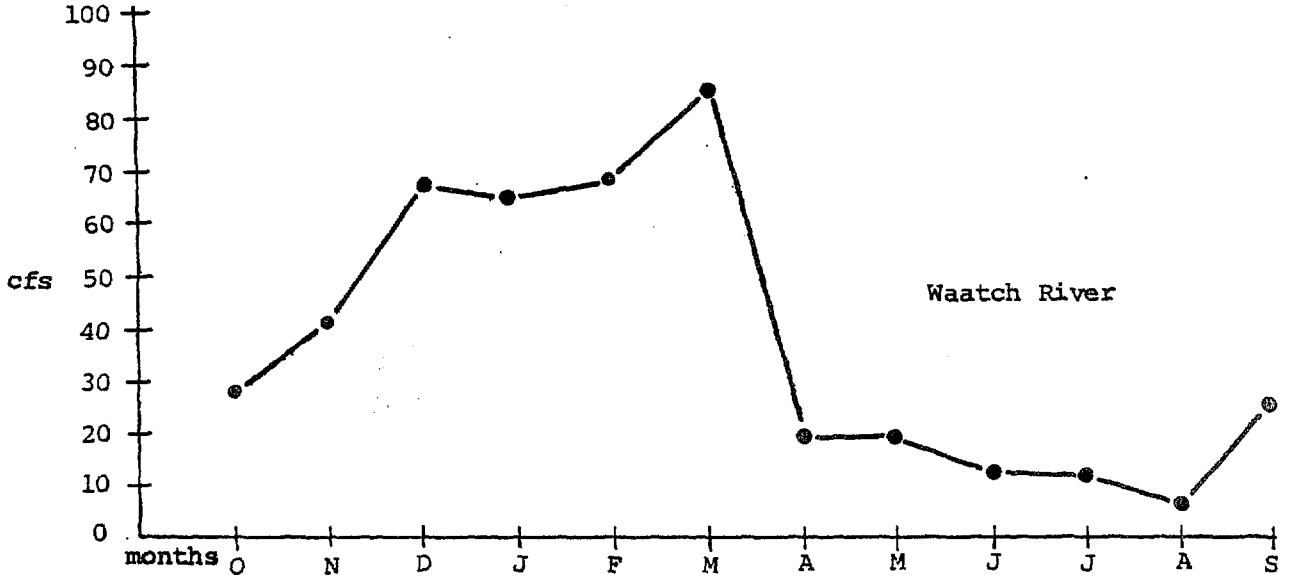
Flow Rates

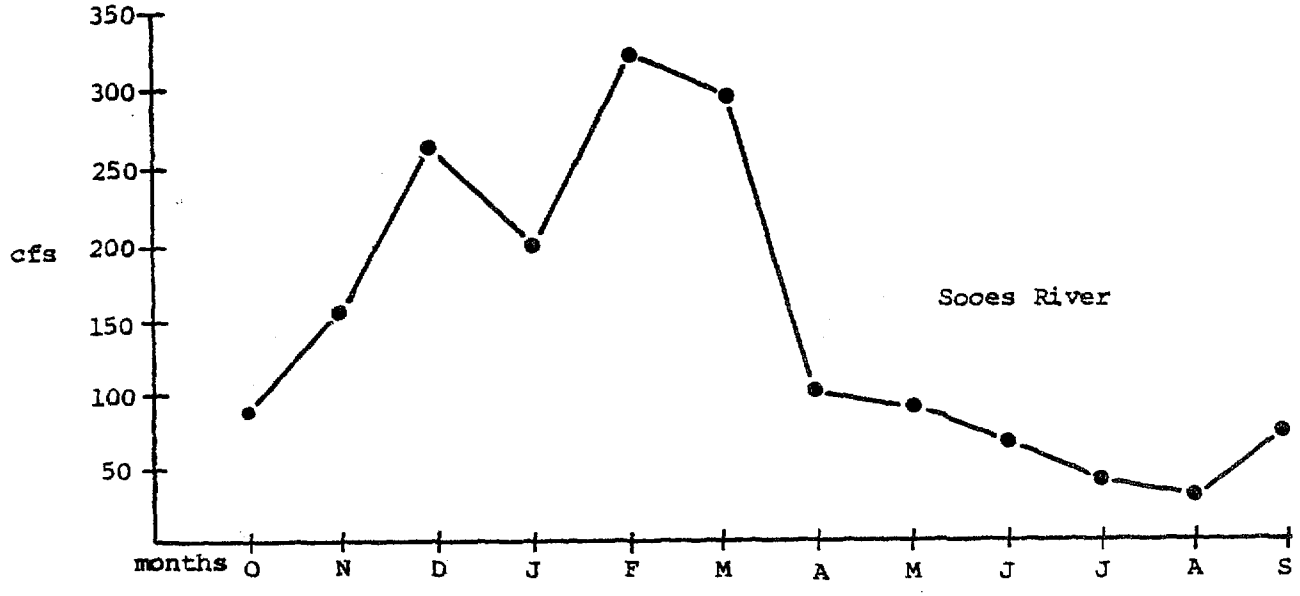
The rates of streamflow fluctuate greatly from stream to stream, and from season to season. On the Makah Reservation, the streams range in size from small, unnamed trickles to the Sooes River, whose watershed includes nearly a quarter of the land in the reservation, and a great deal of land to the south. Thus, there is really no "typical stream" from which to generalize about the others. Three of the larger streams, however: the Sail River, the Waatch River, and the Sooes River, have been monitored in detail by the U.S. Geological Survey, and their water conditions show patterns which suggest similar patterns in other streams (Figure 9). While the number of cubic feet per second varies from stream to stream, the seasonal pattern is probably consistent.

The rate of streamflow increases with the resumption of the rainy season, usually in September or October. Between August and December, the larger streams increase their flow by nearly five times. The flows level off, and in some cases decrease from December to January or February, as precipitation is locked up in the form of snow at higher elevations. With spring thaw, and continuing precipitation, the streams swell in size to their peak discharge rates. With late spring and the coming of summer, precipitation decreases drastically. Since the reservation's mountains are not high enough to accumulate a permanent snowpack to feed the streams in the summer, the dry season brings about a drastic reduction in streamflow. Even the large rivers are reduced to only a few cubic feet per second, while some of the smaller ones dry up entirely. When the rainy season returns in the fall, the streamflow increases once again and the cycle repeats itself.

Figure 9
Mean Monthly Streamflow
(cubic feet per second)
1976-1977







Source: U.S. Geological Survey.

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 reservation's streams has been collected by the U.S.G.S. 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. For optimum growth and survival of salmonids, water temperature should range from 49 to 57 degrees F. (9.4 to 13.9 degrees C.) and should not exceed 62 degrees F. (16.6 degrees C.) (Bell, 1973). 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.

The U.S.G.S. data shows early spring temperatures in reservation streams to drop as low as 42 degrees F. (5.5 degrees C.) which slows the growth of the fish at that season but does not injure them over the long-term. Summer temperatures have been measured as high as 60 degrees F. (15.3 degrees C.) in August. Although this temperature range exceeds that noted as optimum, it is not dangerous to the fish, but may limit growth.

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." U.S.G.S. data indicates that the pH in the Sail River, the Waatch River and the Sooes River falls slightly below that range. It has been measured as low as 6.5 in the Sooes, possibly as a result of leaching of acidic material from the soil by spring rains. This slight deviation from the optimum range may be limiting, but all three rivers are fish producers.

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 stream's dissolved oxygen content is usually reduced; however, in the U.S.G.S. data from the reservation's three largest streams the lowest level shown is 9.7 ppm. In the smaller streams with lower flow rates, the dissolved oxygen level might be lower.

It must be pointed out here that the water quality data from the three largest streams is not necessarily representative of the other streams, and, as it was collected only three times, cannot be considered complete enough to assess the condition of other streams. Additional monitoring of water quality would greatly improve the Tribe's data base, and would aid in evaluating the sensitivity of these streams to disturbance.

FRESHWATER WETLANDS

The reservation has two freshwater wetlands in relatively small areas. These include the forested swamp and the peat bog, which are discussed below.

Forested Swamp

Located just south of the town of Neah Bay, these swamps are formed by water continuous with the Waatch River, standing or flowing slowly. The water requires that the plants growing here be adapted to survive poor drainage conditions. Red alder is the dominant tree, with Sitka spruce a subdominant. Western hemlock occurs here in smaller numbers, as do small western red cedars.

The shrub layer consists largely of red huckleberry and salal, which grow on fallen logs or rotting stumps, rather than in the standing water itself. Herbaceous plants growing in the water are dominated by skunk cabbage and slough sedge.

Although these swamps are not unique, their distribution in the Northwest is quite limited, and those on the western Olympic Peninsula are noted by Franklin and Dyrness (1973) as being among the best developed of the coastal swamps. Decaying wood from this swamp forms the peat soil, discussed earlier in this report, presenting a major obstacle to the southward expansion of Neah Bay. Human use of the swamp is minimal and appears to be limited to fishing in Waatch and Educet creek and some hunting of waterfowl.

Peat Bogs

Approximately 40 acres adjacent to the lower Sooes River is covered by peat bog, another vegetation type strongly influenced by a high water table. Sphagum moss dominates the vegetation here with a good covering of sedges as well. The resulting landscape appears muskeg-like. Small shrubby plants are present here, including Labrador tea, but many of the low shrubs are stunted coniferous trees, such as western red cedar and Sitka spruce, which only grow a few feet tall. Noteworthy among the herbaceous plants here is the round-leaf sundew, a small carnivorous plant which attracts and captures insects for food.

Like the swamps, the peat bog is subject to little human use, and because of its high water table and organic soil is not suitable for development.

Wetland Wildlife

Wildlife likely to utilize these wetland communities is, as might be expected, represented by animals which thrive on the aquatic conditions. Among the mammals are species which consume wetland vegetation, such as meadow mice, and possibly beaver in the forested swamp. Because the wetlands support a profusion of insects, they also likely support a sizeable population of vagrant shrews and marsh shrews which feed on the insects. Raccoons present, feeding on aquatic mollusks and crustaceans. These aquatic invertebrates may also provide food for mink, which prey on small mammals and birds as well.

Waterfowl are common in the swamp, where they are hunted in the fall. The insects associated with the peat bog provide food for swallows, longbilled marsh wrens, red-winged blackbirds, and song sparrows.

SALMONID USE

Perhaps the most important use of the streams is as spawning and rearing habitat for salmonids (salmon, trout, and steelhead). Of the 25 reservation streams cataloged by the Washington Department of Fisheries (WDF), most have not been recorded as being utilized by salmon. In the non-utilized streams, the major obstacles to salmon migration appear to be impassable waterfalls in the steep terrain of the Cape Flattery area, and log jams in the Sooes River and Waatch River watersheds.

Seven streams are used by coho, chinook, and chum salmon (Figure 10). The Ozette is used by sockeye. Pink salmon, the other Northwest salmon species, does not occur in the reservation's streams. All these salmon are anadromous; that is, they are spawned in freshwater, migrate into saltwater where they live most of their lives, and return at maturity to spawn in the stream of their origin.

Because they utilize both the freshwater and the marine environments, salmon depend on factors such as water quality and food supply being adequate in both environments. The freshwater environment is the one over which the Tribe has the most control, and is the one which can be protected and enhanced if the fishery resource is to be protected. Although the specific requirements vary from one species to another, the following factors are necessary for continued or improved salmonid use of the reservation's streams.

Food Supply

Although the chum salmon migrate directly to saltwater immediately after emerging from the egg, the coho and chinook remain in the streams for rearing, and therefore require an adequate supply of food. Insect larvae, particularly caddisfly and mayfly, are the most important constituents of the young salmon's diet, followed by other insect larvae, and then by other aquatic invertebrates such as molluscs and annelid worms.

These organisms feed, in large part, on decomposed organic material derived from leaves and other streamside vegetation, so the vegetation is important, too (Meehan, et al., 1977).

Adequate Streamflow and Water Quality

Although minimum flow requirements are not clearly defined, the close relationships between streamflow, temperature, and oxygen lead to a strong correlation between the flow of a stream and its ability to support salmon spawning.

Of the other physical and chemical requirements, salmon should ideally have temperatures between 49 and 57 degrees F. (9.4 to 13.9 degrees C.), dissolved oxygen levels of at least 5 ppm (higher in spawning beds), and pH of 6.7 to 8.3. As discussed earlier, the data collected by the U.S.G.S. indicates

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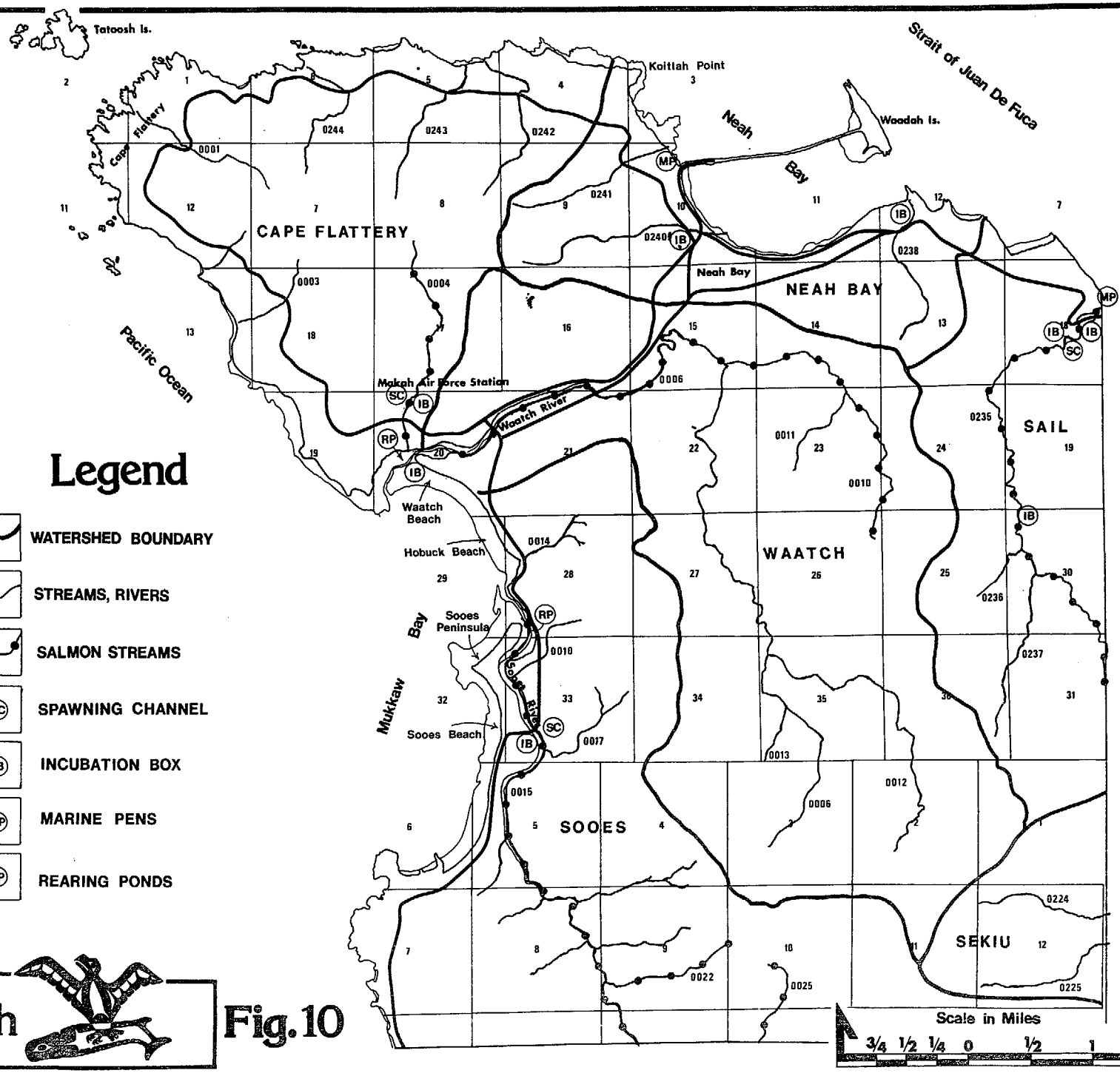
Watersheds



Legend

- WATERSHED BOUNDARY
- STREAMS, RIVERS
- SALMON STREAMS
- (SC) SPAWNING CHANNEL
- (IB) INCUBATION BOX
- (MP) MARINE PENS
- (RP) REARING PONDS

Scale in Miles

3/4 1/2 1/4 0 1/2 1

100 ac.

Makah

Fig. 10

that the streams on the reservation do not always meet these requirements. While there is not enough data to be conclusive, it does point out that the streams must not be disturbed if fish production is to be maintained.

Suitable Streambed Material

Salmonids require a clean gravel streambed as spawning habitat. The proper-sized gravel is small enough so 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. The streambed substrate, therefore, should be composed of these materials, rather than of sand or silt which supports organisms that burrow and therefore are not available as fish food.

One of the major impacts of man on the salmon runs has been through siltation of spawning gravels and log and debris jams (Washington Department of Fisheries, 1975). Much of this has resulted from clearcut logging activities which the WDF (1975) states "has not been conducted in a manner conducive to the maintenance of stream habitat."

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. Bell (1973) cites mortalities of 85% of the salmon eggs if 15 to 20 percent of the voids in the gravel are filled with silt. 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).

This damage to the fishery resource is not unavoidable. An unlogged buffer strip on either side of the stream helps to filter out eroded sediment and provides needed shade to the stream as well. An additional precaution includes the application of specialized logging procedures and minimizing road cuts on steep slopes and erodable soil. These precautions are discussed further in Chapter 3 of the Makah Land Use Plan, in the Makah Environmental Management Study, and later in this report.

The planned fish hatchery on the Sooes River will substantially supplement the fisheries of the reservation, releasing an expected ten million salmon and several hundred thousand steelhead and rainbow trout. The natural salmon runs, and the potential of the reservation's streams to produce more salmon with only minimal efforts at enhancement (e.g. removing log jams), make the reservation's streams valuable resources, and may require consideration in decisions affecting land-resource use.

Marine Resources

The Makah Reservation is bordered on its north side by the Strait of Juan de Fuca and on its west by the Pacific Ocean. Its shoreline varies from broad, sweeping beaches to rough, jagged, rocky cliffs. The different types of shorelines have different uses for humans, and support different forms of marine animal and plant life as well.

The approximate extent of each shoreline type, by geographical area, is shown in Table 1.

TABLE 1

Approximate Extent of Shoreline Types

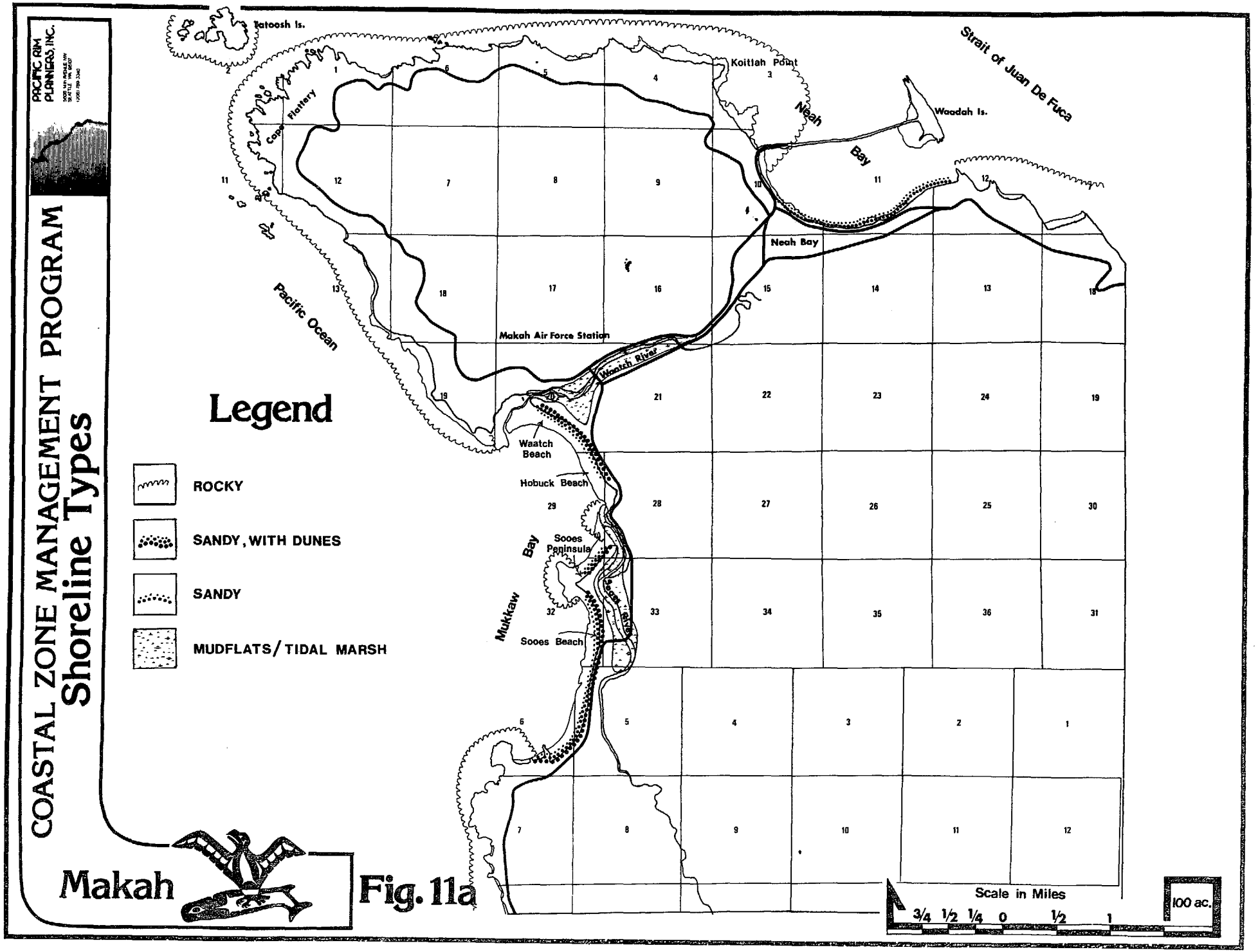
	Miles of Shoreline
Strait of Juan de Fuca	
Rock	5.5
Sand (Neah Bay)	2.0
Mixed Sediment	2.0
Pacific Ocean	
Rock	8.0
Sand (Mukkaw Bay)	6.0
Total Miles:	23.5

ROCKY SHORES

In the more exposed waters of the Strait and the ocean coast, strong wind-driven waves pound the shoreline. Solid bedrock remains, and, while even this material is eroded over geologic time, the rock remains stable on the shoreline long enough to develop a community of plants and animals adapted to the hard solid surfaces. One characteristic that most of these organisms have in common 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 adaption to, the physical and biological changes related to the exposure and inundation by the tides. (Figure 11a shows the location of the rocky shores; Figure 11b shows the location of representative plants and animals on a rocky intertidal shore.)

