

PUBLIC EDUCATION AS A MANAGEMENT STRATEGY FOR
MARINE PROTECTED AREAS:

THE CASE OF THREE ARCH ROCKS NATIONAL WILDLIFE REFUGE IN OREGON

by

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TABLE OF CONTENTS

INTRODUCTION	1
THREE ARCH ROCKS NATIONAL WILDLIFE REFUGE	3
Background	3
Management Jurisdictions and Authorities	6
MANAGEMENT TECHNIQUES FOR MARINE PROTECTED AREAS	8
Prohibition	8
Limitations	9
Education	10
THREE ARCH ROCKS AS A CASE STUDY	11
METHODS	12
RESULTS	13
General Public	13
Recreational Fishers	16
Nonsurvey Data	18
RECOMMENDATIONS	19
Wildlife Enthusiasts	20
Recreational and Commercial Fishers	22
Scuba Divers	22
Personal Watercraft Users	23
Aircraft	24
CONCLUSION	25

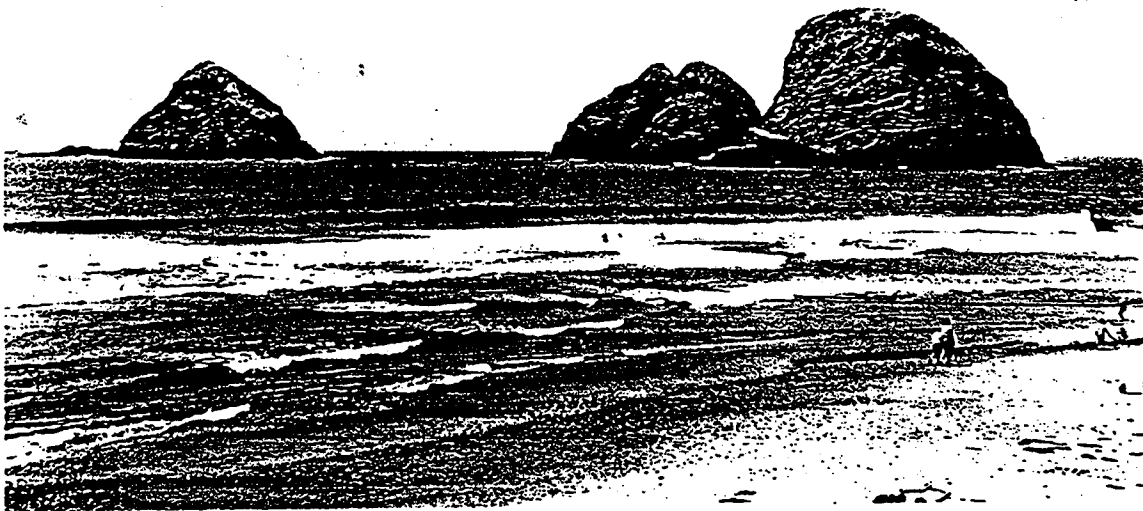
LIST OF TABLES AND FIGURES

<u>Tables</u>	<u>Page</u>
1 Jurisdictional Responsibilities for Three Arch Rocks NWR	7
2 Management Techniques for Marine Protected Areas	9
<u>Reponses to Survey Questions</u>	
3 Percentages of Respondents Engaging in Specific Recreational Activities around Three Arch Rocks	15
4 Percentages of Responses from the General Public Survey to Environmental Knowledge Questions	15
5 Percentages of those Interviewed Responding 'Yes' to Information Programs as Useful	16
6 Percentages of Respondents Engaging in Specific Recreational Boating Activities around Three Arch Rocks	17
7 Percentages of Reponses from the Recreational Boating Survey to Environmental Knowledge Questions	18
<u>Figures</u>	
1 Three Arch Rocks National Wildlife Refuge	1
2 Map of Three Arch Rocks and the Adjacent Oregon Coast	4
3 Oceanside Beach, Oceanside, Oregon	14

INTRODUCTION

Oregon's nearshore ocean is characterized by an abundance of rocks, islands, and reefs that contribute to both its great natural beauty and its value as habitat for marine wildlife. However, the beauty of these rugged landforms and the wildlife they support increasingly entice people to approach more closely, sometimes placing animals under great stress. This form of disturbance is especially prevalent among the more accessible rocks and islands that are very close to shore. A prime example is Three Arch Rocks, a national wildlife refuge and wilderness area located approximately one-half mile off the coast of Oceanside, Oregon (figure 1).

Figure 1. Three Arch Rocks National Wildlife Refuge



Three Arch Rocks and similar rocks, islands, and adjacent ocean waters provide critical habitat for an abundance of seabirds, marine mammals, fish, and invertebrates. The area surrounding Three Arch Rocks is also increasingly used by people: wildlife watchers, commercial and recreational fishers, boaters, divers, kayakers, personal watercraft users, and low-flying aircraft. Unfortunately, the activities pursued by some of these individuals causes wildlife disturbance, resulting in the abandonment of nests or young offspring and the subsequent loss of eggs, chicks, or pups. Successful management of wildlife resources in these areas requires a good understanding of the resources and the people who use the area, including their interests, needs, and expectations.

Over the past several decades, the management of sensitive natural resources has become increasingly sophisticated. Management of protected areas has moved from simple single-purpose management to multiple use management that uses a variety of strategies. Despite this shift, the principal strategies for wildlife protection on Oregon's nearshore rocks and islands are still regulatory in nature. These have proven difficult or impossible to effectively enforce. Other management strategies, such as the education of user groups, have been very effective in marine protected area management in other areas, (such as the Great Barrier Reef Marine Park in Australia), and holds promise for Three Arch Rocks and other rocks and islands off the Oregon coast.