Near the high tide line, not permanently attached, but clinging tightly, are small snails, the periwinkles and limpets. These move about to feed, but generally remain in the higher tide levels.

Barnacles live slightly lower in the intertidal zone. The small acorn barnacles live cemented to the rocks in the areas sheltered from direct storm waves. In the more open areas, they are joined by the larger stalked,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COASTAL ZONE MANAGEMENT PROGRAM
Shoreline Types
Legend
ROCKY
SANDY, WITH DUNES
SANDY
MUDFLATS/ TIDAL MARSH
Tatoosh Is.
Koitlah Point
Strait of Juan De Fuca
Cape Flattery
Neah Bay
Waadah Is.
Pacific Ocean
Makah Air Force Station
Waatch River
Waatch Beach
Hobuck Beach
Sooes Peninsula
Bay
Mukkaw
Sooes River
Sooes Beach
Scale in Miles
3/4 1/2 1/4 0 1/2 1
100 ac.
Makah
Fig. 11a

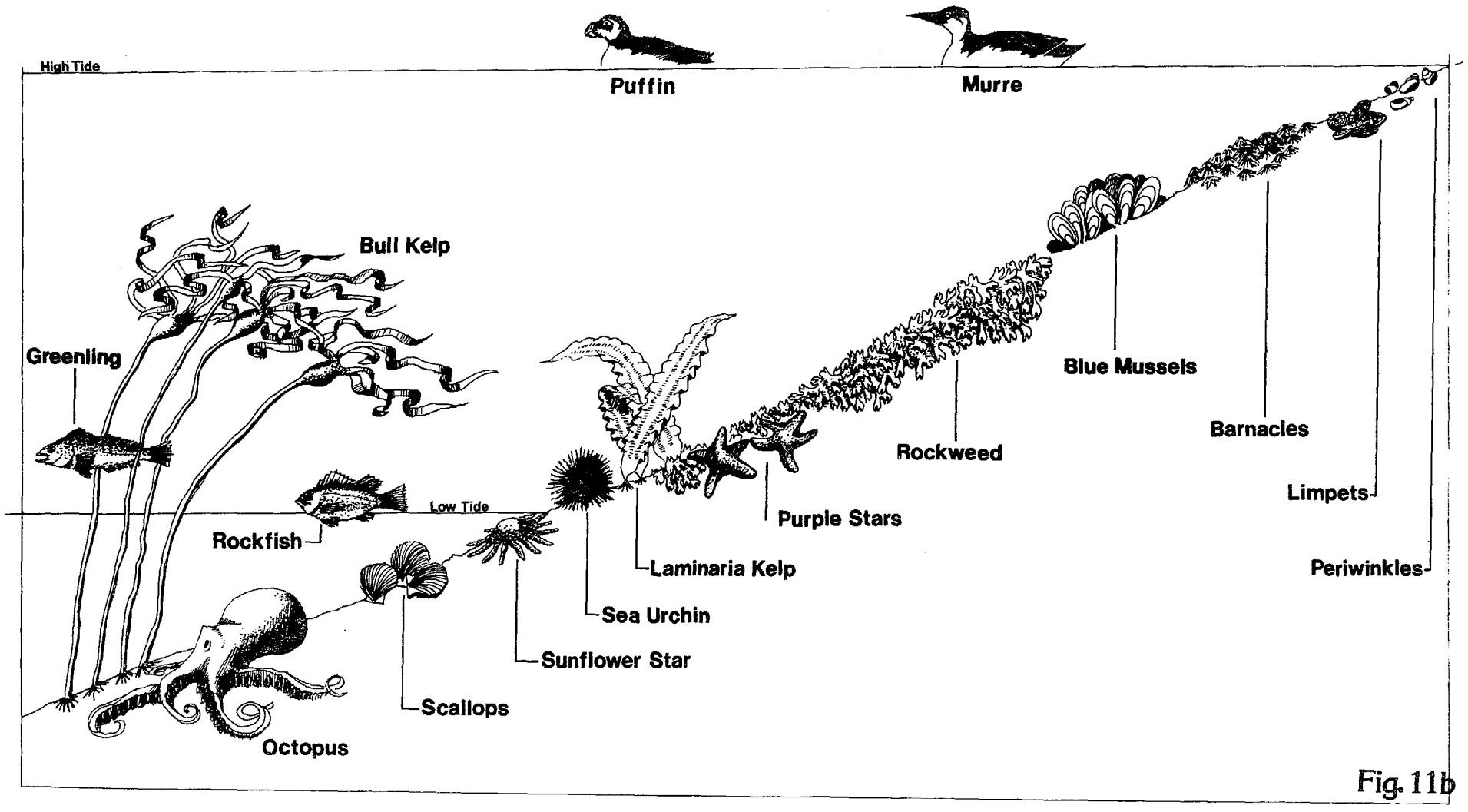


Fig. 11b

Rocky Shore

gooseneck barnacles. Competing for space with these species is the large blue California mussel. The gooseneck barnacle/California mussel zone is particularly distinct along the rocky shores of Tatoosh Head.

Larger snails, such as the wrinkled purple snail and the leafy hornmouth, appear farther down on the rocks, where tidal coverage is greater and exposure to air is reduced. These are joined by chitons, or sea cradles, which have a powerful foot for clinging to the rock. Some of the snails are voracious predators on the barnacles and mussels, while the chitons are grazers, feeding on algae on the rocks.

The lower intertidal zone of rocky shores is populated by many species of plants and animals which are also found in deeper water, and may be taken as a partial indicator of the nearshore 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. Often in the summer these algae grow so profusely that they obscure the diverse communities of animals beneath.

Grazing on the algae at this level are the red and purple sea urchins and the giant gumboot chiton. All of these have been harvested on a subsistence basis by Tribal members. Urchins are the objects of commercial harvest elsewhere along the North Pacific coast, but uncertainties about their population dynamics suggest that until more information is available, urchins should be reserved for observation and for the limited local subsistence harvest.

Starfish of many species including the purple star, sunflower star, sun star, and long-rayed star, are common on the rocky lower intertidal and shallow subtidal bottom. At high water, these starfish migrate up to the higher tide levels on the rocks to feed on barnacles and mussels. Other predators of this zone include several species of colorful sea anemones, which catch small fish swimming near the shore. Octopuses inhabit the cracks and crevices among the rocks, crawling and swimming through the water in search of crabs or other shellfish for food.

In some locations, such as the cliffs at Tatoosh Head, the plants and animals are arranged nearly vertically, and the various zones are narrow bands. Other areas, such as the shoreline just west of Neah Bay, are underlain by sedimentary rocks which have eroded in nearly horizontal planes; here the zones are wide, and extend hundreds of feet in width.

Besides the gulls found on nearly all saltwater shorelines, rocky shores are the habitat of a number of uncommon seabirds. Among these are the deep-diving murres, puffins, auklets and others, which swim to as deep as 60 feet to feed on fish. Also present here is the black oystercatcher, which uses its beak to pry into the shells of mussels and other shellfish. While only a few hundred oystercatchers are believed to inhabit the entire state of Washington, at least four have been observed at one time at a rocky point on the Makah Reservation.

Not a shorebird, but a frequent feeder on the marine life just offshore, is the bald eagle. The large old-growth cedars and spruces along the shoreline provide valuable habitat for eagles to rest between fishing forays.

Although the animals and plants of exposed rocky shores are adapted to the rigors of the open coast, they are sensitive to the abuses of large numbers of people invading their habitat, walking through the tidepools, and over- collecting specimens. While these problems do not appear to be serious at this time, they can be avoided in the future if the use of the tidepool areas is held to its present level of subsistence, with occasional educational and scientific use.

Not all the locations mapped in Figure 11a as rocky shores are all bedrock. Many of the small coves have protected sand, gravel or mixed-sediment beaches. These were not mapped separately, but have characteristics more closely resembling the sandy beaches in Neah Bay described below.

SANDY BEACHES AND DUNES

Along the shores of Mukkaw Bay, sandy sediments from the Waatch and Sooes Rivers have been distributed by the ocean waves into broad, nearly flat, crescent-shaped beaches, rimmed by low sand dunes (Figure 12).

The waves sweep across the beaches, continually shifting the loose sand and making living conditions difficult for the animals inhabiting the beaches. Unlike the rocky shores, which provided solid surfaces for attachment, protected crevices, and abundant food, the sandy beaches have no surfaces for attachment. They have only loose, unstable sand for burrowing, and contain little food for marine animals.

The most noticeable animals are the amphipods, or "beach hoppers", living near the high tide line. Here the rows of drift algae and other material deposited by the waves provide a source of food for these crustaceans, which feed on detritus (decomposing organic material). The beach hoppers follow the receding tide (and the drift algae) down the beach, and then return as the tide rises, burrowing in the sand just above the waves. At low tide, shorebirds such as sandpipers feed on these amphipods.

Further down on the sandy beach, the marine life is more sparse. Burrowed into the sand are occasional crustaceans such as ghost shrimp, amphipods, and a few species of polychaete worms ("bristleworms"). While these animals are not of direct use to humans, they are often fed upon by bottomfish which move onto the beaches at high tide, as well as by some species of waterfowl.

Of the species important to humans, the razor clam is perhaps most important. Accessible only at low tide, and then only to fast, skillful clamdiggers, the razor clam is itself an accomplished digger. It feeds by extending its siphon above the surface of the sand, but retreats rapidly at the first sign of disturbance. While the razor clam is dug commercially in other areas (including the Quinault Reservation to the south) it does not appear to be sufficiently abundant in Mukkaw Bay to permit any harvesting beyond the present subsistence and recreational digging.

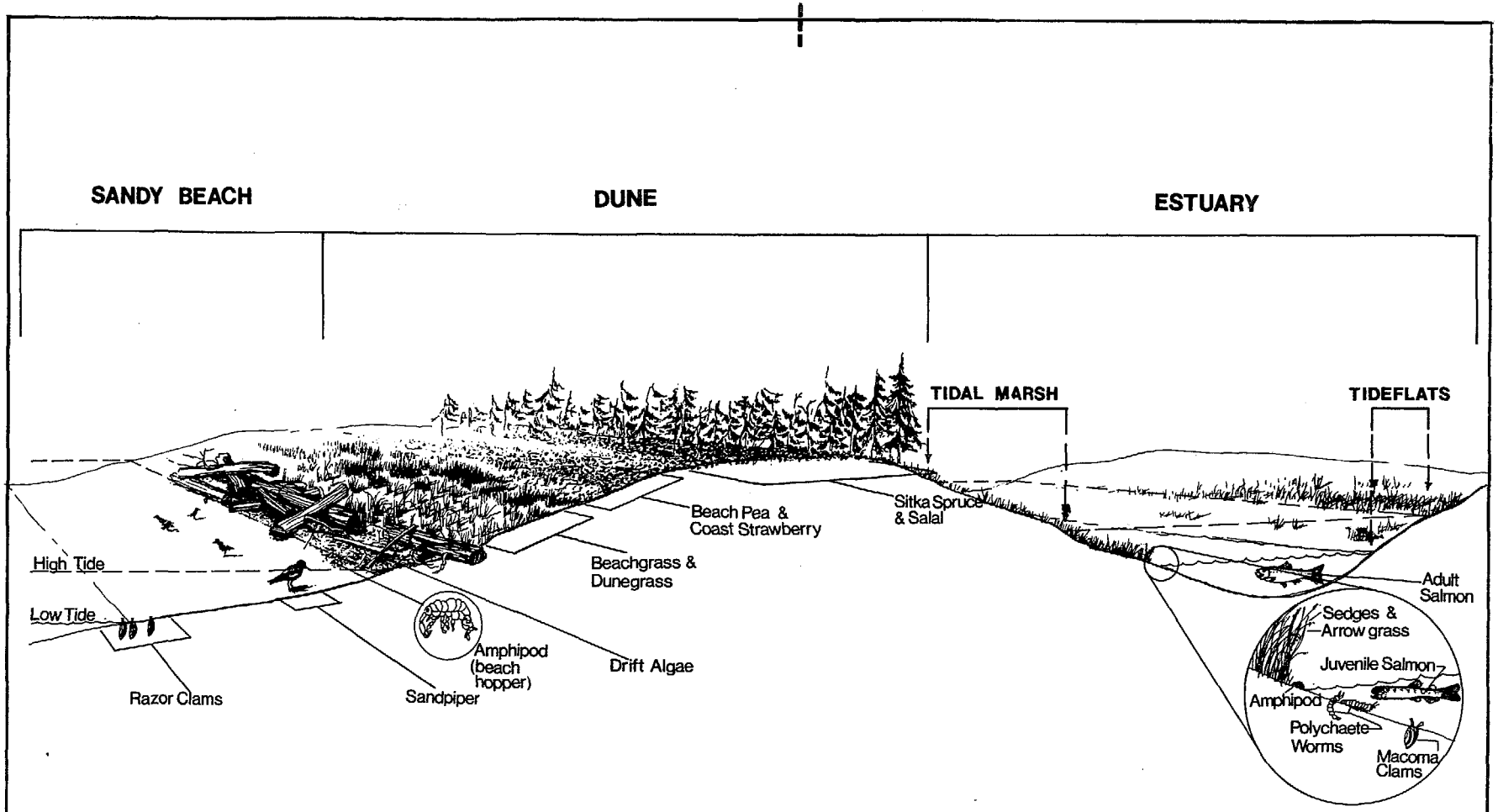


Fig. 12
Sandy Shore and Estuary

The upper part of the beaches on Mukkaw Bay is bordered with low sand dunes. These dunes are formed as sand is blown in from the beach and accumulates above the reach of the waves. Several very hardy plant species including dunegrass, yellow abronia, seashore lupine, and brassbutton catch the wind-blown sand, stabilizing it somewhat, thus allowing the sand to build up into dunes. These plants are tolerant of the drying of the wind, abrasion from blowing sand, and salt spray from the waves. Beach strawberry, yarrow, and wild roses grow farther inland, where the influence of the wind and salt spray is lessened. Out of reach of all but the largest storm waves, Sitka spruce and salal also grow on these dunes, the spruces low and stunted from the force of the winds, but providing valuable protection against coastal erosion. No large foredune has developed here as it has farther south on the coast (Ruef, 1975; Weidmann, et al., 1974), but the dunes which have developed nevertheless provide a valuable recreational and scenic resource.

Although the plants are tolerant of the rather difficult natural conditions, they are vulnerable to excessive human disturbance. Any excavation would breach the dune, allowing high storm tides to flood the meadow and possibly the homes just inland. Construction of buildings here would leave them vulnerable to destruction by storms, as has occurred elswehere (McHarg, 1969). Even driving motor vehicles, such as dune buggies and motorcycles, on the dunes results in destruction of the vegetation which holds the dunes together. So far no buildings have been constructed on the dunes, but vehicle traffic (and the accompanying litter) do violate the area.

Much of the shoreline of Neah Bay is also composed of loose sand and gravel. In the bay, however, the beach is protected from the waves by the breakwater. In this less stressed environment, more species are able to survive. Horse clams, for instance, are common in the lower intertidal zone, and support a limited amount of subsistence clam digging. An abundance of empty butter clam shells on the beach suggests that they may inhabit the shallow subtidal waters of the bay, but they are not common in the intertidal beach.

Because the beach is more protected, it has the opportunity to accumulate more organic material in the sediments, and support more smaller organisms, such as crustaceans and polychaete worms, which in turn become food for shorebirds at low tide and for fish at high tide.

TIDAL MARSH/MUDFLAT

The gradual deposition of fine sediments in the slow-moving waters of the estuaries of the Waatch and Sooes Rivers has allowed the development of the tidal marshes and mudflats here. Unlike the continual wave action in the ocean, the waters in these estuaries are calm enough for fine-grained silts and clays to settle out, forming the tideflats.

On the surface, these mudflats appear to be nearly barren of life. On closer examination, however, small crustaceans, and amphipods, can be seen moving across the surface of the mud, and burrowing into it. Washing a shovelful of sediment through a fine-meshed sieve reveals an abundance of small polychaete worms and more crustaceans which burrow through the sediment and feed on organic material.

Shorebirds feed on these small mudflat animals, but, perhaps more important, they serve as a food source for small fish in the estuary. They are particularly valuable as food for pink and chum salmon fry which, immediately upon emerging from the spawning gravel upstream, swim down to the estuary to begin feeding. Mudflat crustaceans have been found to be especially valuable to fry in some locations (Gerke and Kaczynski, 1972).

As the river continually deposits sediment in the mudflats, it eventually builds them up to a level at which tidal marsh plants can establish themselves. Arrowgrass, a species tolerant of prolonged inundation by tidal water, is a pioneer species in these marshes, colonizing mudflat that has not been previously vegetated. Growing in clumps, and spreading across the mudflat by means of rhizomes, or underground stems, the arrowgrass causes the deposition of additional sediment from the estuary. As the sediment accumulates, it builds the flats up to a higher tidal elevation providing habitat for other plants.

In the lower marsh, the vegetation is dominated by the salt-tolerant species pickleweed and saltgrass. The pioneering arrowgrass is subdominant, along with seaside plantain. At a somewhat higher tide level, the arrowgrass is replaced by jaumea, but the other species remain. Saltmarsh sedge is common in the Sooes estuary, but less so in the Waatch.

An important aspect of the tidal marshes in the Waatch and Sooes estuaries is the role they 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 it is not grazed upon by mammals and birds, is largely converted to organic detritus which the tides export to the marine waters (Odum, 1961). In the marine environment many, possibly a majority, of the species of animals use it as a food source. The contribution of the tidal marshes takes on added value in that its organic 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. With the consequent reduced productivity of plankton, the material from the tidal marshes is likely to be exported to the marine waters at the time when it is most needed.

Mudflats and tidal marshes are also particularly valuable as habitat for wildlife. Among the birds using the mudflat and tidal marshes are several species of ducks and geese, feeding on the algae and tidal marsh plants. Sandpipers are found on the ocean beaches. Great blue herons are also commonly found here, feeding on fish and crustaceans in the estuaries and their tideflats. Bald eagles can be seen feeding on salmon here, with ospreys possibly using this habitat as well.

Human use of the tidal marsh is fairly limited, but includes cattle grazing, apparently at a low enough level to keep the impact on the vegetation minimal. The marsh is also the site of a setnet fishery for salmon in the Waatch River. A negative influence on the marsh is the Crown-Zellerbach logging road, which was built on crushed rock fill and appears to have isolated parts of the marsh from free exchange of water and nutrients with the estuary.

Tidal marshes have historically been viewed with less regard to their importance as a natural resource and more to their value as real estate. In areas such as the Makah Reservation, where level land is at a premium, tidal marshes look attractive as potential residential development property. 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 has led to the establishment of laws and policies protecting them.

Chapter 4

Population and Economy

Chapter 4
POPULATION AND ECONOMY

To a large degree, the population, economy and resource use within the Makah Reservation are closely interrelated. In order to be realistic, a coastal zone management plan must be based on a forecast of future population, which in turn is related to future opportunities for employment in the area.

Previous planning studies (Conserco, 1968-1972, and Pacific Rim Planners, 1977b) have provided much detailed analysis of employment and population relationships on the reservation. Therefore, this section will utilize the previous studies where appropriate, and provide updated information where necessary to develop basic estimates of present and future levels of employment and population.

Population

Reliable population information for past years for the Makah Indian Reservation is quite meager, and available data often are not comparable. In total numbers, the population of the Makah Tribe has not increased appreciably over the past century. From a total population of about 800 in 1855 (the date of the signing of the Makah Treaty with the United States), the population dwindled as the prosperous maritime economy of the Makah was curtailed by restrictions on fur trade, halibut fishing, and whaling. From the turn of the century to the 1940's, the population remained at a fairly low level of several hundred. Since the 1940's, the Makah population has again increased (Conserco, 1968-1972).

PRESENT POPULATION

A Tribal Demographic Survey (January, 1977) provided estimates of reservation population characteristics with which to update previous population estimates. The results of this survey and estimates for previous years are shown in Table 2.

Several observations can be made based on the figures shown in the table. First, the Indian population has shown a rapid growth over the past two decades. This trend is probably due to a high birth rate and resulting net natural increase, a moderate expansion in income-earning opportunities (such as with tribal government or salmon fishing), and a concerted effort by the Tribe to encourage members who have moved away to return to the reservation.

Table 2

Past Year-Round Population Levels
Makah Indian Reservation

Year	Indian	Non-Indian	Total
1960[1]	547 (50%)	540 (50%)	1,087
1968[2]	666 (64%)	381 (36%)	1,047
1970[3]	NA	NA	1,113
1977[4]	1,020 (69%)	461 (31%)	1,481

NA - Not Available
Sources: [1]U.S. Bureau of Census data adjusted to reflect Crown Zellerbach Logging Camp closure.
[2]Conserco, 1968-1972.
[3]U.S. Bureau of Census.
[4]1977 Tribal Demographic Survey, Makah Indian Tribe.

A second observation is that the non-Indian population has remained at about the same level during the past two decades, although a considerable drop apparently occurred sometime between 1960 and 1968. Probably much of the reason for this is that most of the non-Indian population is associated with the Air Force and Coast Guard bases on the reservation, and as such the level of total non-Indian population does not exhibit the gradual rates of increase or decrease typical of a resident population.

Finally, as a result of the first two trends, total year-round population levels have shown a substantial overall increase over the past nine years after a long period of relatively stable population following closure of the Crown Zellerbach Sail Creek Logging Camp in 1960.

Indian Population

A major distinction between Indian and non-Indian populations is that Indian populations generally experience significantly higher birth and death rates. In addition, Indians have a shorter life expectancy.

Two previous population analyses (Conserco, 1968-1972, and Pacific Rim Planners, 1977b) examined and compared the birth and death rates among Indians and non-Indians in western Washington. The former noted that birth rates among Indians in Washington State are about two and a half times as great as for the population as a whole. Death rates, though also higher, were only 40% greater. As a result, the rate of growth of Washington's Indian population is significantly greater than for the state as a whole.

Based on these observations, Conserco (1968-1972) forcasted a gradual rate of increase in reservation population of slightly less that 2% per year, resulting in a total population of 1,456 in 1985. Actual population growth from 1968 to 1977, however, has been greater than this earlier forecast,

averaging about 4.4% per year -- a very high rate of growth.

Since 1968, according to figures prepared by the Bureau of Vital Statistics of the Washington State Department of Social and Health Services (1976) birth rates decreased slightly, bottomed out, and most recently have shown a slight upturn. The same observation is true for all age groups among women of child-bearing age (15 to 44 years). On the other hand, death rates have continued their steady, but slow, decline. While recent information is not available for the Indian population in Washington State separately, Indian birth and death rates have probably followed the same pattern, though maintaining the same relative differences.

Other figures prepared by the Bureau of Vital Statistics indicate that over half of the large recent increase in Indian population may be due to in-migration. According to state estimates, the Indian population of Clallam County (which includes the Makah Reservation) has increased by about 564 between 1970 and 1978. Natural increase (the surplus of births over deaths among Indian residents) accounted for only 277, (49%) of this increase. By implication, therefore, in-migration accounted for the other 287, (51%), of the increase. Since the Makah Reservation accounts for over half of Clallam County's Indian population, it can be assumed that these observations are probably true for the Makah Reservation. The countywide rate of increase was somewhat greater, however, indicating that in-migration probably accounts for a smaller, though still significant, share of the increase in Indian population on the reservation. By applying countywide Indian birth and death rates to the reservation's 1970-1977 Indian population increase, it can be estimated that natural increase (excess of births over deaths) accounted for about 60% of recent population increases (or about 2.5% annual increase), while in-migration accounted for the remaining 40% (1.7% yearly rate of increase).

In order to project increases in the Indian population, assumptions were made to account separately for natural and migration components of change by time period. Natural change was assumed to range from +2.1% to +4.3% in 1978-1980, and +1.8 to +4.2% in 1996-2000.

Migration is somewhat harder to predict, since it depends on factors such as the local availability of income-earning, housing, educational and leisure time opportunities, social trends, and the like. Since the Tribe has taken a fairly active role in promoting these opportunities, in-migration (such as has been recently experienced) was assumed to continue, although at varying rates. Estimated present and projected future Indian population on the Makah Reservation by alternative activity levels are presented in Table 3.

Non-Indian Population

The level of year-around population among non-Indians is more difficult to project. The great majority of non-Indians on the reservation are persons who are associated with the Makah Air Force Station and the Coast Guard Stations on Tatoosh Island and Neah Bay. The level of this population will likely respond far more to federal decisions regarding

these installations than to natural factors such as birth and death rates. Most of the remainder of non-Indians are probably living on the reservation in order to be near their place of employment, such as forestry (logging, truck driving), fishing (charter boat and motel operators), and other services (schools, tribal government). This latter group will probably remain fairly stable in size, although fluctuating somewhat in response to changes in economic conditions.

Overall, the level of population among non-Indians has been fairly stable over that time period, increasing by about one-fifth from 382 in 1960 to 461 at the present. This is an average annual increase of about 1¼%. Assuming that present levels of military personnel and families continue in the future (Future plans for the Makah Air Force Station have not been made public, although the Tribe has received some information that they may enlarge further) the population of non-Indians is projected to increase annually at rates of between 0.5 and 2.0%, with 1.2% the most probable.

Total Population

Combining the assumptions and figures which were developed in the preceding sections, total year-round population on the Makah Reservation is projected to increase by about 1,887 persons between 1978 and 2000. This increase would bring total population on the reservation to 3,421 persons, which is approximately 2.2 times the present (1978) population.

The majority of this increase will probably occur in the Indian component of the population, which is projected to increase from 70% to about 82% by 2000. These figures are summarized in Table 3.

Of course, since the reservation has a fairly small population, population forecasts, especially as long range as these, are subject to considerable error, particularly since accurate data on past years is lacking. A single major unanticipated public or private action can significantly alter future population levels. Therefore, these projections should be considered as the best available at this time, but should be revised again at a later date as conditions change or additional important information becomes available.

Economy

Traditionally, fish, timber, wildlife, and many other resources were used and conserved for the welfare of future generations. In the last century, modern concepts of specialized occupations and monetary exchange were introduced, and have since gradually risen in terms of overall importance. Still, natural resources remain the foundation on which Makahs base their livelihood. Table 4 presents comparative employment in 1976 by industry for the reservation, Clallam County, and Washington State.

Table 3

Present and Projected Population

Makah Indian Reservation

year	Low Projection			Most Probable Projection			High Projection		
	Indian	Non-Indian	Total	Indian	Non-Indian	Total	Indian	Non-Indian	Total
1977[1]	1,020	461	1,481	1,020	461	1,481	1,020	461	1,481
1978	1,052	464	1,516	1,067	467	1,534	1,081	469	1,550
1979	1,084	467	1,551	1,116	472	1,588	1,146	478	1,624
1980	1,118	469	1,587	1,167	478	1,645	1,215	486	1,701
1985	1,271	484	1,755	1,475	507	1,982	1,688	532	2,220
1990	1,438	498	1.936	1,856	538	2,394	2,324	581	2,905
1995	1,619	513	2,132	2,313	571	2,884	3,169	636	3,805
2000	1,814	529	2,343	2,814	607	3,421	4,280	695	4,975

Sources: [1]1977 Makah Tribal Demographic Survey
All other figures Pacific Rim Planners, Inc., estimates.

Table 4

Comparative Employment by Industry

1976

Industry Division	Makah Reservation[1] Number	Makah Reservation[1] Percent	Clallam[2] County Percent	Washington[2] State Percent
Agriculture, Forestry & Fishing	25	7.1%	1.1%	0.7%
Mining	--	--	0.2%	0.2%
Contract Construction	9	2.6%	4.7%	6.0%
Manufacturing	53	15.1%	33.6%	22.2%
Food & Kindred Prod.	10	2.8%	0.5%	2.7%
Lumber & Wood Prod.	41	11.7%	23.6%	4.6%
Other Manufacturing	2	0.6%	9.6%	14.9%
Transportation & Public Utilities	1	0.3%	5.4%	5.8%
Wholesale & Retail Trade	31	8.8%	23.1%	27.5%
Finance, Insurance & Real Estate	--	--	3.9%	6.0%
Services	4	1.1%	15.7%	19.1%
Government	228	64.9%	12.2%	12.3%
Federal	41	11.7%	2.2%	5.5%
State & Local	187	53.3%	9.1%	6.9%
Local	187	53.3%	4.9%	0.8%
State	--	--	5.1%	6.1%
Totals	351	100.0%	100.0%	100.0%

Sources: [1]Makah Tribal Demographic Survey, 1977.

[2]Washington State Department of Employment Security, 1977.

Note: Includes all reservation residents except uniformed military personnel.

FISHING

Fishing has been one of the most important economic activities on the reservation. Until the signing of the treaty with the U.S., the Makah had a complex structure of ownership of fishing areas which were managed by their owners. After the signing of the treaty, non-Makah fishermen and governments began competing with and imposing restrictions on the Makah. Important traditional activities, such as whaling, trapping, and fishing for salmon and halibut were severely restricted and, in some cases, altogether eliminated. Recently, however, traditional salmon fishing rights have been upheld and restored through court action (U.S. vs. Washington), affirming the right of Indians to take 50% of all harvestable salmon in the waters of the state of Washington.

Since the Boldt ruling, fishing has begun to increase again in terms of economic importance to the Makah. It is estimated that approximately 25 Makah currently fish as a full-time occupation, although this number roughly doubles during peak fishing in late summer and early fall. Most of the fish caught by Makah fishermen is landed at Neah Bay, although very little is actually processed on the reservation. The only processing occurs at a small custom cannery which caters primarily to sport fishermen. Nearly all commercially caught fish is landed at two fish-buying stations, and iced and shipped by truck to Port Angeles or Seattle for processing.

A smaller number of residents (about 10) work in fish buying and processing establishments catering to commercial or sport fishermen. Overall therefore, about 35 persons (or 10%) of the reservation's work force are employed in fisheries or fisheries-related employment.

FOREST PRODUCTS

Another important economic activity is forestry and forest products-related activity. At the present time, the Bureau of Indian Affairs manages, as trustee for the Tribe, a substantial timber resource, under a sustained yield operating plan approved by the Tribal Council. Revenue from sales of timber stands in an extremely important component of tribal government income which supports many tribal services.

Most of the employment generated by the forestry resource is in logging and transportation, since most of the timber harvested on the reservation is trucked to mills outside of the reservation. There is only a small amount of timber processing on the reservation, primarily in the form of shake production. Althogether, about 41 persons, or 12% of employed residents, were in the forest products industry in 1976.

WHOLESALE AND RETAIL TRADE

About 31 persons are employed in wholesale and retail trade pursuits. Trade establishments include several motel and recreational vehicle-

oriented resorts, a cafe, a grocery store, two native crafts shops, and two service stations on a year-round basis. Several other small businesses operate during the summer only.

Most of the businesses rely heavily on customers from off the reservation for their livelihood. Comparison with Clallam County and Washington State percentages for this category indicates that much potential trade business (by reservation residents) is probably lost to competing trade centers (such as Port Angeles). Some improvement in this situation can be expected when the planned Tribal Business Center is completed in the village of Neah Bay.

TRIBAL AND OTHER LOCAL GOVERNMENT

Formerly a fairly small source of employment, this activity has expanded a great deal recently. Tribal leaders have combined tribal revenues and resources with state and federal aid programs to initiate a number of tribally-run programs to maintain and improve public services formerly provided by non-tribal agencies. The recent increases in state and federally supplemented activity have made the tribal government the largest employer on the reservation, totalling about 139 workers in 1976. Many of these jobs are temporary, however, and the tribal Overall Economic Development Program indicates that tribal government should become a relatively less important employer as other employment sources are developed in the future. The Cape Flattery School District is also a large employer, employing about 48 persons in 1976.

FEDERAL GOVERNMENT

Most of the activity and employment in the federal government sector is associated with the Makah U.S. Air Force Radar Station and U.S. Coast Guard Stations on Tatoosh Island and Neah Bay. The jobs generated are held primarily by uniformed servicemen, and few tribal members derive their living from these sources. Other federal programs, though not as large, probably have a greater relative impact on the overall employment of tribal members; these programs include the Roads, Forestry, Real Estate and Credit offices operated by the Bureau of Indian Affairs and medical clinics operated by the Indian Health Service of the U.S. Public Health Service

In all, the federal government directly employs about 41 residents, not including uniformed military personnel. In relative terms, this figure accounted for abour 12% resident employment in 1976, about twice the state average and five times the county average. The reservation's strategic location (for military purposes) and federal trust status are probably responsible for this relatively high fraction.

Chapter 5

Human Use of Natural Resources

Chapter 5
HUMAN USE OF NATURAL RESOURCES

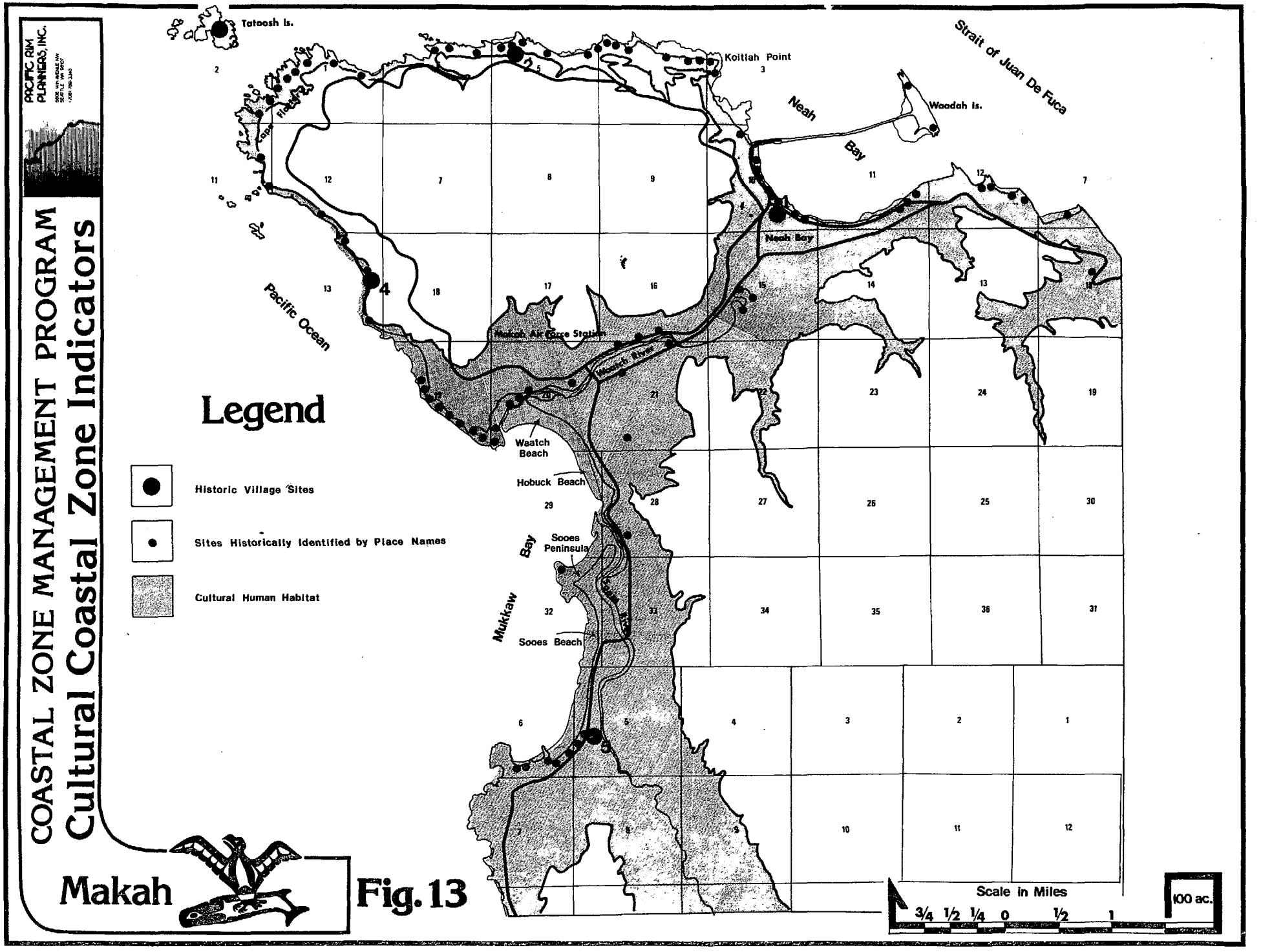
The natural resources of the Makah Reservation are discussed in Chapter 3 and the human resources, primarily population and economic information, are described in Chapter 4. This chapter brings those two elements together in a discussion of the human use of the natural resources. The predominant resource uses on the reservation are timber harvesting and fishing. Other uses include cattle grazing and recreation. Also included in this chapter is a discussion of the shoreline development on the reservation and the cultural elements in the area. The coastal zone is defined culturally by locating the historical sites and identifying the traditional use of the natural resources.

Cultural

Long before European contact with Northwest Coast Indians, the Makah were importers and exporters of goods. Regular trading expeditions traveled along the Pacific coast, with dried halibut, herring eggs, and whale blubber and oil being the prominent commodities. Throughout the years of commerce, the goods which the Makahs received in exchange varied with their needs. For example, if housing materials and cedar trees large enough for ocean-going canoes became scarce in their territory, they were imported from other regions.

Because the coastal resources were so important to the Makahs for trade and subsistence, individual ownership rights of resource areas were guarded. Individuals or families owned sections of the halibut banks, the salmon streams, shellfish beds, and stretches of coastline where usable items might be washed up on the shore. Cranberry bogs and stands of cedar were also under this type of ownership.

The Makah historic settlement patterns, as described by Swan (1968) and Waterman (undated), centered around the immediate coastal beaches, adjacent uplands, and along the major rivers of the area. Figure 13 shows sites identified by Indian names for places in the Cape Flattery vicinity. As evident from this figure and the dependence on coastal resources, the Makahs seldom ventured far from the shorelines, at least in their normal living patterns. If the coastal zone were defined by this data, it would be indicated by a line similar to that shown in Figure 13. This figure points out that not only is the shoreline historically significant to the Makahs, but those lands which potentially impact the shoreline are worthy of notice.


PACIFIC RIM PLANNERS, INC.
COASTAL ZONE MANAGEMENT PROGRAM
Cultural Coastal Zone Indicators
Makah
Fig. 13
Legend
Historic Village Sites
Sites Historically Identified by Place Names
Cultural Human Habitat
Tatoosh Is.
Koitlah Point
Strait of Juan De Fuca
Neah Bay
Waadah Is.
Pacific Ocean
Makah Air Force Station
Waatch River
Waatch Beach
Hobuck Beach
Sooes Peninsula
Mukkaw Bay
Sooes River
Sooes Beach
Scale in Miles
3/4 1/2 1/4 0 1/2 1
100 ac.

OZETTE EXCAVATION

Among the several ancient village sites identified along the Makah coastline, the Ozette village gives the most complete view of Northwest coast prehistoric Indian life. The excavation has revealed much about Indian trade and resource utilization. The main village site is situated on the broad, flat point of Cape Alava, approximately 16 miles south of Neah Bay. The ancient village site extends over 3/4 of a mile along the beach. The excavation site itself constitutes a relatively small portion of this area (Figure 14).

The village is located within the largest known midden deposit (layers of shell of varying degrees of concentration and decomposition) along the Washington coast. A series of terraces extends from the present beach over 200 feet up the adjacent hillside to an elevation of approximately 70 feet (Friedman, 1976).

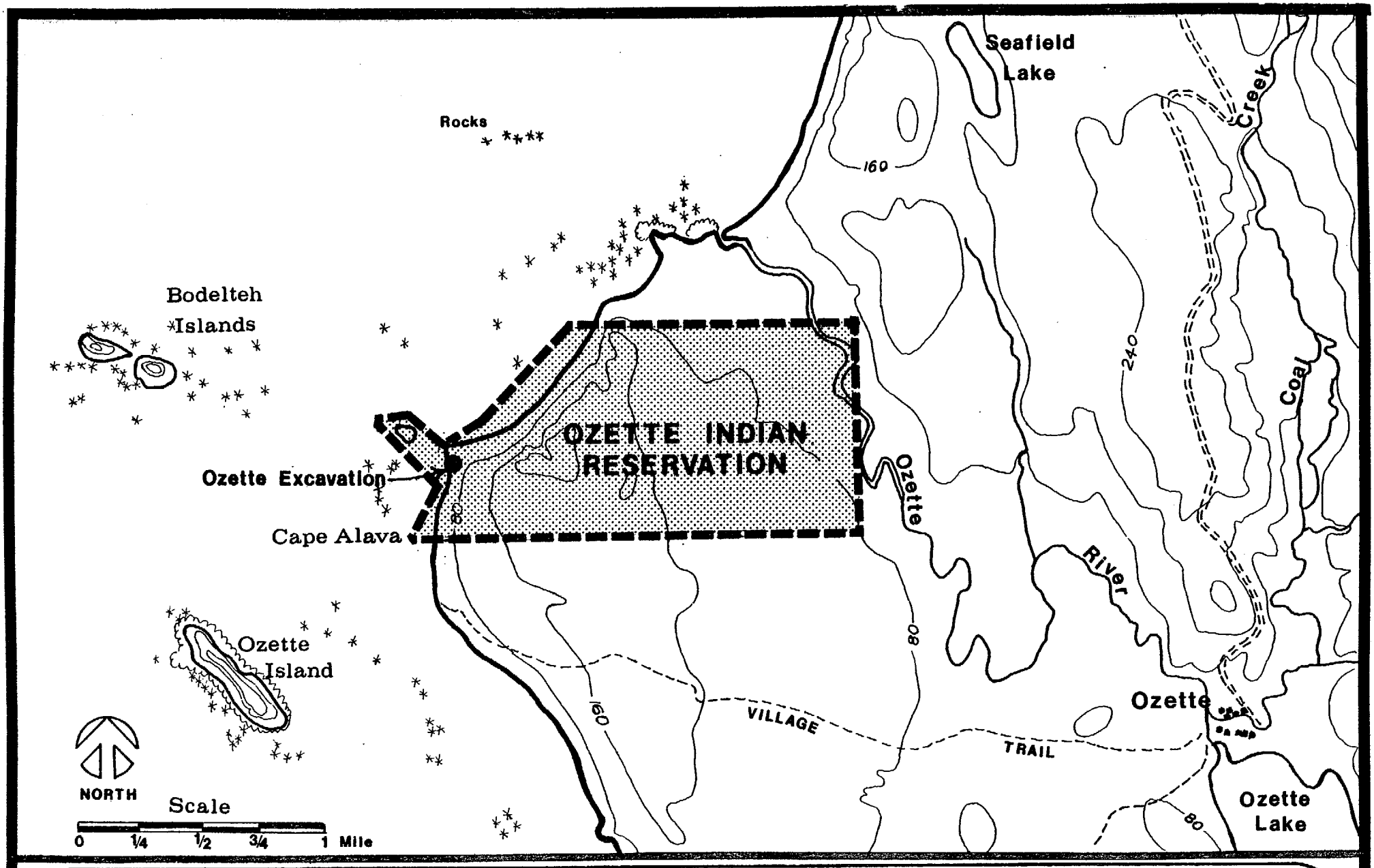
The village had been occupied for at least 2000 years prior to being covered by a mudslide approximately 500 years ago. Dr. Richard Daugherty, of Washington State University, visited the site in 1948 and began excavation work in 1966 and 1967. Prompted by the threat of storm wave damage, excavation was intensified in 1970, and work has continued year-round since. The excavation, accessible by trail, is approximately 4 miles from Ozette Lake. Visiting hikers can view the proceedings (Kirk, 1975).

The mudslide effectively sealed the village structures and artifacts from deterioration. A great number of hunting and cooking tools have been recovered from House 1 (in the lower portion of the site). Evidence of at least 3 additional houses exists, yet the full extent of the site has not been determined.

Because the Makah depended heavily upon local resources, the environmental characteristics of the region give important clues pertaining to lifestyle. Additionally, consideration must be made of the potential for new findings within the heavily used resource areas near the village site. The cultural significance of the village is such that preservation of the local environment is important to gain an understanding of life within the village proper.

Fisheries

Marine and freshwater areas on and adjacent to the reservation support significant populations of fish. Some of these populations are highly utilized by Tribal members and have attracted sport and commercial fishermen from many parts of the Pacific Coast, as well as other parts of the world. Such interest has recently made the reservation the subject of considerable attention regarding production, management, and the allocation of harvests among competing groups of fishermen.



Makah Coastal Zone Management Program

Fig. 14

Pacific Rim Planners, Inc.

The coastal waters off the reservation are used by non-Indian, Makah and other Indian commercial fishing vessels and by sport anglers. The streams on the reservation are used for Makah setnet and gillnet operations and by a small number of sport anglers. The commercial, Makah, and sport fisheries often conflict in their use of the fishery resource, and will be discussed individually. The section on commercial fishery is separated into discussions of salmon and halibut fisheries, describing the history, methods of harvest, management, and current issues and trends of each.

COMMERCIAL SALMON FISHERY

In nearly all annals and journals of early Pacific Northwest explorers, the writers remarked again and again about the prevalence of salmon as native food. With the development of canning during the mid 1800's, the salmon fishing industry began an intensive exploitation of the species, which has continued to present. Catches of all species of salmon in Puget Sound, for example, have ranged from a high of over 39 million fish (or 124 million pounds) in 1913 to a low of just over a million fish in 1944 (Washington Department of Fisheries, 1973). Figure 15 indicates the annual statewide commercial salmon catch from 1935 through 1970.

Most chinook salmon are taken by troll fishing vessels operating in the ocean. The ocean catch by the troll fishery has generally increased during the past 40 years, due in large part to increased fishing and artificial propagation efforts. Beginning in 1935 (the first year in which records were kept), the catch of chinook by ocean trollers generally increased, rising from about 200,000 fish in 1935 to about 400,000 fish annually in the early 1950's. Catches then plummeted to about 96,000 fish in the mid-1960's, but have since recovered to a recent high of 367,000 fish in 1976. Slightly less than 2% of the latter figure includes troll catches by a year-round troll fishery operated by the Makah Tribe, centered in the outer Strait of Juan de Fuca (Pacific Fishery Management Council, 1977). The statewide catch, however, has been considerably more stable.

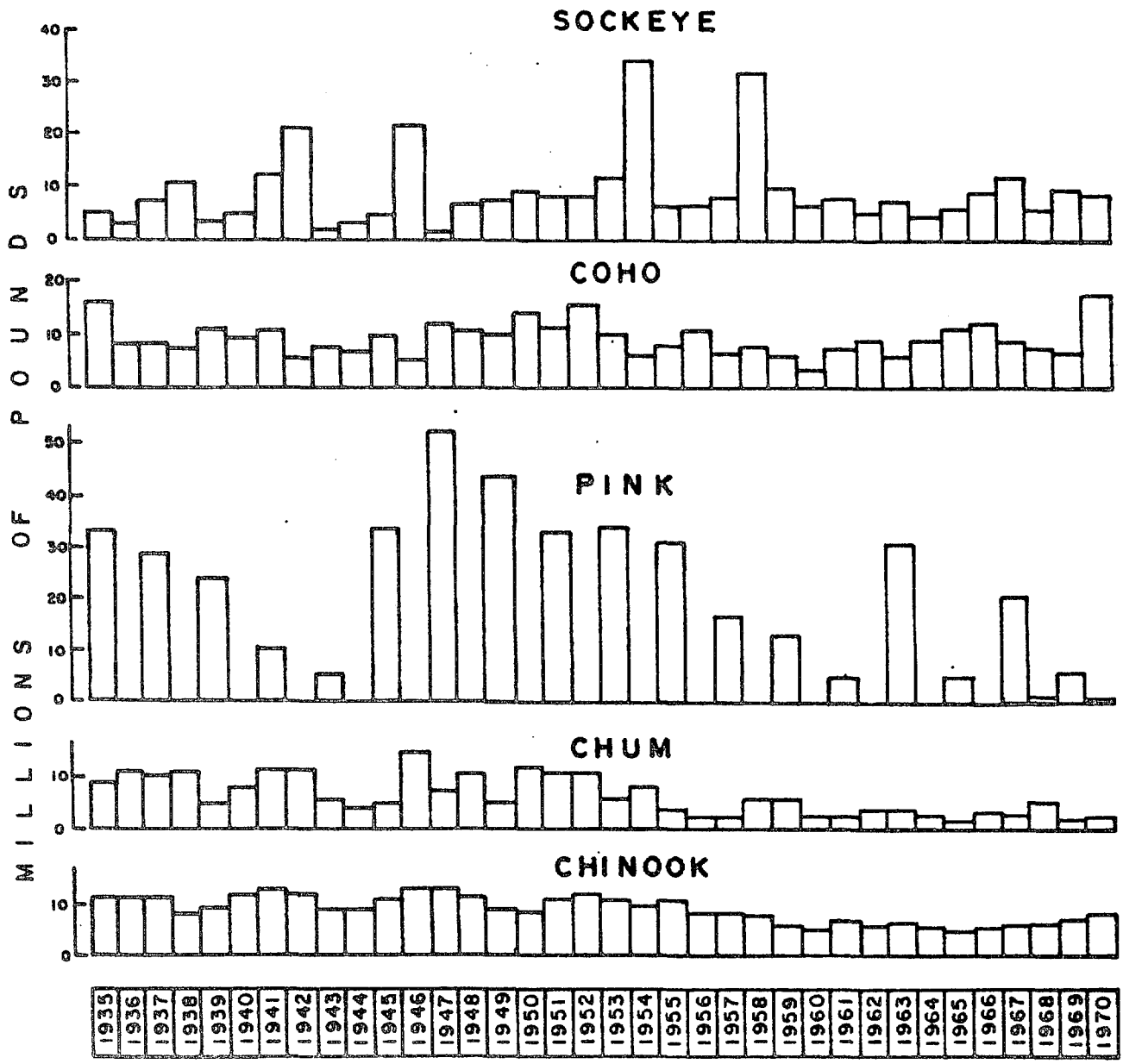
Commercial troll catches of coho salmon in the ocean have been considerably more variable than those of chinooks, declining during the 1930's and early 1940's, improving during the late 1940's and 1950's, and generally increasing from the mid 1960's to the present. The statewide catch has exhibited similar characteristics. Again, much of this increase can be attributed to increased fishing efforts and fairly intensive artificial propagation (Pacific Fishery Management Council, 1977).

Pink salmon are caught by Washington troll fishermen primarily in odd-numbered years. Catches began increasing in the early 1950's and reached a record level in 1963. Following another large catch in 1967, the ocean catch has declined drastically since (Pacific Fishery Management Council, 1977). Statewide catches have declined significantly since reaching a peak in 1947.

The statewide ocean sport catch has generally increased rapidly since 1952, occasionally exceeding even the combined ocean sport catch of all other

Figure 15

State of Washington Total Annual Commercial Salmon Catch
1935 through 1970



Source: Ward, Dale, Robert Robinson, Gene Nye and Don Reed. 1972 1970 Fisheries Statistical Report. Wash. Dept. of Fish, Olympia, Wash.

Pacific Coast states and British Columbia (Pacific Fishery Management Council, 1977). Ocean sport catches continue to take an increasing share of Washington's salmon catch.

Methods of Harvest

Several different types of methods are currently used to harvest salmon, depending on the area being fished. Figure 16 illustrates major commercial salmon fishing methods.

In the open ocean, trolling is used almost exclusively. Trolling utilizes poles from which lines with about four hooks are attached.

In inside marine waters (that is, out of the open ocean), gillnetting is the method most frequently used. Gillnetting involves stretching a long, deep net in an open body of water. The mesh of the net is large enough to allow a salmon to pass only part of its body through; it is hooked by the gills when it attempts to back up. Most Makah marine fishermen employ this method. Purse or drum seining may also be employed in inside waters, although is not common in the Neah Bay area.

In rivers, treaty fishermen may employ a variety of traps and nets, but tribal regulations currently limit river fishing to setnets and gillnets.

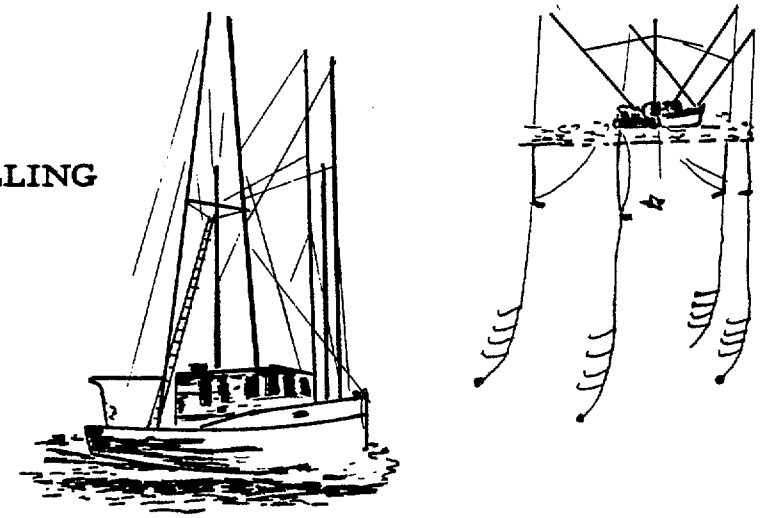
Management

A recent publication by the Pacific Fishery Management Council (1977) discusses some of the current issues and problems facing the West Coast salmon fisheries.

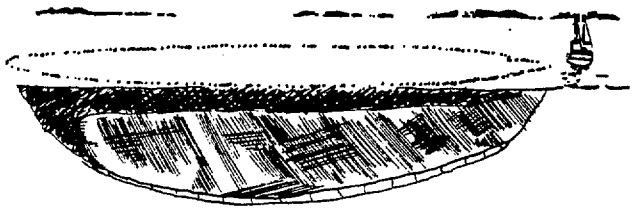
> *Normal management practices for salmon involve setting escapement goals by individual stock or aggregate of stock for natural spawning and artificial production facilities. Management intent is then to permit any additional fish over and above these goals to be harvested....*
>
> *In practice, however, the ocean troll fisheries for chinook and coho salmon have never been actively managed in the context of either adjusting fishing rates up or down in response to similar fluctuations in salmon abundance or regulating the ocean fisheries to take a reasonably constant proportion of the fish actually available from year to year...Pre-season run size predictions for individual areas are commonly "updated" through analysis of catch and effort during the early portion of each run...At this point, only restrictions on the "inside" fisheries can achieve the proper balance between total catch and escapement...(As a result,) the various inside fisheries have also borne virtually the entire brunt of restrictive measures deemed necessary to*

Figure 16
Present Commercial Salmon Fishing Methods in the
State of Washington

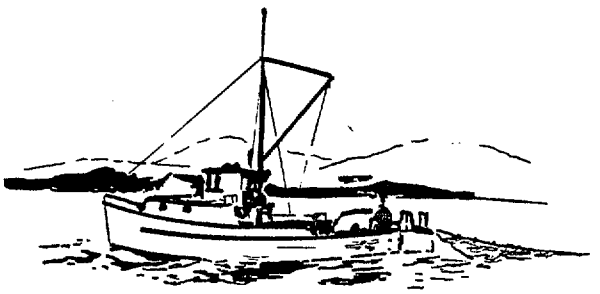
SALMON TROLLING



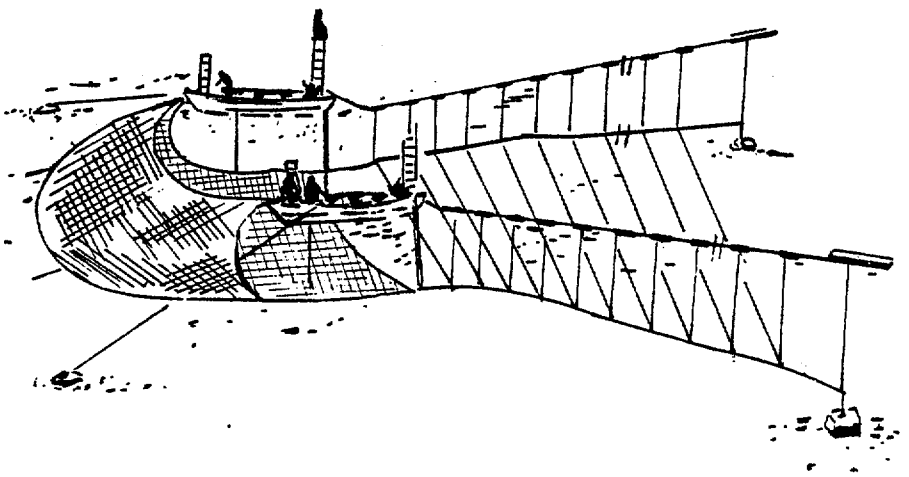
SALMON
PURSE SEINING



SALMON GILLNETTER



REEF NET



> *protect the depressed salmon runs. In some cases, there have not been enough fish reaching the spawning grounds to meet even minimum escapement requirements in spite of extensive closures of inside fisheries...Achieving maximum yield levels in pounds (of fish) would (however) require elimination of ocean troll and sport fishing and the taking of all fish at or near the river mouths. This action would be required because rate of growth exceeds rate of mortality in the ocean.*

Unfortunately, neither the State of Washington nor the federal government have had sufficient powers to effectively manage "inside" or "outside" salmon fisheries. As a result, many salmon runs have been overfished to the point of virtual extinction. Also, extensive entry into the fishing by additional fishermen and foreign nations in the face of declining overall harvests has made in increasingly difficult for long-time fishermen to continue to earn a living by fishing for salmon. As a result, the ocean salmon fishery is currently characterized by a large number of small boats operated largely by part-time fishermen and fewer large boats operated by full-time fishermen that often engage in other commercial fisheries (Pacific Fishery Management Council, 1977).

Washington's coast has also received fishing pressure from vessels based outside of the state. Vessels from Oregon, California, and British Columbia catch salmon off the coast of Washington. The Canadian fishermen have been allowed to fish in an area between 3 and 12 miles offshore north of 40° north latitude since 1973 under the terms of the bilateral agreement with the U.S. (Pacific Fishery Management Council, 1977). The agreement expired December 31, 1977, but as of this writing, negotiations are underway towards its renewal and extension. By terms of the same agreement, U.S. fishermen are allowed to fish Canadian waters along the south coast of Vancouver Island. Recently, however, two major events have dramatically changed the management and allocation of fishery resources. The first was a 1974 federal court decision, the Boldt decision, allocating the opportunity for harvesting 50% of the state's salmon to Washington's coastal and Puget Sound tribes. (United States vs. Washington, 384, F. Supp. 312 (W.D. Wash. 1974), affirmed 520 F.2d 676 (9th Circuit 1975), cert. denied 423 U.S. 1086 (1976)).

In the case of the Makah Tribe, the decision restores fishing rights guaranteed to the Tribe by the United States in the Treaty of Neah Bay (12 Stat. 939). While the decision has been quite beneficial to most treaty fishermen, Makah fishermen have been placed under more restrictions, and the total catch of salmon by all Makah fishermen has not increased appreciably. These treaty rights apply to all stocks of salmon under U.S. control or jurisdiction (including jurisdiction exercised by the states) that, without prior interception, would pass through or be available at any of the treaty tribes' "usual and accustomed" fishing grounds, wherever located. Specific federal court adjudications of usual and accustomed fishing grounds for the Makah Tribe pursuant to U.S. v. Washington include the following areas (others may be added later):

> Marine waters extending from the Strait of Juan de Fuca "out into the ocean to an area known as Swiftsure and then south along the Pacific Coast to an area intermediate to Ozette village and the Quileute Reservation" (384 F. Supp. at 364).

The second event was the passage, in 1976, of the U.S. Fishery Conservation and Management Act of 1976 (P.L. 94-265). This act extended U.S. jurisdiction over ocean fishery resources from 12 to 200 miles offshore and established a program for their management. It was particularly intended to control fishing for stocks of bottomfish (such as hake) by foreign vessels. Trawling, particularly by Soviet vessels, began off the west coast in the mid-1960's. Other countries, including Japan, Poland, East Germany, West Germany, and Bulgaria, subsequently entered this fishery. Foreign fishing activity affects U.S. salmon fishing activity in two major ways. First, there is physical interaction of large foreign vessels competing for space with salmon trollers, primarily because hake and salmon have similar feeding habits.

Second, foreign trawl gear often catches salmon incidentally while fishing for hake. Estimates of catch amount vary, but a mid-point estimate of 43,000 coho and chinook salmon per year off Washington, Oregon, and California has been suggested. Recent treaties with Poland and USSR permit a continued fishery for hake in the U.S. Fishery Conservation Zone (between 12 and 200 miles offshore), but allow no retention of salmon. These agreements and recently issued U.S. regulations for the FCZ will probably reduce significantly the foreign taking of U.S. salmon.

Recently, state and federal agencies have been considering imposing further limits on ocean fishing for salmon. The purpose of these limits would be to improve management of individual runs by shifting fishing efforts to "inside" or terminal areas (fishing grounds which are near the mouths of spawning rivers), and to increase total poundage for a given number of fish harvested by allowing the fish to mature longer before harvest. Proposed plans to accomplish this objective have been flawed, however, by the fact that much U.S. spawned salmon production is taken by Canadian fishermen, and any reduction in U.S. ocean fishing effort would simply increase Canadian catches unless matched by a corresponding reduction in Canadian fishing effort.

Limited entry to non-Indian commercial salmon fisheries was instituted in 1974 by the Washington State Legislature when it passed the Salmon License Moratorium Law (SSB 2940). The bill provided a three-year moratorium on the issuance of new non-treaty salmon fishing permits to allow state and private groups a chance to formulate recommendation for a permanent limited entry program for non-treaty salmon fisheries. The 1977 legislature extended this moratorium through 1978 to allow additional time for the development of such an approach.

THE HALIBUT FISHERY

The halibut fishery, the most established bottomfish industry, is both historically important and potentially economically important to the Makah Tribe. Although only a limited amount of halibut fishing currently takes place off the reservation, the halibut fishery could provide an area of diversification for the tribe in the future.

Pacific halibut are found along both sides of the North Pacific. Along the North American coast, halibut have been taken as far south as Santa Barbara, California, and as far north as Nome, Alaska. Inhabiting waters of the continental shelf, halibut are usually taken during the summer months when they move to shallower waters. A commercial fishery using "sets" of hooks and lines takes the fish at distances ranging up to 20 miles from shore.

Halibut was an important food source for Northwest Indians for centuries prior to the coming of European colonists and traders. The native fishery utilized hook and line gear, and operated routinely up to 20 miles from shore. Makah were particularly well-known for their halibut fishing skills; one author noted that catches by Makah fishermen reached a peak of about 600,000 lbs. per year in the 1880's (International Pacific Halibut Commission, 1978).

In 1888 three sailing ships from New England began fishing off of Cape Flattery, shipping their catch from Tacoma to Boston via the newly completed transcontinental railroad. Rising prices and improving vessel and gear technology lead to increasingly intensive fishing effort by non-Native groups, and with succeeding years the vessels fished ever further north. The fishery for halibut became, like that for salmon, overexploited, and landings diminished gradually through the first half of the 1900's. The decline in landings prompted the U.S. and Canada to form the International Pacific Halibut Commission (IPHC) in 1923 to manage the northeast Pacific halibut fishery.

The IPHC introduced a number of measures to restrict fishing effort and improve fish stocks, including the setting of allowable fishing seasons for geographic areas and regulations governing the types of gear which may be utilized. The commission has not, however, limited the number of domestic vessels which may enter the halibut fishery. Furthermore, until the passage of the U.S. Fishery Conservation and Management Act of 1976 (P.L. 94-265), the United States was virtually unable to regulate foreign fleets off the U.S. coast. There, fleets of large trawler fishing vessels (primarily Japanese and Soviet) began appearing in force during the mid-1960's. Despite their avowed purpose of harvesting only the underutilized bottom-fish species (such as pollock and hake), the fleets took such a high incidental catch of both mature and juvenile halibut that U.S. and Canadian catches (both total and per day of fishing effort) declined seriously. Recent revisions to international treaties with the major nations and expanded U.S. jurisdiction have lead to increases in stocks of juvenile halibut, but these increases probably will not be noticed until the 1980's, since the U.S. and Canadian commercial fisheries usually take only fish which are eight years old or more.

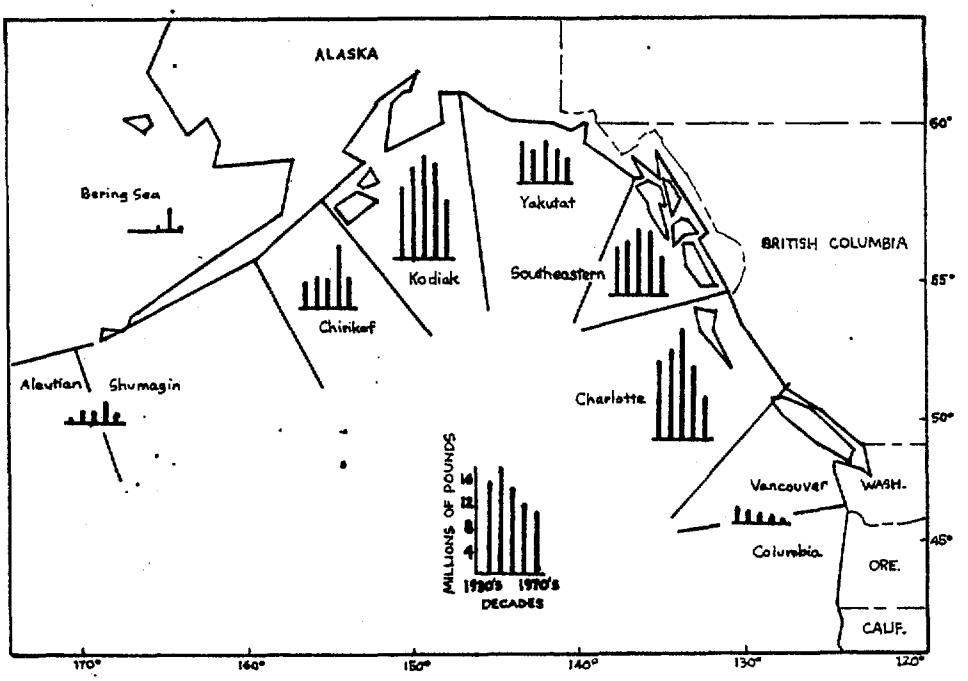
Large numbers of U.S. and Canadian vessels have entered the halibut fishery recently, in part due to declining catches in other important fisheries, restricted entry in others (such as limited entry in the Alaskan and Washington salmon fisheries), and to the attractive prices paid for halibut. As a result, the IPHC is considering instituting increased management efforts, including a program of restricting the number of vessels through a limited entry program (IPHC, 1978).

The modern North American halibut fishery consists of about 750 large boats which fish primarily for halibut, and about 3,600 smaller boats which fish during only part of the season.

Figure 17 depicts catch trends in major halibut fishing areas for the past five decades. The Kodiak (Alaska) and Queen Charlotte (British Columbia) areas have been the leading areas in terms of average annual catch during this period, but both have exhibited significant recent declines. The Washington coast - Vancouver Island areas have contributed an ever smaller portion of the catch.

Figure 17

Distribution of Northeast Pacific Halibut Catch
by Regions by Decades from the 1930's to 1970's



(latitude)

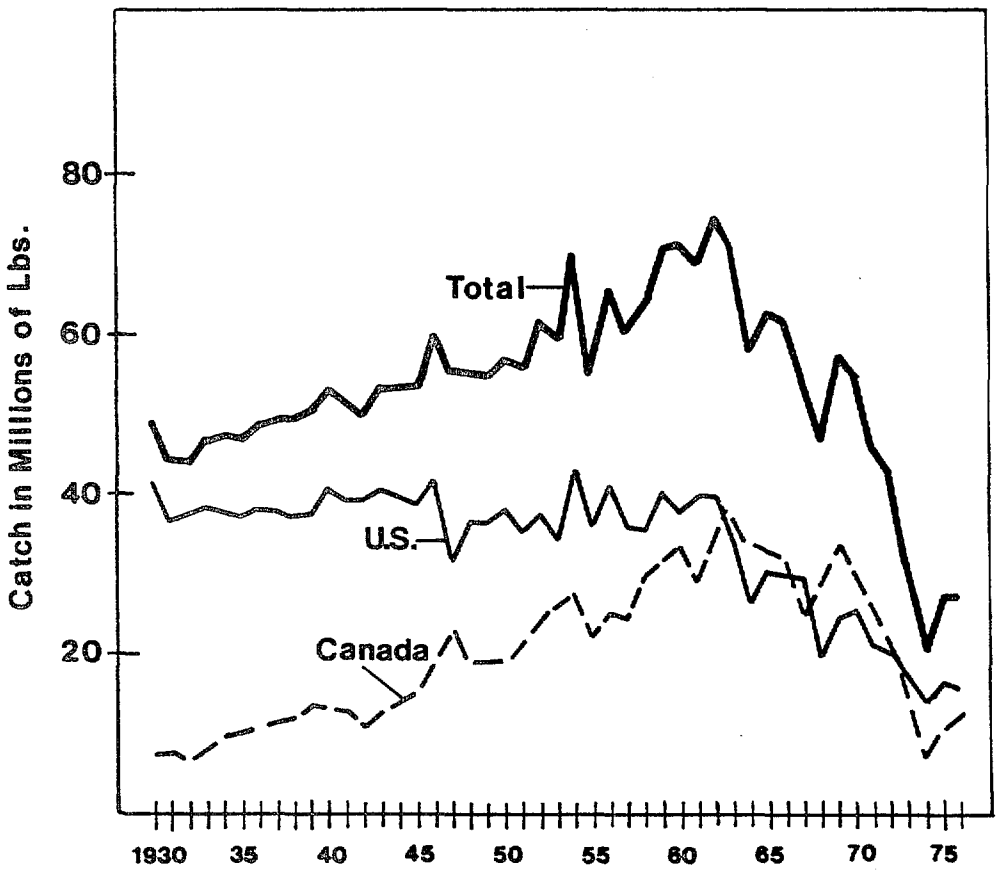
(longitude)

Source: International Pacific Halibut Commission, 1978.

Figure 18 illustrates trends in halibut catches during the 46 year period from 1930 to 1976. Total catches generally increased through 1960, but have declined drastically since, primarily because of overharvesting by both foreign and domestic fleets. Canadian catches have been the most variable, but U.S. catches have also been affected by the recent decline. Although evidence is not yet conclusive, it appears that this decline has halted for the present.

Figure 18

Total Canadian and United States Catch of Pacific Halibut
1930-1976
(heads-off, eviscerated weight)



The five major ports of landing in 1976 were Prince Rupert and Vancouver, B.C., and Kodiak, Seward, and Petersburg, Alaska. The latter three have only recently risen to importance, whereas others (such as Seattle and Ketchikan) have declined. In deciding where to sell fish, fishermen must balance the higher prices usually prevailing in the more southerly ports against the fuel costs and fishing time lost in running to these ports. In recent years, buyers in northern ports have been offering more competitive prices and fewer vessels are running to southern ports.

Most halibut fishing grounds are found in the North Pacific, along the Alaska Coast, but there are some off Cape Flattery. Large-scale expansion of the Makah commercial fishery to include halibut would be an expensive venture for the Tribe, requiring larger boats and docks and processing and maintenance faiclities. Individual fishermen, however, might choose to pursue halibut on a smaller scale using Neah Bay as a headquarters for short trips.

Sport and subsistence fishing for halibut is allowed from the month of March through October. Total non-commercial catch is estimated to be about 20,000 fish (or about 250,000 lbs.) annually (International Pacific Halibut Commission, 1978).

MAKAH FISHERY

The Makah Development Corporation operates a nine-boat fishing fleet of Tribally-owned 34-foot combination gillnetter/trollers. In addition, there are numerous smaller boats that troll, seine, and river fish (Makah Tribal Council, 1977).

Overall, coho have been the most important species of salmon taken in the Makah fishery, accounting for nearly two-thirds (62.6%) of the mean annual catch during 1974-1977. Chinook were also important, accounting for another quarter (25.0%) of this figure, with chum salmon and steelhead accounting for the remainder. Pink and sockeye salmon, two salmon species of major importance in some other parts of the state (particularly in Puget Sound), were not taken by Makah fishermen during this period. Table 5 summarizes these figures.

Table 5

Mean Annual Makah Salmon and Steelhead Catch, by Species

Species	Numbers of Fish	% of Total
Chinook	2,162	25.0%
Coho	5,417	62.6
Chum	343	4.0
Steelhead	725	8.4
Totals	8,647	100.0%

Source: Makah Fisheries Departement, unpublished data.

Three areas contribute over three-quarters of the tribal catch--Hoko Bay, Hoko River, and Sooes River. The remainder of the tribal catch comes from four other areas. Tribal catch for the past four years is summarized in Table 6 .

Table 6

Mean Annual Makah Catch by Area

Area	Numbers of Fish	% of Total
Hoko Bay	2,033	23.5%
Hoko River	2,230	25.8
Sekiu River	192	2.2
Sail River	42	0.5
Waatch River	1,233	14.3
Sooes River	2,348	27.2
Mukkaw Bay	569	6.6
Totals	8,647	100.0%

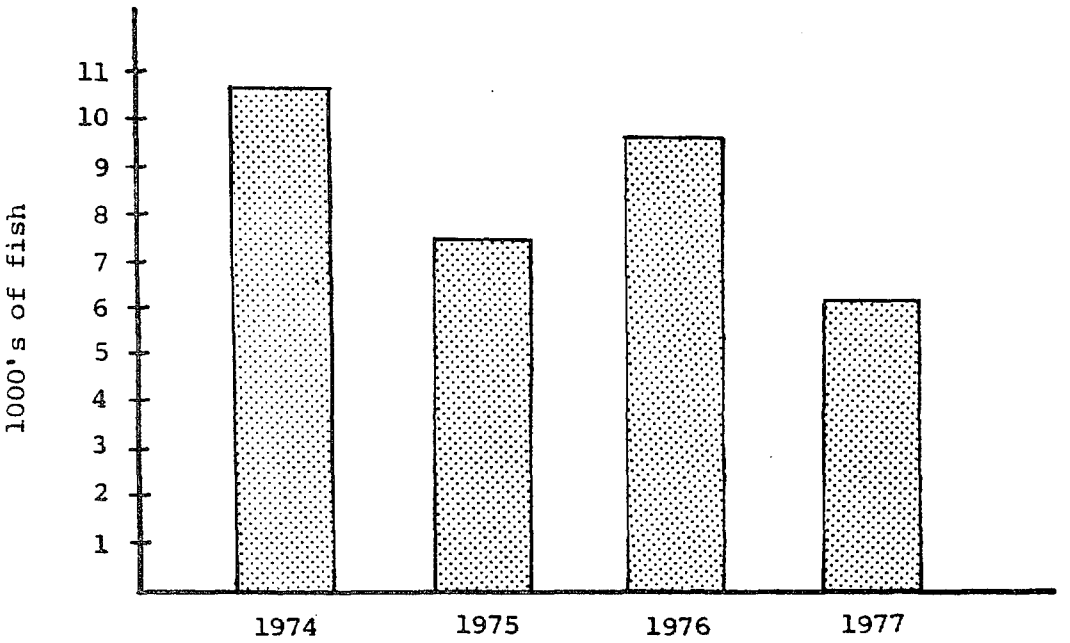
Source: Tribal Fisheries Department.
Note: Figures may not add to 100% due to rounding.

It is also worthwhile to note that the advent of the Boldt Decision has not yet had a positive effect on tribal fish catches. As Figure 19 shows,

total Tribal catches have not yet shown any increasing trend since the decision.

Figure 19

Average Annual Tribal Salmon Catch
1974-1977



Source: Makah Fisheries Department.

Table 7 shows the non-Indian and Makah catches by gear for 1977. As indicated in this table, the Makahs caught only 10% of the total catch for that year.

Table 7

Non-Indian and Makah Marine Catches
1977

	Number of Fish	Percentage of Total
Sport Troll	64,232	10.6%
Makah Troll	17,703	2.9%
Non-Indian Commercial Troll	391,936	64.9%
Non-Indian Commercial Gillnet	87,270	14.5%
Makah Gillnet	35,990	6.0%
Makah Setnet	6,743	1.1%
Total Non-Indian Catch	543,438	90.0%
Total Makah Catch	60,436	10.0%
Total	603,874	100.0%

Source: Makah Fisheries Department.

More detailed information on trends in the Makah fishery is available only for the setnet and gillnet catches on the Hoko, and Waatch Rivers (Table 8). As the table indicates, the salmon catch from these rivers decreaded from 1957 to 1971, especially during the late 1960's.

Table 8

Salmon Taken by Setnets and Gillnets on Hoko, and Waatch Rivers

(Numbers of Fish)

	Hoko River	Waatch River	Total
1957	2,019	2,019	4,038
1958	2,134	2,050	4,184
1959	2,311	1,911	4,222
1960	1,615	1,630	3,245
1961	2,580	4,226	6,806
1962	3,420	4,308	7,728
1963	1,118	1,948	3,066
1964	3,865	3,049	6,914
1965	2,368	2,575	4,943
1966	1,002	1,991	2,993
1967	247	1,232	1,479
1968	776	1,061	1,837
1969	286	602	888
1970	1,133	2,764	3,897
1971	469	1,133	1,602
1972	1,106	1,539	2,645
1973	5,075	2,249	7,324
1974	2,977	2,314	5,291
1975	NA	NA	4,320[1]
1976	2,184	5,440	7,624
1977	1,334	1,375	2,709

NA - No Data Available
1-Setnet catches, Makah Fisheries Department
Sources: Washington Department of Fisheries and Makah Fisheries Department.

SPORT AND SUBSISTENCE FISHERIES

Although the fisheries resource use is dominated by the commercial fisheries, the reservation supports a significant sport and subsistence fishery.

Location and Extent

Sport salmon angling takes place in the waters off the coast of the reservation generally from early May until September. Marine anglers are

required to record salmon catches under the Washington State Department of Fisheries punch card system. Angling on the reservation's numerous streams is under the jurisdiction of the Tribe, which issues a reservation fishing license for non-Tribal members.

The reservation did not receive intensive angling until the 1950's. The angling effort increased significantly from 1950 to 1975, with an average rate of increase of 1,800 trips per year. As shown in Table 9, an average of 54,500 trips per year in the 1970's. Angling success in the past 14 years has ranged from 0.60 salmon per trip in 1976 to 1.60 salmon per trip in 1971.

The number of salmon landed in the Neah Bay area has been rather sporadic, as shown in Table 10. Chinook landings increased significantly from 1970 to 1974, but have since leveled off.

Table 9

Marine Angler Trips and Salmon per Trip

Neah Bay Area

	Marine Angler Trips	Salmon/Trip
1964	49,555	0.91
1965	45,728	1.26
1966	62,980	1.24
1967	58,530	1.45
1968	51,499	1.43
1969	64,832	1.25
1970	48,967	0.95
1971	54,480	1.60
1972	64,791	0.95
1973	56,599	0.86
1974	53,613	1.50
1975	58,493	1.02
1976	44,282	0.60

Source: Washington Department of Fisheries.

Projected Demands

The use of private boats for sport fishing has become increasingly popular, causing local boat launching and moorage facilities to become increasingly overcrowded during the peak summer months. As noted in the discussion of issues in Chapter 1, there is a strong demand for a new multipurpose marina facility.

The demand for sport fishing in the Neah Bay area will probably continue at least at the present level and most likely increase as the population in western Washington increases. This demand on the fisheries resources emphasizes the importance of continued protection of the sensitive spawning streams. Policies to protect salmon spawning habitat are presented in Chapter 7.

Table 10

Neah Bay Marine Sport Salmon Catches

	Chinook	Coho	Pink	Other Marine Fish
1964	8,795	36,256	--	NA
1965	5,532	49,094	2,974	NA
1966	12,987	64,536	--	NA
1967	6,183	42,883	35,569	NA
1968	8,497	64,912	--	NA
1969	11,883	56,947	12,091	NA
1970	7,670	37,613	--	NA
1971	8,974	71,714	6,379	NA
1972	14,563	47,141	--	NA
1973	14,836	31,171	2,638	NA
1974	16,881	63,421	--	NA
1975	13,743	38,773	6,500	43,135
1976	11,320	56,572	221	30,379
1977[1]	5,999	49,127	9,106	NA

NA - No Data Available
1 - From Makah Department of Fisheries data.
Source: Washington State Department of Fisheries, 1967-76.

As mentioned in Chapter 3, the U.S. Fish & Wildlife Service is developing a fish hatchery on the Sooes River, with completion scheduled in 1980. This hatchery will help to restore the natural production of salmon in this area, but it cannot meet the high demand for fish in the area. Protection and enhancement of the valuable fisheries resource will require effective management of this resource as well as management of other resource uses on the reservation. The goals, objectives, and policies discussed in Chapter 7 set forth guidelines for the Tribe to ensure this protection of the fisheries resources.

Forest Resources

One of the most important resources of the Makah Reservation is timber. Approximately 76% of the land area of the reservation is now being used for timber production. The commercial timber harvest is a major contributor to the local economy, providing 90% of annual income for the Tribal government. Approximately 11% of the labor force is employed in timber harvesting both on and off the reservation. The forested hills also contribute to the scenic and recreational value of the reservation.

EXTENT AND LOCATION

The coniferous forests, mapped in the previous chapter (Figure 8), supply the reservation's commercial timber harvest. Of the 27,600 acres of the

reservation, approximately 21,000 are managed as commercial timberland, and harvested on a 60-year rotation cycle.

Over the last 10 years cutting has averaged approximately 300 acres per year, with a yield of about 11,000,000 bf (board feet) per year, or over 36,000 bf per acre. Timber harvested now is primarily old-growth, and 80% of the production is hemlock.

By 1986 to 1988, harvesting will begin on second-growth timber. The second-growth is made up of a lower proportion of hemlock and a higher proportion of alder. Consequently, yields per acre may be somewhat reduced after the 1980's; however, the current cutting rate leaves some 3000 acres unaccounted for under a strict assumption of a 60-year rotation cycle. If this area is included in future timber sales, it may compensate for any reduced yields. In addition, if prices for wood products continue to rise at a rate greater that that of inflation, the Tribe can realize the same or greater income from smaller yields per acre, or from less acreage harvested. Recent timber contracts, sold in 1977 and 1978, have included areas near Cape Flattery, Hoebuck Lake, and Bear Creek. These sale contracts have involved a total of approximately 54 million board feet, to be cut over the next 5 years. A summary of these sales is shown in Table 11.

Table 11

Recent Timber Contracts
Makah Reservation

NAME	YEAR SOLD	MILLION BOARD FEET	ACRES	LOCATION
North Hoebuck	1977	4.9	145	Portions of Sections 21,22,27,28
South Hoebuck	1977	5.0	160	Portions of Sections 27,28,33
Cape Flattery	1978	27.0	610	Portions of Sections 5,6,7,8,9,16
Bear Creek	1978	17.0	435	Portions of Sections 16,17,18,20

Source: Makah Forestry Department.

PROJECTED DEMANDS

A study conducted by the Greenacres Consulting Corporation (1972) discussed the forest resource, industry, and projected harvest for the forests tributary to the port of Port Angeles. According to this study, the forest harvest in the Clallam and Jefferson Counties area (which includes the Makah Reservation) will continue to increase in the next 40 years.

Table 12 indicates the timber harvest, exports, and local consumption for the Clallam and Jefferson Counties area from 1962 through 1976. As shown in this table and Figure 20, the timber harvest increased significantly in this 15 year period.

Table 12

Timber Harvest
in the Clallam and Jefferson Counties Area

(Million Cubic Feet)*

Year	Tributary[1] Timber Harvest	Exports[2]	Local Consumption
1962	72.85	3.65	69.20
1963	95.61	7.52	88.90
1964	112.90	5.43	107.47
1965	100.32	17.52	82.80
1966	99.07	22.09	76.98
1967	107.99	35.59	72.40
1968	123.67	38.33	85.34
1969	118.00	36.43	81.57
1970	112.08	44.98	67.10
1971	114.62	39.43	75.19
1972	140.31	52.89	87.42
1973	153.86	56.67	97.19
1974	149.65	50.65	99.00
1975	118.75	52.72	66.03
1976	146.81	60.09	86.72

1 - Clallam County timber harvest plus two-thirds Jefferson County timber harvest, taken from State of Washington Department of Natural Resources Timber Harvest Reports 1961-1976.

2 - 1962-1964: Log exports through the Port of Port Angeles, taken from annual reports of the Port
1965-1976: Exports from Port Angeles, compiled by U.S. Dept. of Commerce.

Source: Greenacres Consulting Corporation, 1972, and U.S. Department of Commerce, 1976.

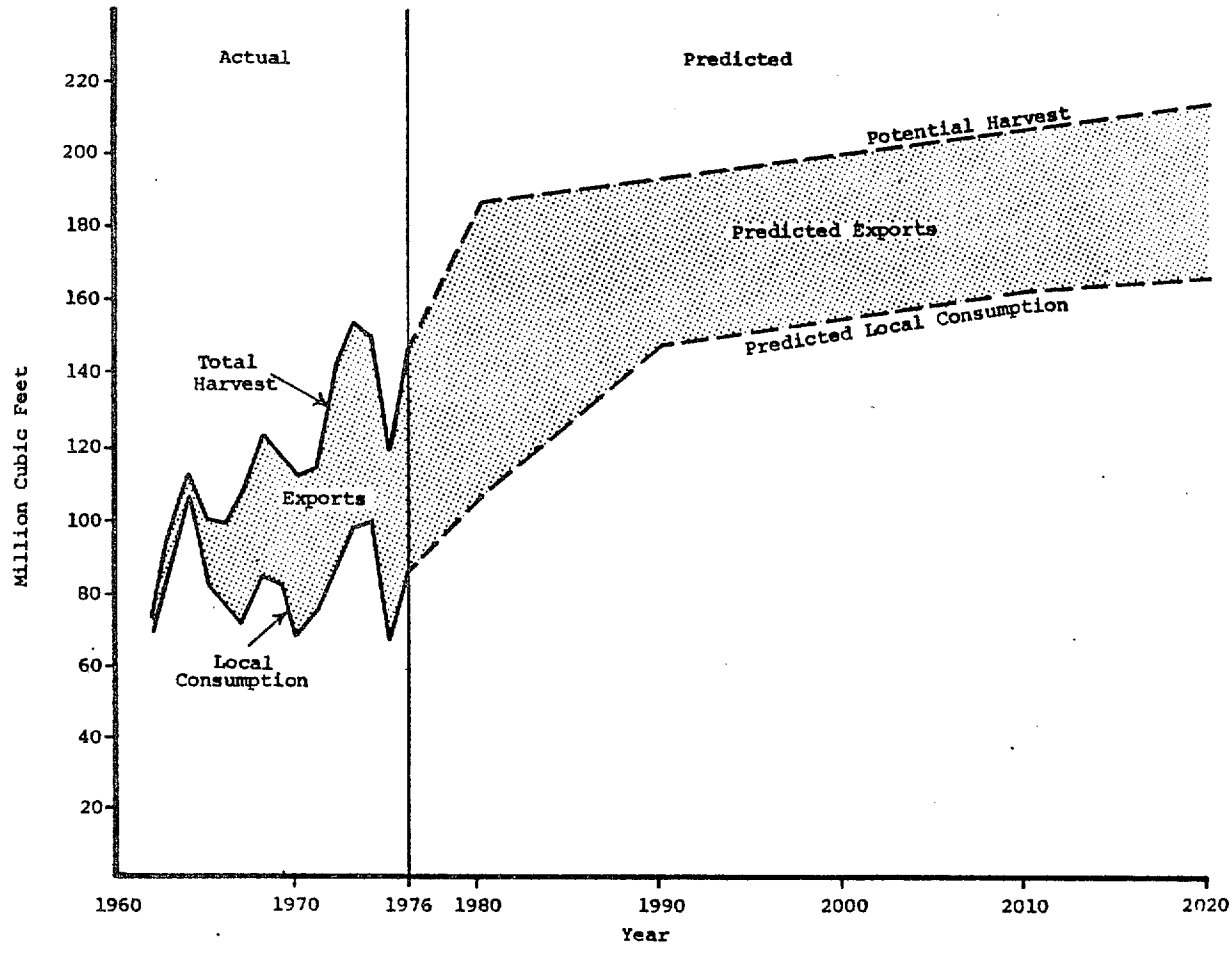
*Note: 1 cubic foot = 12 board feet.

Table 13 indicates the projected harvest potential from 1980 to 2020 (also graphed in Figure 20). The projected wood exports from the area, based on these figures and the projected Japanese demands, are shown in Table 14. The projected Japanese demand for wood from the Port Angeles area was calculated from data which indicated that Washington supplies approximately 65% of wood exported from the U.S. to Japan, of this, Port Angeles supplies about 10%.

The study concluded that there is a potential surplus of wood, consisting of a growth plus reduction of inventory, in the Port Angeles area, and that there is a strong and increasing demand for wood in Japan which cannot be met by Japanese domestic forests. According to the study, the Clallam/Jefferson area will therefore most likely export wood to Japan in the future at the rate indicated in Table 14.

Figure 20

Historical and Predicted Harvest, Export,
and Local Consumption of Wood in the Clallam/Jefferson Area



Source: Greenacres Consulting Corporation, 1972 and U.S. Dept. of Commerce, 1976

Table 13

Harvest Potential
for the Area Tributary to Port Angeles

(Million Cubic Feet)*

	1980	1990	2000	2010	2020
Harvest Potential	186	194	200	207	215
Local Consumption	117	147	154	163	166
Wood Available for Export (Balance)	69	47	46	44	49

Source: Greenacres Consulting Corporation, 1972.

Table 14

Projected Wood Exports
From the Port of Port Angeles

(Million Cubic Feet)

	1980	1990	2000	2010	2020
Minimum [1]	21	23	25	25	25
Maximum [2]	69	47	46	44	49

1 - Taken from projected Japanese demand.

2 - Taken from projected wood available for export.

*Note: 1 cubic foot = 12 Board Feet

Source: Greenacres Consulting Corporation, 1972.

Although no specific information is available on the projected demand for the timber on the Makah Reservation, it can be assumed that, like the entire Clallam/Jefferson area, the harvest potential and regional consumption will increase through the year 2020.

According to the Makah Fisheries Department, timber harvesting and road building activities appear to have caused the most damage to watersheds and fish habitat in the area. Timber harvesting, both on and off the reservation, has contributed to the overall decline in the salmon spawning beds.

The Tribal Fisheries Department has conducted investigations on salmon habitat alterations of Makah fishing streams. A list of major habitat alterations that have occurred on the reservation is contained in Appendix B ; many more areas off the reservation, not included in this list, have been altered and have significantly impacted the Tribe's fishery resource.

Timber harvesting seems to have its greatest impact on the fisheries resource, but it affects other resources as well. Because of the unique aesthetic character of the Makah reservation, special care must be taken to preserve valuable potential recreation areas.

In order to avoid these impacts of timber harvesting on resource management, policies have been developed in Chapter 7 which allow for the responsible use of these resources.

IMPACTS

The impacts of timber harvesting both on and off the reservation affect the use of other resources in the region, and are felt at other areas besides the logging sites. Siltation and temperature increases are transmitted downstream. Other, more localized, impacts from timber harvesting also contribute to problems of soil and recreation management.

Siltation and temperature increases can cause disruption of salmon spawning areas and habitats. Removal of stabilizing vegetation from steep slopes causes downslope movement of finer soil particles. The heavy rainfall of the region contributes to this effect. The resultant accumulation of silt within higher elevation tributaties is carried downstream. Gravel spawning beds thus become clogged with silt, shutting off the essential supply of oxygen to developing salmon eggs. Points along the lower Sooes watershed, in particular, show accumulations of silt from upstream logging operations. Clearcutting near stream banks also removes the forest canopy and increases the temperature of the water, further disrupting the stream habitat. Temperature increases of 2° C. have been noted within clearcut Pilchuck Creek (Joner, 1978).

Grazing

Another resource use is cattle grazing, the only significant agricultural activity on the reservation. Grazing takes place on the river bottom land, most noticeably along the lower Waatch River.

The local Cattleman's Association has determined, from the results of the 1977 summer round-up, that there are approximately 120 head of cattle on the reservation. The number of cattle that the grasslands can support is severely limited by the horses that also graze in the area. The cattle are used for subsistence only; few or none are sold commercially.

IMPACTS

The majority of the impacts of the grazing stems from the fact that this is an uncontrolled use. The cattle and horses tend to roam the areas at will, often interfering with vehicular travel and recreational use. In addition, some areas of the river bottom land have been over-used by the livestock.

There is a need for a controlled management system in order to reduce the overgrazing. One possibility is to contain the animals in certain areas and then rotate these areas. This rotation would allow adequate regrowth of grasses in the valleys. Any such management system, however, would need to adequately consider the fractionated status of most grazing lands.

Recreation

The diversity in environments of the Makah Indian Reservation provides many recreation opportunities for both Tribal members and tourists. From the rocky coasts of Cape Flattery to the wide sandy beaches of Mukkaw Bay, the scenery is outstanding. While the scenery draws visitors to these areas, recreation facilities are not developed.

A recreation survey of tourists was taken during four weekends in July and August of 1978. The survey, conducted by Tribal students and funded by the Bureau of Indian Affairs, dwelled upon the activities and needs of the tourists while on the reservation. Only preliminary results of the survey are available, but they indicate that fishing was the dominant activity of the tourists with 62% of those responding having participated. This is followed by camping, sightseeing and hiking. Approximately half of those questioned experienced some difficulties while on the reservation. The most common complaint was that of crowded facilities followed by the inadequacy of facilities.

The final results of the survey will be available later this year and should provide insight into the tourists needs. The areas where some of the recreation activities occur are described below.

TRIBAL BEACH ALONG NEAH BAY

The Tribal beach area includes the western portion of the village waterfront and between Bayview Avenue and the extreme low water line. This 4.4 acre beach (plus the remainder eastward to the coast guard station) is primarily reserved for use by Tribal members. The Tribal docks and the Makah Canoe Club, housing racing canoes, are located in this area. The beach is adjacent to some of the residential area and is away from most of the tourist concentration.

WAATCH AND HOBUCK BEACH

This 108-acre beach is located along the northern part of Mukkaw Bay. Use of these beaches by tourists is discouraged. There is no development on the beaches except for an Air Force mobile home park and an area reserved for guests of Air Force personnel for overnight camping.

KOITLAH POINT

This area is located northwest of Neah Bay village, situated atop a steep cliff overlooking Neah Bay and the Strait of Juan de Fuca. This

area has been used by tourists for overnight camping although the restrooms, picnic tables, fire pits, and the access road are in a state of disrepair.

SOOES PENINSULA

One of the most pleasant sites on the reservation, this area is located between Mukkaw Bay and the Sooes River. The rolling, grass-covered dunes are effectively maintained by cattle and horse grazing, giving a park-like atmosphere which is accented by clumps of spruce and hemlock. Presently, tourists are discouraged from using this area. There are no developed roads in this area, although vehicles have worn an impromptu road system on the sensitive dunes. When a rutted road becomes inconvenient, rough, or impassable, a new route through the grass is taken. These roads are a major factor in the degeneration of the area and will contribute to its destruction if driving on dunes continues.

SOOES BEACH

This beach extends from the mouth of the Sooes River south to the end of Mukkaw Bay. It includes approximately 196 acres of sandy beach and receives some tourist use.

CAPE FLATTERY VIEWPOINT

Located on the northwestern tip of the cape, this viewpoint provides a spectacular view from the northwesternmost point of the contiguous 48 states. Although poorly maintained and in various stages of disrepair, the trail provides a pleasant walk through lush vegetation. The signing for this area is non-existent and parking facilities are undeveloped.

PROJECTED DEMAND

As was discussed in Phase II of the Environmental Management Study (PRPI, 1978), tourism currently strains the reservation's facilities and services during the peak summer months. This problem has been increasing in recent years, due to a rise in outdoor recreational demands and to a decline in available facilities in the area. The opening of the new Makah Cultural and Research Center will certainly draw additional tourists, adding to the problem.

IMPACTS

The impacts on the environment from recreational activities are largely due to the fact that there are no developed facilities. As noted above, vehicular travel on the Sooes Peninsula, as well as Hobuck Beach, has led to destruction of the vegetation on the dunes. Similarly, the lack of maintained camping and picnicking facilities results in further degradation of the environment in the area.

The projected increase in recreational use in the area requires additional control of that use. Policies are presented in Chapter 7 which deal with management of resources for recreation use and enjoyment.

Shoreline Development

Although the Makah Indian Reservation has 23.5 miles of coastline, only about two miles of this shoreline, along Neah Bay, is both protected from storms and deep enough to accommodate most small boat traffic. Of this two miles of shoreline, only a little over one-half mile (approximately 3300 feet) is vacant and available for some type of development. To plan for utilization of this dwindling resource, uses were prioritized as to their dependence upon water access, shown in Figure 21. This illustrates those uses which are water- or shoreline -dependent, water-related, and not water-related. Simply stated, those uses which are water-or shoreline-dependent should be given priority in the use of the shoreline for development purposes, followed by those uses which are water-related.

This pattern of use is generally followed along Neah Bay at present, with port facilities and fishing-related uses making up the majority of the uses along the shoreline. Notable exceptions to this pattern are the relatively recent construction of the Senior Citizens Center and the Teen Center. Justification for these two facilities on the waterfront stems from the cultural link of the Makah people to the shoreline. Uses such as housing, retail commercial, and motels would be better placed in other areas leaving the shoreline open to water-dependent and water-related uses.

IMPACTS OF SHORELINE DEVELOPMENT

The limited land area between Bayview Avenue and the shoreline of Neah Bay restricts the extent of possible waterfront development. One solution to this problem in other areas has been to fill the tidelands and build on the fill. The shorelines of the Strait of Juan de Fuca and Puget Sound are scattered with houses, commercial buildings, and even parking areas extending out over former tidelands. This approach to shoreline development destroys the shoreline which would otherwise enhance the development, and removes publicly (or Tribally) owned tideland from use by the public.

Figure 21

Uses Dependent on Water Access

USES	Water Dependent	Water Related	Non-Water Dependent
Port Facilities	●		
Float Plane Facilities	●		
Park & Recreation	●	●	●
Boat Harbor	●		
Commercial Fishing	●		
Sport Fishing	●		
Shellfishing	●		
Wildlife Habitat	●	●	●
Pleasure Boating	●		
Parking			●
Fish Hatchery	●	●	
Timber Processing		●	
Utilities		●	●
Streets/Roads		●	●
Timber Harvesting		●	●
Fish Processing		●	
Grazing		●	●
Single-Family		●	●
Multi-Family		●	●
Commercial/Retail		●	●
Landfill/Dump			●
Mining			●
Airport			●
Tourist-Oriented (motels, restaurants, etc)			●

In addition, it eliminates tideland habitat inhabited by marine invertebrates, and used by shorebirds at low tide and fish at high tide. Sediment transport along the shoreline is disrupted, further changing the character of adjacent beaches. As an interface between the land and the sea, the beach can not perform its physical and biological functions when obstructed by filling and extensive bulkheading.

When deepwater access is desired for water-related or water-dependent uses, over-the-water structures can be built on pilings and/or floats. Although these structures do cause some environmental damage during construction, they allow the marine habitats to remain along the shoreline and usually do not impede the movement of water, sediment, or fish.

Aesthetically, a shoreline cluttered with many overwater structures or landfills is perhaps not as pleasing as an undisturbed shoreline, but, through careful planning, water-dependent facilities can be consolidated (with two or more facilities sharing a dock, for instance) to minimize the visual and environmental impact.

The charter boat facilities along the shoreline of Neah Bay create many problems of circulation, parking, and congestion. More development in the area would certainly add to this problem unless steps are taken to ensure adequate parking and access.

The fact that there is only a limited amount of land available for shoreline development increases the importance of carefully planning any such development. Currently, not all of the shoreline along Bayview Avenue is being utilized. There are several lots which are vacant or occupied by dilapidated buildings. These areas of shoreline could be put to uses that are more beneficial to the Tribe.

The impacts, and related effects of shoreline development, are addressed in the discussions of land suitability and policies later in this report.

LEASING OF WATERFRONT LAND

The entire shoreline of Neah Bay is held in Tribal trust status, meaning the Tribal Council has control of its use with approval by the federal government. The shoreline is comprised of some 58 lots, 34 of which are vacant. The remaining 24 lots are used for activities ranging from motels to charter boat facilities. Of these 24 waterfront lots, 15 have current leases or are presently negotiating new leases, while the remaining 9 lots are occupied but have no current lease. Seven of these lots without leases are being used for Tribally supported functions including the Senior Citizens Center, the Teen Center, and the Alcohol Center.

Concerns have been raised as to the process of developing and writing leases for these lands. The concerns generally center on the fact that the Tribe has no standard criteria for determining leasing terms such as

method or amount of payment or length of the leasing period. Without a standardized procedure for developing leases, the Tribal Council puts itself in a weak negotiating position with present and future leaseholders. The existing situation makes it difficult for the Council to treat each new lease in a like manner. Standard criteria for computing the method and amount of payment and the length of the leasing period could take many forms. The payment could be based on the number of linear feet of waterfront used and a standard time period of 5 or 10 years could be established. This simple solution to the problem, however, may not be fair to the individual lease holder or monetarily sound for the Tribe. For some enterprises, the capital outlay by the leaseholder to develop the property may require a much longer lease period for financing purposes. In such a case, adherence to a rigid time period could stifle economic opportunities on the reservation.

Another form these criteria could take is a formula linking the time period and payment for a lease to the relative importance or value of the land to the Tribe, the capital investment which the leasee must sustain, the seasonality of the enterprise, and the amount of product produced or processed during the lease period. Other factors which could be included are the economic and environmental effects the enterprise would have on the Tribe.

Some of these criteria are presently used by the Tribal Council when negotiating leases; however, they should be reviewed and standardized for the benefit of the Tribe and the leasee.

Besides the length and method of payment stipulated in the present leases, the Tribe has the opportunity to control the type and quality of the development which can occur on these lands. Through the language in the leases, the Tribe can solve or at least lessen some of the problems which now occur along the shoreline of Neah Bay. For example, some of the parking and traffic congestion problems along Bayview Avenue could be alleviated by stipulating in the lease agreement provisions for parking and access. Other issues such as sign control, maintenance of structures, and upkeep of the property can also be addressed in the lease to insure a quality environment not only for the users of the property but for the residents of the community.

By dealing with these and other issues in lease agreements, the Tribal Council will lessen the need to enact Tribal ordinances and regulations which have historically been difficult to enforce.

Appendix C contains examples of protective covenants, performance standards, the make-up of a design standard board, and lease payment scheme.

Chapter 6
Land Management

Chapter 6
LAND MANAGEMENT

Managing the resources on the Makah Reservation often requires controlling external factors that affect the resources. The preceding chapters analyzed the interactions among the reservation's resources, and the influence of environmental factors and human activities on those resources. The analyses in those chapters point out the need to manage the uses of the land on the reservation in order to ensure effective resource management.

Several considerations enter into coastal land management decisions. Before a resource-use decision is made, it is important to know how the land interacts with the marine environment, how well it can support human activities without damage to the resources or hazard to the user, and, finally, which uses are appropriate for that land. These considerations were discussed in general terms in the proceding chapters. This chapter will apply that information to specific land and shoreline areas of the reservation to designate the land into classifications, and to specify uses for each classification.

Defining the Coastal Zone

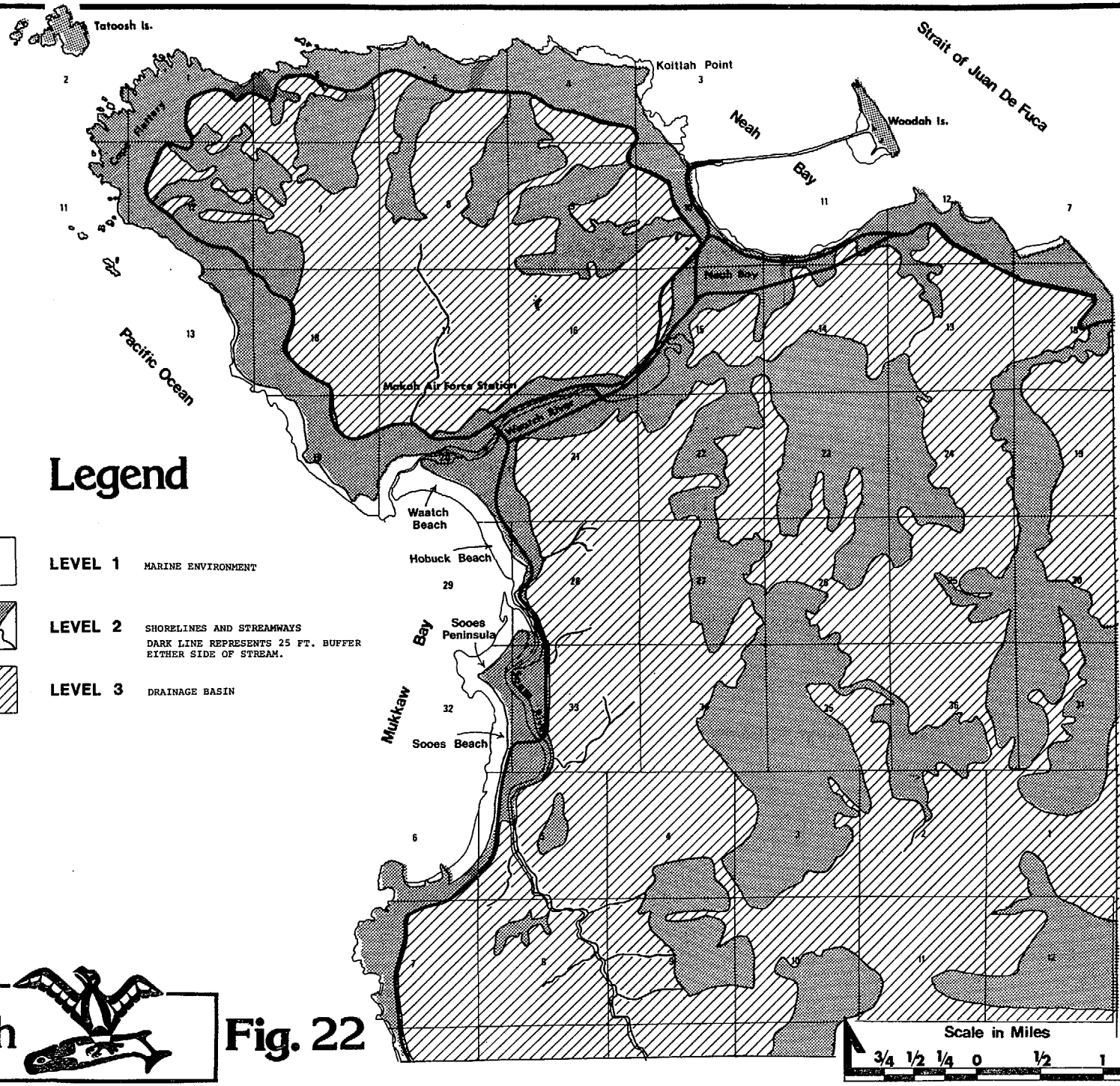
Although interactions between humans and the environment anywhere on the reservation have some effect on the reservation's waters, the type and intensity of those effects vary from one place to another, depending on the relation a place has with the marine environment. Coastal zone management, as a means of controlling those effects, must take into account the varying degrees of interaction with marine waters.

From the analyses of natural resources and human uses of those resources presented in this report, it can be seen that all the land on the reservation has enough influence on "the coastal waters, the lands therein and thereunder" (as specified in the Coastal Zone Management Act) to be included in the coastal zone. From a practical point of view, however, it is not realistic for policies and regulations designed to manage the use of the shoreline to apply also to land several miles inland and hundreds of feet up in elevation from the saltwater shoreline.

The designation of the coastal zone for this plan has been developed, therefore, on three levels (Figure 22). All the land and water on the reservation falls into one of these levels, depending on its degree of interaction with the marine environment. The levels are summarized as follows:

PACIFIC RIM PLANNERS, INC.

COASTAL ZONE MANAGEMENT PROGRAM
Coastal Zone Levels



Makah

Fig. 22

LEVEL I: Marine Environment

Includes: Marine and estuarine waters up to the line of mean higher high water (MHHW).

-Tidelands and beaches up to the line of MHHW.

-Tidally-influenced wetlands as evidenced by the present total marsh vegetation (see species list, Appendix A)

LEVEL II: Shorelands and Streamways

Includes: -All the land between the MHHW line and the first road running along the shoreline.

-All permanent streams, and all intermittent streams used by anadromous fish, along with a zone extending from both sides of the stream, as defined in the Environmental Management Study.

Factors in defining this zone

Includes: -Soil types and percolation characteristics

- Types and amount of vegetation cover and its functions in stabilizing the soil along the stream.

-Slope of the land adjacent to the stream and its significance in retaining sediment.

LEVEL III: Uplands

Includes: -All remaining lands on the reservation

RATIONALE FOR LEVEL I

While its overall definition can be interpreted fairly broadly, the foundation for the definition of coastal zone in the federal Coastal Zone Management Act is the "coastal waters, the lands therein and thereunder." This wording places a strong emphasis on the marine environment. The coastal waters and "the lands therein and thereunder" also contain resources which support many of the residents of Neah Bay on a commercial or subsistence basis. The marine environment was, in fact, a major determinant in the location of the community. Thus, the management of coastal resources and uses should focus on the marine environment as Level I of the coastal zone.

There is no question that the marine and estuarine waters are part of the marine environment. Beaches and tidelands, two terms whose definitions overlap, denote those areas which are alternately submerged and exposed by the tide. These areas are sufficiently integrated with the marine environment that most of the organisms found here are found nowhere else but in association with marine waters. In addition, as described earlier in this report, the tidelands and beaches are among the more

productive components of the marine waters. Their inclusion as part of Level I of the coastal zone ensures that they will be managed as an integral part of the marine environment.

Tidally-influenced wetlands include, for the most part, the tidal marshes of the Waatch and Sooes estuaries, vegetated by several species of plants which are tolerant of alternate exposure and inundation by tidal water, and varying concentrations of salt. These wetlands may extend above the MHHW line, but the species present (see list, Appendix A) attest to their contact with tidal water. They are used as habitat by marine-oriented birds and mammals, and several studies indicate that the tidal marshes are important contributions to marine and estuarine productivity. They are therefore included as part of Level I of the coastal zone.

RATIONALE FOR LEVEL II

In the federal Coastal Zone Management Act, the definition of coastal zone includes "shorelands, the uses of which have a direct and significant impact" upon the coastal waters. The actual extent of these "shorelands" is not specified as a distance from the water, but is left open, depending on the types of uses which impact the coastal waters. On the Makah Reservation the predominant uses of the shorelands are diverse. Regular, on-going human uses generally have a road as an access point; the boat moorage in Neah Bay, for instance, is accessed by Bayview Drive. Tidepool-watchers at Tatoosh Head use the Cape Flattery Loop Road. On the Makah Reservation, with its steep topography, the roads usually define the landward limit of shore access. The nearshore roads also serve as a highly visible, mappable and enforceable boundary for this second level of the coastal zone shorelands.

Farther inland is another strong influence on the marine waters. The reservation's streams and rivers are vital pathways through which sediments, nutrients, dissolved gases, animals and plants are carried from the land to the sea. Disturbances of the uplands can disrupt or alter this vital flow through the streamways. As proposed in the Environmental Management Study, a buffer strip should be designated along all streams, creeks, rivers, wetlands and other water bodies defined as sensitive areas. The study recommends a "floating" buffer strip determined by the land characteristics, rather than by a fixed distance. The minimum buffer strip will be 25 feet beyond the high water mark on each side of the stream or wetland, but the buffer will take in additional land area necessary to maintain the water quality, as determined by the soil, slope and vegetation.

RATIONALE FOR LEVEL III

The remainder of the reservation, as discussed earlier, has an influence on the marine environment, but an influence which is much less than that of the areas included as Marine Environment or Shorelands and Streamways. Management of these uplands should recognize this reduced connection, and regulations or policies designed to protect coastal waters can be less intense in Level III, the Uplands.

Land Use Units

The Makah Land Use and Housing Plan (Pacific Rim Planners, Inc., 1977b) defined and mapped land use units for the reservation. These same units will be used in this program to define where uses will take place in the coastal zone and to what extent. The criteria for defining the land use units are based on both natural characteristics and the human uses and opportunities for the use of the land.

The criteria based on natural characteristics take into account the effects of the use on the land, for example loss of sand dunes from wind erosion following vehicle use. They also consider the effects of the land on the activity. For example, they consider possible damage to homes which are built on a steep, unstable slope.

The criteria based on existing and potential human uses and opportunities consider such aspects as the costs of site preparation, construction, provision of utilities and services, and access to roads. A general assumption considered, but not formulated into written criteria, is that most development will occur in some proximity to presently developed areas, and that the people do not intend to live in isolation from each other.

The following section describes each of the units and sets forth general guidelines. Figure 23, indicates these units as mapped on the reservation. The criteria by which the land was designated into the units are listed in Table 15.

DEVELOPMENT UNIT

Definition: Those areas in which human activity can be conducted and buildings constructed with minimum impact on the environment or danger from natural hazards.

General Use Guidelines: Human activities will include residential, commercial, industrial, high-intensity recreational and institutional uses.

PRODUCTIVE UNIT

Definition: Those areas which are now producing or whose environmental features have the potential to produce renewable natural resources of direct use to humans.

General Use Guidelines: Use in productive areas will be limited to those activities and intensities which will not result in any long-term change in the natural features of the area, or impairment of its capacity for production of natural resources, whether or not those resources are now being harvested.

PROTECTIVE UNIT

Definition: Those areas which are scarce in the planning area, sensitive

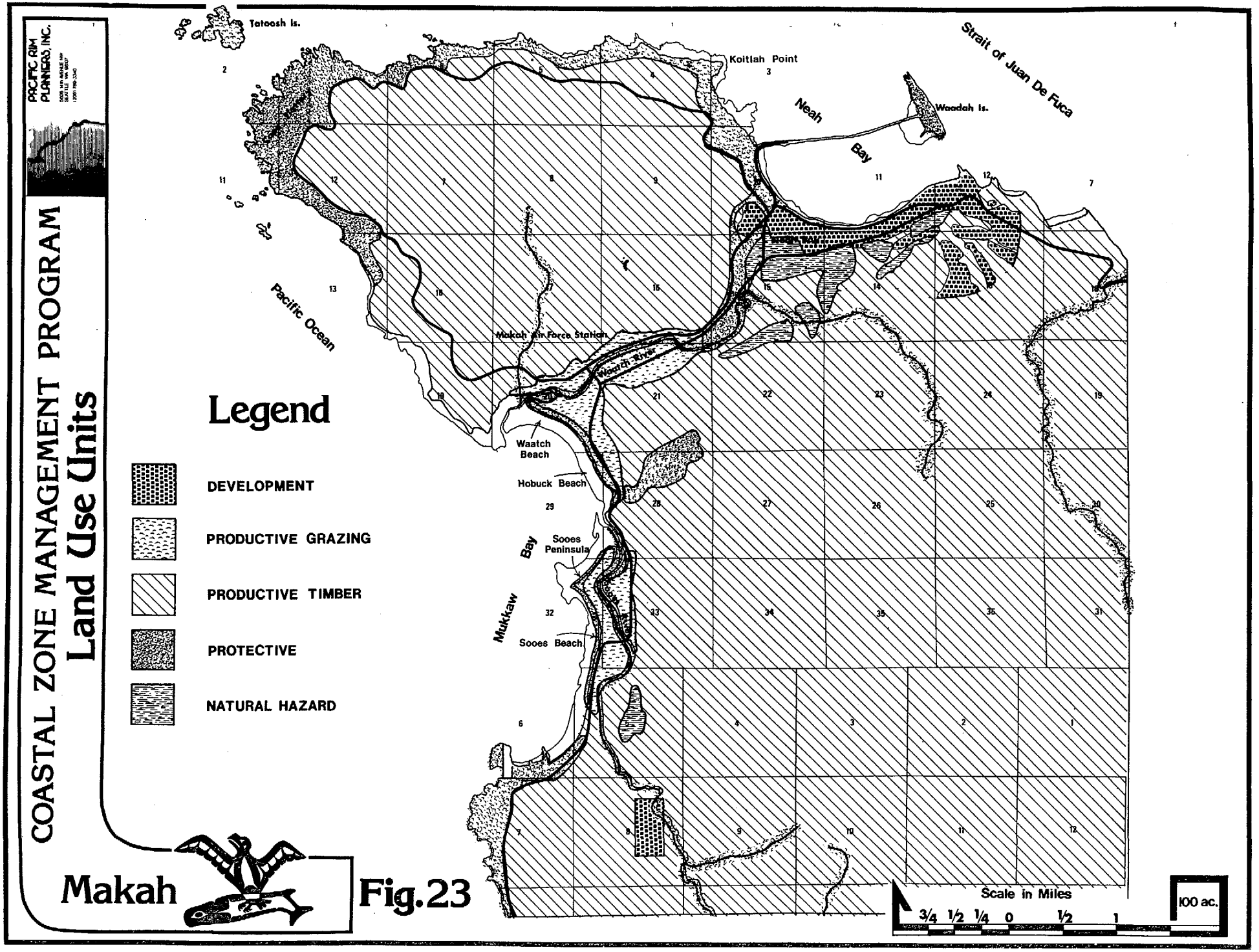

COASTAL ZONE MANAGEMENT PROGRAM
Land Use Units
PACIFIC RIM PLANNERS, INC.
Tatoosh Is.
Koitlah Point
Strait of Juan De Fuca
Neah Bay
Waadah Is.
Pacific Ocean
Makah Air Force Station
Waatch River
Waatch Beach
Hobuck Beach
Sooes Peninsula
Mukkaw Bay
Sooes Beach
Legend
DEVELOPMENT
PRODUCTIVE GRAZING
PRODUCTIVE TIMBER
PROTECTIVE
NATURAL HAZARD
Scale in Miles
3/4 1/2 1/4 0 1/2 1
100 ac.
Makah

Fig. 23

Table 15

LAND USE UNIT CRITERIA

	DEVELOPMENT UNIT	PRODUCTIVE UNIT	NATURAL HAZARD UNIT	PROTECTIVE UNIT
Geology	Not fine-grained sedimentary rock (shale) when slope exceeds 5%	Not applicable	Not applicable	Unique rock formations, seastacks, etc. sand dunes
Slope	Not exceed 15%	Not applicable	Not applicable	Not applicable
Soils	Suitable for structures (not clay if slopes exceed 5%; not organic peats or loose sand)	Suitable for timber or pasture	Organic peat soils	Dune sand
Ecological Communities	Not applicable (Native landscaping desirable after construction)	Coniferous forest, grassy meadow, tidal marsh	Swamp or bog	Dune vegetation, old-growth cedar forest Salmon spawning streams and Floating buffer
Hydrology	Not in Floodplains	Not applicable	Areas subject to flooding	Not applicable
Streets & Utilities	Within one-half mile	Road access desirable	Not applicable	Minimal
Ownership	Not applicable	Tribal trust land, private land	Not applicable	Tribally-owned and designated natural areas

to disturbance, or essential to the productivity of natural resources, although not suitable for commercial harvesting of resources.

General Use Guidelines: While human activity in the protective unit is not prohibited, it will be limited in terms of both numbers of users and intensity of uses so that the activity does not result in any measurable or observable changes to the natural features of the area.

NATURAL HAZARD UNIT

Definition: Those areas in which suitability for safe or environmentally sound human activity, resource use, or development is impaired by the natural features of the area.

General Use Guidelines: Uses of areas of natural hazards should not be undertaken unless the hazardous condition can be mitigated by consideration of the condition in the engineering or design of the activity development.

COMBINING THE PROCESSES

The coastal levels and land use units are defined by the degree of interaction with the marine environment and the capability of the land. By superimposing the levels and units, the Tribe can classify the land for the purposes of land management. Figure 24 illustrates this superimposition through a series of overlays on a hypothetical land base. Plate 1 of Figure 24 denotes a land base with a variety of natural and man-made features. Upon this land base, the coastal levels are overlain in Plate 2. This Plate defines the relationship of the land to the marine environment. Plate 3 superimposes the land use units on the land thereby associating the capabilities of the land with the coastal levels. To formally combine these processes, an analysis of the suitability of activities was undertaken and is described below.

Suitability of Activities Within the Coastal Zone Levels

Appropriate activities and uses are assigned to the land use units within the coastal zone levels by matching the physical requirements of the use with the natural characteristics found in the land use units at each level. This is graphically shown in the suitability matrix (Figure 25).

A basic assumption incorporated into the matrix is that all activities and uses, in all units and levels, will comply with applicable tribal, state and federal regulations and standards pertaining to the specific use.

In the suitability matrix, uses and activities have been designated to land use units as: appropriate conditionally appropriate, or inappropriate. The physical requirements of the activities and uses designated as appropriate are generally considered to be compatible with the capability of the resources in the unit at the specified level. In addition, in many cases, these uses have historically occurred in these environments.

Figure 24

Schematic Diagram of Land Designations.

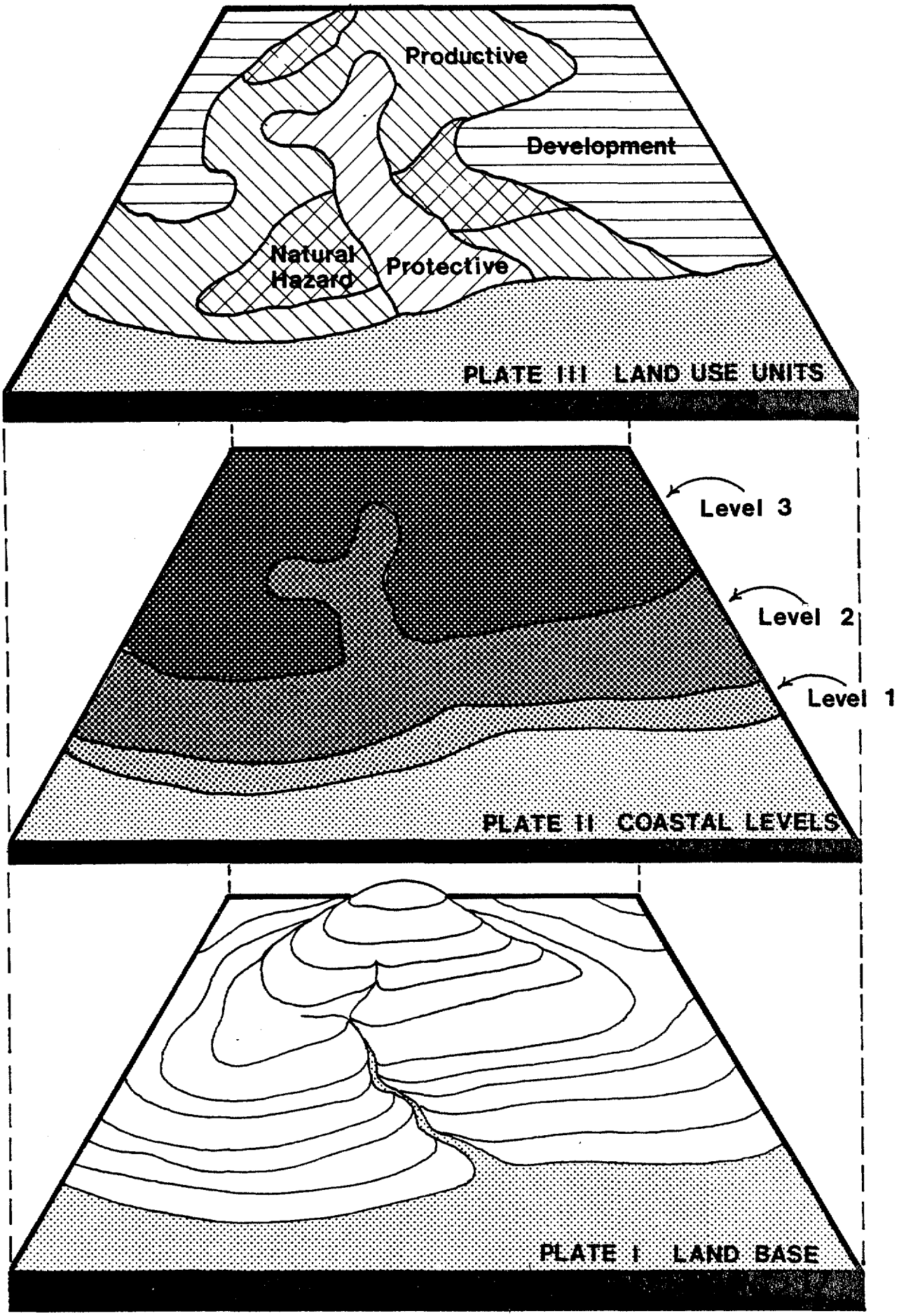
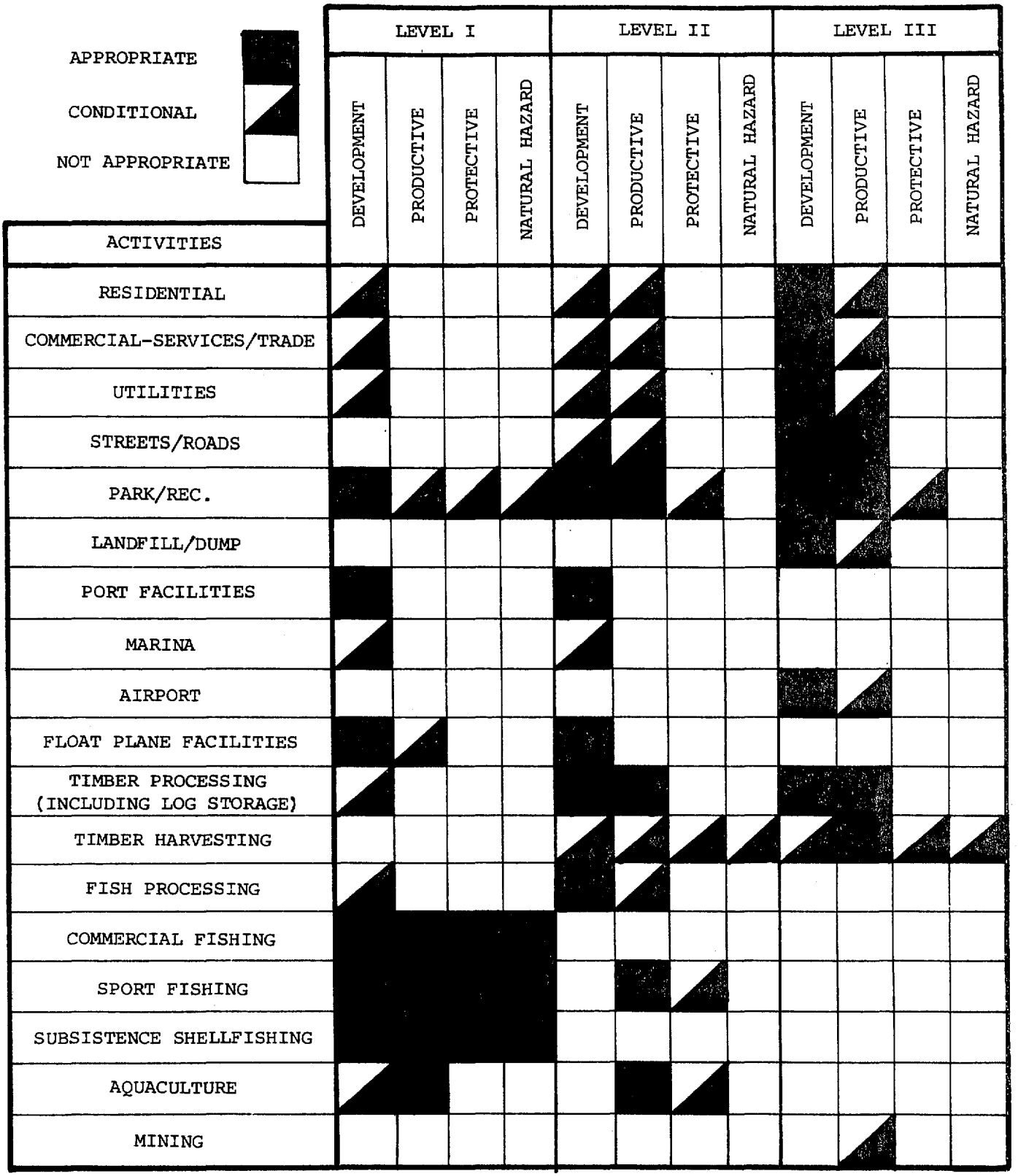


Figure 25
Suitability Matrix



The uses and activities which are designated as conditional require additional safeguards to ensure that the activity does not harm the environment, destroy surrounding resources or interfere with adjacent land uses. These safeguards will be required in addition to the local, state and federal standards and regulations.

The uses or activities designated as inappropriate in the suitability matrix, would, if undertaken, create major conflicts between the physical requirements of the use and the capabilities of the natural resources in that unit/level.

Chapter 7

Goals, Objectives and Policies

Chapter 7

GOALS, OBJECTIVES AND POLICIES

Chapter 1 presented the issues, goals, and objectives identified by Tribal members and staff. This section presents policies which may be used as a means to implement the goals and objectives.

GOAL 1: Resource management to encourage employment on the reservation and ensure the responsible use of the resources.

OBJECTIVE 1.1: Manage and protect salmon streams.

POLICY 1.1.1: The Tribe shall ensure that no activities which they engage in, contract for, or have jurisdiction over, discharge wastes into lakes, streams, or marine or estuarine waters in a way that degrades the characteristics of those waters from the Washington State Water Quality standards for Class AA waters.

POLICY 1.1.2: The Tribe shall ensure that no activity or new structure on the reservation impedes the flow of freshwater or seawater to the extent that any measurable changes can be detected in flow temperature, dissolved oxygen, or nutrient content, or that fish passage is blocked.

POLICY 1.1.3: The Tribe shall ensure that no activity which they engage in, contract for, or have jurisdiction over, shall result in significant impacts on a stream, creek, or river.

OBJECTIVE 1.2: Continue to maximize the commercial timber resource in a responsible manner.

POLICY 1.2.1: The Tribe shall encourage prompt reforestation on lands from which timber is harvested.

POLICY 1.2.2: The Tribe shall investigate uses of the forest resource other that commercial timber harvest.

POLICY 1.2.3: The Tribe shall pursue innovative techniques in timber management, such as the use of forest residue.

OBJECTIVE 1.3.: Develop jobs on the reservation to ensure full employment.

POLICY 1.3.1: Contracts for the sale of coastal tribally-owned resources (e.g., timber and fish) should provide a balance between monetary income to the Tribe and employment opportunities for tribal members.

POLICY 1.3.2: Cooperative planning and marketing of services offered by reservation businesses will be encouraged.

POLICY 1.3.3: A sufficient number and size of waterfront sites shall be kept readily available for use by waterfront oriented businesses, as determined by periodic assessments of demand for waterfront commercial sites.

POLICY 1.3.4: Terms of land leases and public services to commercial organizations shall be set to provide the Tribe with financial compensation adequate to reimburse Tribe for expenses incurred in providing services.

OBJECTIVE 1.4: Manage reservation resources to provide a balanced maximum economic return.

POLICY 1.4.1: The Tribe shall make land leasing and development decisions based on comprehensive overview of available sites and demands by competing uses.

POLICY 1.4.2: The Tribe shall coordinate resource development planning actions of tribal agencies.

OBJECTIVE 1.5.: Ensure responsible land use practices in all environments on the coastal zone.

POLICY 1.5.1: The Tribe shall ensure that no activity which they engage in, contract for, or have jurisdiction over has significant impacts on environmentally sensitive areas of the reservation.

OBJECTIVE 1.6.: Seek avenues to check the continued fractionation of alloted lands.

POLICY 1.6.1: The Tribe shall continue efforts to identify multiple owners of trust lands and assignments, and buy fractionated allotments when possible.

POLICY 1.6.2: The Tribe shall coordinate their activities with those of other agencies having jurisdiction in the region.

OBJECTIVE 1.7.: Utilize effectively the lands along the shorelands of Neah Bay.

POLICY 1.7.1: The Tribe shall standardize the leases of tribal shorelands along Neah Bay.

GOAL 2: Maintenance of the Makah culture.

OBJECTIVE 2.1.: Protect historical and archeological sites.

POLICY 2.1.1: The Tribe shall not engage in, issue permits for, or establish leases or contracts for actions which will destroy, damage, or adversely affect a designated historic site.

OBJECTIVE 2.2.: Protect designated forest preserve.

POLICY 2.2.1: Pursuant to the resolution passed by the Makah Tribal Council, the Tribe shall identify the timber preserve areas through an official tribal map and on-the-ground posting.

POLICY 2.2.2: The Tribe shall not engage in, issue permits for, or establish leases or contracts for actions which destroy, damage, or adversely affect these forest preserve sites.

GOAL 3: Appropriate siting of various marine and marine related development.

OBJECTIVE 3.1.: Develop a well-planned marina.

POLICY 3.1.1: The Tribe shall develop a marina in a site that is compatible with existing land use and environmental conditions.

GOAL 4: Availability of low-cost, quality, environmentally-sound housing for tribal members on the reservation.

OBJECTIVE 4.1.: Encourage the development of housing areas which are environmentally sound and aesthetically pleasing.

POLICY 4.1.1: Since historically the Makah used the coastal areas for home sites, the Tribe shall seek developable sites which relate to the shoreline as well as to the environmental conditions.

POLICY 4.1.2: Because the land available for development on the reservation is limited, the Tribe shall strive to make land available for community use, rather than individual use, particularly in the case of beaches, streams, or other areas offering recreational opportunities.

OBJECTIVE 4.2.: Rehabilitate dewllings in need of repair.

POLICY 4.2.1: The Tribe shall continue to provide assistance to rehabilitate existing homes which can be saved.

OBJECTIVE 4.3.: Continue existing housing programs.

POLICY 4.3.1: The Tribe shall continue to seek assistance from the HUD Mutual Help Housing Program.

GOAL 5: Preservation of present character and environment of the reservation.

OBJECTIVE 5.1.: Manage solid wastes responsibly.

POLICY 5.1.1: The Tribe shall establish a means of solid waste disposal which will have the least impact on the environmental or aesthetic qualities of the coastal zone.

OBJECTIVE 5.2.: Control vehicles on the reservation beaches and dunes.

POLICY 5.2.1: The Tribe shall protect the fragile coastal beaches and dunes from vehicular use.

OBJECTIVE 5.3.: Maintain water quality in Mukkaw and Neah Bay.

POLICY 5.3.1: The Tribe shall ensure that no activity which they engage in, contract for, or have jurisdiction over, discharges wastes into Mukkaw or Neah Bay that will degrade the waters of these bays beyond their present condition.

OBJECTIVE 5.4.: Protect natural features and sites from indiscriminate use.

POLICY 5.4.1: The Tribe shall ensure that designated recreation areas on the reservation are protected from abuse resulting from uncontrolled or irresponsible use.

GOAL 6: Benefits for the Tribe from, and influence over, potential development of offshore resources.

OBJECTIVE 6.1.: Obtain benefits for tribal members from offshore resource development (such as oil drilling or mining) without jeopardizing other sensitive resources (such as fisheries).

POLICY 6.1.1: The Tribe shall regularly appraise information regarding exploration, potentials and proposals involving offshore resources by public and private organizations.

OBJECTIVE 6.2.: Assure tribal input into and influence over decisions regarding use of off-reservation resources which may affect the Tribe.

POLICY 6.2.1: The Tribe will utilize available channels to oppose off-reservation resource development unless the proponent has adequately demonstrated that the action would result in a net gain to public welfare and that sufficient compensation has been afforded those who are adversely affected by the proposed action.

MAKAH COASTAL MANAGEMENT PROGRAM IMPLEMENTATION

The implementation portion of the program will be developed during fiscal year 1979. The scope of the work, not yet fully defined, will include implementing procedures for the management policies in Part 1. These procedures may take the form of training sessions for the Resource and Economic Development Committee, adopting land use standards to implement the policies, and developing forms, permits, etc. necessary to monitor the coastal zone.

APPENDIX A

TIDAL WETLANDS SPECIES LIST

The definition of Level I of the coastal zone in Chapter 6 of this report includes areas which are integral parts of the marine environment. For convenience in surveying, the tidal elevation of mean higher high water (MHHW) is used as an upper limit. On the Makah Reservation this elevation can, in most cases, be considered the upper limit of land and water areas which have regular interaction with the marine environment to the extent that their natural or cultural features are altered by marine or estuarine waters.

There are two noteworthy exceptions to this limit of interaction. The sand dunes along the shoreline of Mukkaw Bay extend much higher that MHHW, yet their soil and vegetation, as discussed in Chapter 3, reflect a considerable ocean influence. By their location between the road and the bay, they fall into Level II, and can be managed accordingly.

The other exception to this limit is the tidal marsh area found in the estuaries of the Waatch and Sooes Rivers. While tidal marshes are integral components of the marine environment, their upper limit in elevation sometimes exceeds MHHW; nevertheless the presence of certain species of plants indicates regular or occasional inundation by tidal water.

This preliminary list of tidal wetland indicator species was prepared from field observations on the reservation, with geographical and habitat distributions confirmed from Hitchcock and Cronquist (1973). The presence of these species can be taken as an indicator that an area is included in Level I of the coastal zone.

Canada Sandspurry	*Spergularia canadensis*
Pickleweed	*Salicornia virginica*
Sea milkwort	*Glaux maritima*
Tufted hairgrass	*Deschampsia caespitosa*
Common spikerush	*Eleocharis palustris*
Lyngbye sedge	*Carex lyngbei*
Seaside plantain	*Plantago maritima*
Arrowgrass	*Triglochin maritima*

APPENDIX B

HABITAT ALTERATIONS

The following is a list of alterations of reservation streams observed by the Makah Fisheries staff during stream surveys. Although some areas have not been surveyed due to inaccessibility, the conditions listed are an indication of the general area. A more complete list which included alterations off the reservation is on file in the Tribal Fisheries Department.

Stream No.	River Mile	Activity	Descriptions
Sail River			
0235	0.0-0.2	channelization	Lower portion of Sail River was channelized on east bank by logging companies for log rafting.
0235	0.2-1.0	logging and associated road building	Log jam, debris, and sild deposits from early logging operations.
0236	0.1	"	Water supply dam was built by early logging company. The dam washed out, leaving debris and silt deposits now present in the stream.
Waatch Area			
0004	0.5	dam	Water supply dam built by U.S.A.F. blocks upstream fish migration past dam.
0005	3.1	industrial or residential development	Makah Tribe removes stream water for domestic supply. No dams or obstructions present.
0005	3.8	logging and associated road building	Two major log jams with sawed logs may block or hinder up-stream fish migration.
0005	3.1-4.0	"	Numerous small log jams, debris and solt deposits.

APPENDIX C

EXAMPLE PROVISIONS FOR LEASE AGREEMENTS

These measures were taken from a number of lease agreements for land in the Seattle area. They are included only to provide examples of some of the options open to the Tribal Council in the development of leases on the reservation.

Protective Covenants, Example A

The undersigned hopes to have on said land an attractive community of warehouses, light manufacturing plants, and similar or supportive businesses.

(1) Except as hereinafter specifically provided, this declaration shall constitute a covenant to run with said land, and shall be binding upon all persons owning said land, thereof, and the conditions and restrictions shall be for the benefit of and limitations upon all future owners of said land.

(2) These conditions and restrictions:

(a) Shall be and remain in full force and effect until and including the 31st day of December, 2000, and thereupon and thereafter shall be automatically extended for successive periods of ten (10) years unless there has been recorded an instrument, signed by the then owners of the majority of the land (determined on the basis of land area) to which this declaration is then applicable, providing for the modification, change or cancellation of these conditions and restrictions, in whole or in part; and

(b) May be enforced against said land by any person, firm or corporation now or hereafter having title to any part of said land.

(3) Said land shall be used only for industrial purposes (which shall include, without limiting the foregoing, the right to use said land for construction, maintenance and operation of railroad tracks and their appurtenances; roads, streets and highways; sewers, water pipes, drain pipes, gas pipes, steam pipes, communication wires, electric wires, or other utilities, and their appurtenances). None of said land may be used for residential purposes. Said land shall not be used for retail commercial purposes, except as such purposes are incidental to a wholesale or industrial use. No noxious or offensive trade, business or activity shall be conducted on said land, nor shall anything be done thereon which may be or become an annoyance or nuisance, whether by reason or unsightliness or the excessive em-

Stream No.	River Mile	Activity	Descriptions
Sooes River			
0015	3.5	logging and associated road building	Major log jam which was partially washed out in 1977. Large deposits of silt washed downstream.
0015	3.5-8.0	"	Much of the lower Sooes watershed has been clearcut to river banks. Many small log jams and debris piles in the river and most tributaries. Most of the spawning gravel is compacted with silt from previous logging operations.
0015	5.0	"	Muddy water and oil from CZ maintenance yard flow into river.
0015	5.8	"	CZ sorting yard drains into inadequate settling pond and then into Sooes. Large amounts of silt are carried into river, and silt deposits build up.

(8) Breach of any of the foregoing covenents shall not defeat or render invalid the lien of any mortgage or deed of trust made in good faith and for value as to said land, or any part thereof; but said covenants shall be binding upon and effective against any owner of said land whose title thereto is aquired by foreclosure, trustee's sale or otherwise.

Protective Covenants, Example B

(1) Those covenants shall and do hereby provide that no improvements as herein defined shall be erected, placed or altered on any building site in said development until the building landscape, or other improvements on the particular building site have been submitted to and approved in writing by the Design Standards Board as to conformity and harmony of external design with existing structures in the development, and as to location of the improvements on the building site, giving due regard to the anticipated use thereof as same may affect adjoining structures, uses and operations, and as to location of the improvements with respect to topography, grade and finished ground elevation and as to submitted landscape plan, part of which shall be design layout, grading plan showing two foot contour intervals and spot elevations, planting plan, construction detail drawings and specifications, unless and until such right has been expressly assigned and then such right will pass to such assignee;

PROVIDED, HOWEVER, that the Design Standards Board and/or its successor or assigns shall not be liable in damage to anyone to submitting plans for approval or to any owner or owners of land covered by this instrument by reason of mistake in judgment, negligence or nonfeasance of itself, its agents or employees, arising out of or in connection with the approval or disapproval, or failure to approve any such plans. Likewise anyone so submitting plans to the Design Standards Board, for approval, by the submitting of such plans and any owner by so acquiring title to any of the property covered hereby, agrees that he or it will not bring any action or suit to recover for any such damages against the Design Standards Board. In the event the Design Standards Board fails to approve or disapprove in writing such design and location within thirty (30) days after said plans and specifications have been submitted to it, this covenant will be deemed to have been fully complied with. If the construction or alteration of improvements is begun in violation of the terms and conditions of this Section (1) or without the written approval required in other sections hereof and no suit to enjoin the erection, establishment or alteration of such improvements has been commenced prior to the completion thereof, this covenant will be deemed to have been fully complied with.

(2) Maximum lot area coverage by all buildings and structures shall be 35%.

ission of odors, dust, fumes, smoke, or noise. Subject thereto and to the other restrictions herein contained, said land may be used for any purpose permitted in and by industrial classifications of the zoning ordinances of the City of Kent, Washington, as such ordinances now exist or may hereafter be amended, except that said property, or any part thereof, shall not be used for:

(a) Automobile wrecking;

(b) Storage, processing, handling, cleaning, sorting, baling, sale or disposal of salvage, or used parts or materials of any kind, including, but not by way of limitation, waste paper, rags, bottles, junk, scrap metals, and used automobile parts, unless such functions are carried on entirely indoors and are of a secondary nature, incidental to an otherwise authorized industrial use;

(c) Boiler and tank works;

(d) Processing of feed, fruits, vegetables, meats and poultry;

(e) Maintenance, use or operation of any slaughterhouse, soap factory, glue plant, tallow chandlery or tannery for the tanning, dressing, preparing or keeping of hides, skins or leather; or

(f) Central mixing plants for asphalt, mortar, lime, plaster or concrete.

(4) No building or other improvement shall be constructed or permitted on said land, and no building or other improvement shall be reconstructed, or the exterior altered, until the plans and specifications, plot plan, and landscaping plan therefore shall have been approved in writing. Without limitation of the foregoing, no building or other improvement, except (a) underground utilities, (b) railroad tracks and facilities, (c) paving, and (d) landscaping, shall be constructed within sixty (60) feet from street right-of-way lines and within fifteen (15) feet from the side property line (except that twenty (20) feet is required on a corner lot, second street side). Any and all buildings, structures, improvements and landscaping at any time constructed or maintained on said property shall at all times be maintained in good condition and repair, and shall present a neat appearance. A maximum of 60% of total ground area can be covered by building.

(5) Access areas shall be so arranged and controlled that vehicles will have access to and from buildings loading dock areas without maneuvering in or occupying street areas.

(6) No waste material or refuse shall be dumped upon or permitted to remain upon any part of said land outside of buildings constructed thereon or outside of enclosed containers. Outside storage of bulk commodities, drums, boxes, and other similar material shall be maintained in an orderly manner.

(7) Invalidation of any one of these covenants, or any part thereof, by judgements or decrees of any court, shall in no way affect any of the other provisions, which shall remain in full force and effect.

spaces per 1,000 sq. ft. of sales space in heavy retail areas, as a general measure of the success in design of parking. Customer parking may be provided in the front yard only to the extent that it does not dominate the front yard landscaping. Parking for employees shall be provided in the side and rear areas and may be located in the side and rear setbacks. Employee and client parking will not be allowed on the streets, except if it is in the nature of an emergency.

(10) No materials or supplies shall be stored or permitted to remain on any part of the property outside the buildings constructed thereon. Any finished products or semi-finished products stored on the property outside of said buildings shall be confined to permanently screened areas within building setback lines. The said finished or semifinished products shall be stored in orderly piles not exceeding a height of twelve (12) feet and shall be completely screened by architecturally designed and constructed screens so as to conceal the view of the products from all sides of the property. The storage area shall be a drained and gravel surface, or better. Employee parking and storage areas for official vehicles shall be subject to the screening requirements of this section.

(11) No billboards or advertising signs other that those identifying the name, business and products of the person or firm occupying the premises shall be permitted, and in this case must be a part of the architectural treatment, except that a sign not to exceed five (5) feet by ten (10) feet in size, placed horizontally, offering the premises for sale or lease may be permitted.

(12) No fence, masonary wall, hedge, or mass planting shall be permitted to extend beyond the building lines established herein except upon approval in writing by the Design Standards Board.

(13) No waste material or refuse shall be dumped upon or permitted to remain upon any part of said property outside of buildings constructed thereon. In addition to the foregoing, the property shall not be used by any industry whose primary business requires industrial sewage, unless then governing municipal body authorizes the use of its sewage disposal facilities or said industry constructs its own sewage disposal facility.

(14) Wherever the written approval of the Design Standards Board is required in connection with any improvements to be installed, erected, or altered, or is otherwise required by the provisions of these covenants, same shall be governed by the conditions set forth in Section (1), Clause III hereof.

(15) The landscape and plant materials shall be maintained in a clean and healthy condition as specified in Section (20) of this clause. Instruction to proceed with corrective measures must be compiled with within two weeks after receiving notice to do so from the Design Standards Board.

(16) Owners within the area described in Clause I shall contribute, on a pro-rated land ownership basis towards the landscape maintenance and removal of litter within the public right-of-way. A landscape Maintenance Division composed of one representative of each owner,

(3) The minimum building setback from all right-of-ways shall be seventy-five (75) feet with a minimum side and rear yard setback of fifty (50) feet.

(4) No building or structures above ground shall extend beyond the building lines and it is hereby declared that a minimum of 25% of the total land area between the building lines and the property lines must be used for open landscape and green areas including natural growth; however, an average of 25 feet setback from the property line shall be part of said landscaped area. Landscaping shall be part of said setback area. Landscaping shall be done attractively according to plans first approved in writing by the Design Standards Board and the landscaping of the site shall be to the standard established in the comprehensive development plan for the front yard as specified in Section (6) of this Clause. Any landscaped areas shall be properly maintained thereafter in a sightly and well-kept condition. Parking areas shall likewise be kept in a well-maintained condition.

(5) Architectural and landscape design shall proceed simultaneously and shall result from collaborative effort on the part of the separately employed architect and landscape architect to achieve good design relationship between architecture and the landscape and maximum site efficiency.

(6) In order that a harmonious and continuous street design be achieved the Design Standards Board shall prepare and approve a landscape development plan for the street right-of-way and the frontal seventy-five foot building setback area at the time of the design of the street, the same to be adopted before final grading is commenced. It shall become the official adopted comprehensive plan to be used as a future development guide and shall establish standards for installation in the right-of-way and setback area and in some cases indicate placement of critical appurtenances.

(7) No loading docks may be located on any street frontage unless architectural screening approved in writing by the Design Standards Board is provided. The loading areas shall be screened with evergreen plantings and/or attractively designed architectural screens, so as to conceal the dock from view from the street and from neighboring properties.

(8) All power and telephone utilities shall be concealed by placing them underground, according to generally accepted standards in the area. Transformers and other distributive facilities may be placed on grade, but shall be concealed by attractive landscaping with evergreen plant materials.

(9) For each light manufacturing, jobbing, warehousing, wholesaling, heavy retail, or other use permitted in the area subject to these covenants, there shall be provided offstreet automobile parking facilities, such facilities as to entrances, exits, drainage, lighting, screening, and maintenance plan to be approved in writing by the Design Standards Board, but to be based generally, but not specifically, at the minimum rate of one parking space for each 1½ employees to be employed on the premises by the original occupant thereof, to be measured at the time of co-terminus maximum shifts or seven

(C) The intensity level of sounds shall not exceed the following described levels when adjacent to the following types of uses:

Sound Level in Decibels	Adjacent Use
50	Residential Districts
60	Business and Professional Districts
75	Major Street
60	Minor Street

The sound levels shall be measured with a type of audio output meter approved by the Bureau of Standards. Objectionable noise due to intermittance, beat frequency or shrillness, shall be muffled so as not to become a nuisance to adjacent uses.

(D) Exterior lighting shall be so installed that the surface of the sources of light shall not be visible from any bedroom window, and shall be so arranged as far as practical to reflect light away from a residential use, and in no case shall more than one foot candle power of light cross a property line five feet above ground in a residential district.

(E) Any operation producing intense glare or heat shall be performed within an enclosure so as to completely obscure such operation from view from any point along the property line except during the period of construction.

(F) The emission of noxious, odorous matter in such quantities as to be readily detectable at any point along lot lines of the offending property when diluted in the ratio of one volume of odorous air to four or more volumes of clean air or as to produce a public nuisance or hazard beyond lot lines is prohibited.

(G) The escape or emission of any gas which is injurious or destructive shall be unlawful and may be summarily caused to be abated.

(H) Radiation or electrical emissions in the interest of maintaining an atmosphere beneficial to research, applicable rules and regulations of the Federal Communications Commission are hereby made a part of these Covenants, and shall be on file in the office of the secretary of the Design Standards Board.

Design Standards Board

"Design Standards Board" shall mean an owners' committee to act in all matters relating to the enforcement of those Protective Covenants and to study development proposals. This Board shall be composed of elected representatives of each owner which shall be a number equal to one-third of the number of owners within the area to which these Covenants apply; in addition, these owners shall appoint two architects, two urban planners and two landscape architects to serve on the Board in a professional capacity. The Board will select a chairman and secretary and make its own rules of procedure but must record the minutes to be forwarded to each owner after every meeting. The Design Standards Board may be incorporated for enforcement purposes and for purposes of collection and disbursement of funds relating to enforcement or possible joint maintenance services.

shall hire and administer services under a budget allocated by the Design Standards Board.

(17) Temporary buildings, other than a contractor's field office or construction shelter, shall not be permitted. Furthermore, those shelters may remain for the period of construction only, after which time they must be removed.

(18) Any buildings existing on the site at the time of the approval of the plan lying in the area described in Clause I shall not be permitted to be used or to remain in said area. Furthermore, buildings may not be moved into said area for industrial or commercial use.

(19) The storage and use of explosives, other than in small experimental quantities, shall not be allowed on the premises. Also they shall be stored and used in such a manner as to eliminate the danger of accidental explosion.

(20) The new owners, hereinafter called the second party shall constitute an acknowledgement that the same, and the buildings and improvements thereon, has been received by the second party in good and first class condition; and that the second party will at all times during the life of this agreement keep said premises, the buildings and the improvements at any time thereon, the appurtenances, and the sidewalks and service drives adjoining the same, in a safe, clean, and wholesome condition; and will in all respects observe and comply with all governmental, health, and police requirements and regulations respecting said premesis and all ordinances and laws affecting said premises and buildings and improvements; and that the second party will remove, at the second party's own expense, any rubbish of any character whatsoever which may accumulate thereon; that the second party will not use or permit to be used upon or in said premises or any building thereon anything that will invalidate any policy of insurance at any time carried on the building or improvements thereon or that will increase the rate of insurance on the same or adjoining property.

Performance Standards

(A) Smoke discharge into the atmosphere from any single source of emission whatsoever of any air contaminant for a period totaling more than four (4) minutes in any one half-hour which is:

1. As dark or darker in shade that No. 2 on the Ringleman Chart published by the United States Bureau of Mines which is hereby made a part of these Covenants. A Ringleman Chart shall be on file in the Office of the Secretary of the Design Standards Board.

2. Of such opacity as to obscure an observer's view excepting the emission consisting of water vapor only.

(B) The quality of gasborne or airborne dust, dirt, or fly ash shall not exceed 0.20 grains per cubic foot of the carrying medium at 500 degrees F.

native published price index and advise the sublessor and sublessee in writing of such selection. The selection of an alternative published price index shall be made by a majority of the appointees. The fees and expenses of the appointees and of any Judge of a Court of competent jurisdiction making an appointment as aforesaid shall be shared equally by sublessor and sublessee.

The Landscape Maintenance Committee shall be under the jurisdiction of the Design Standards Board.

General Restrictions

No noxious or offensive trade or activity shall be carried on, nor shall anything be done thereon which may be or become an annoyance or nuisance to the said Industrial Park hereby restricted by reason of unsightliness or the excessive emission of noise, odors, dust and dirt, fumes, smoke, noxious gasses, glare and heat, or by permitting or encouraging fire hazards, industrial waste, transportation and traffic problems, psychological or non-esthetic effects.

The measure as to the existence of noxious or offensive activity shall be that the activity is continually reoccurring. In addition, where an offense is noted on occasion as a result of accident or as a part of a research effort the offender would take steps to prevent such an act in the future. Should it be impossible to confine the offensive effects of any activity to the site the activity must be halted with the Performance Standards established for purposes of judgment and abatement proceedings.

Lease Payment

At the commencement of the second year of the original term thereof and at the commencement of each succeeding year throughout the original term and any renewal terms, the monthly rental payable pursuant to Paragraph 2 hereof shall be adjusted by the same percentage that the Consumer Price Index, United States Average (All Items) published by the Bureau of Labor Statistics of the United States Department of Labor (hereinafter referred to as said "index") has increased from the first day of the original term hereof to the date of adjustment. To determine the index figure for any particular date, the latest index figure published prior to said date shall be deemed the index figure for said date.

If the Bureau of Labor Statistics should cease to publish said index so that the hereinabove described rental adjustment cannot be determined, then sublessor and sublessee shall negotiate to determine an appropriate alternative published price index. In the event the parties are unable to agree on such an alternative within thirty (30) days after the request is made by one party to the other to negotiate, then upon request by either party, sublessor and sublessee shall each appoint an impartial person within fifteen (15) days after said request to select an alternative published price index. Said two appointees within fifteen (15) days after the appointment of the last of them to be appointed, shall appoint a third impartial person to act with them in the selection of said alternative published price index. If either sublessor or sublessee shall fail to appoint a person as provided for above, or if the first two appointees shall fail to appoint a third, the vacancy or vacancies so existing shall be filled by an impartial person or persons appointed by the presiding Judge of a Court of competent jurisdiction of the state and county in which the leased premises are located acting in his individual and not his judicial capacity upon request of either sublessor or sublessee. If any appointee declines or is or becomes unable to serve, he shall be replaced by another person appointed in the same manner as said appointee. As soon as possible after their appointment, on the basis of all pertinent factors, the appointees shall select an alter-

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