Because of increasing disturbance of wildlife at Three Arch Rocks, the U.S. Fish and Wildlife Service (USFWS) and the Oregon Ocean Policy Advisory Council (OPAC) commissioned a study to address the problem and the role that the education

of user groups might play in improved management. The specific purpose of the study was to explore how a wildlife awareness program emphasizing education and communication might reduce human impact on environmentally sensitive resources by increasing the knowledge of user groups of marine resources and the reasons for their protection.

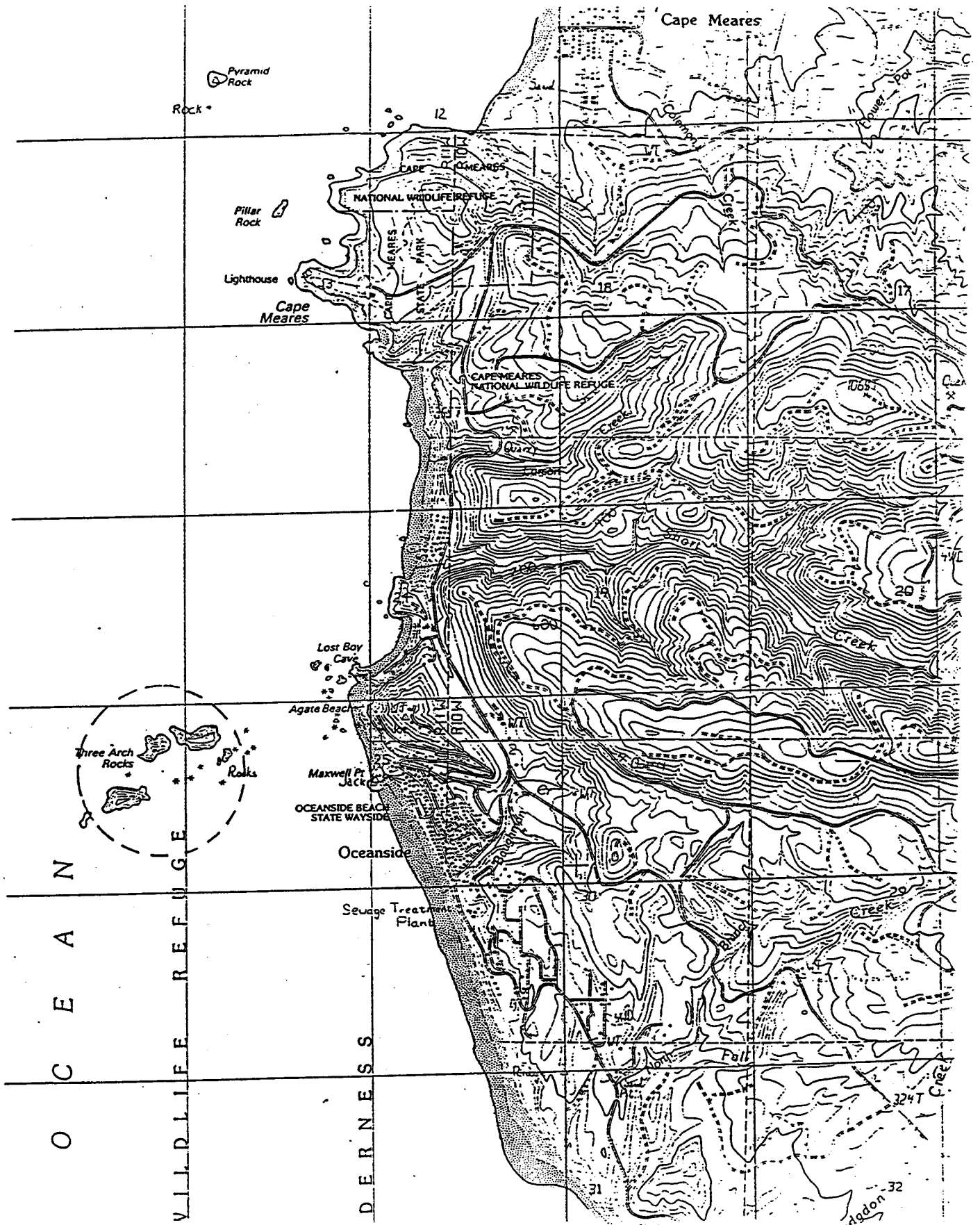
This report is the result of the study and is organized as follows. First, some background information on Three Arch Rocks National Wildlife Refuge is provided, including its accessibility, marine resources, problems of disturbance, and existing management authorities and regulations. Next, available management strategies for marine protected areas are discussed and how these strategies apply to Three Arch Rocks. This section is followed by a discussion of my study of Three Arch Rocks user groups and their attitudes toward marine wildlife and future education programs. Finally, recommendations for improved public and user group awareness are offered as a mechanism to improve marine protected area management at Three Arch Rocks and along the Oregon coast in general.

THREE ARCH ROCKS NATIONAL WILDLIFE REFUGE

Background

President Theodore Roosevelt established the Three Arch Rocks National Wildlife Refuge in 1907 - it was Oregon's first (figure 2). The refuge, composed of three large rocks and six smaller rocks, encompasses a 17-acre area approximately one-half mile off the coast of Oceanside, Oregon (USFWS, 1987). In 1970, the

Figure 2. Map of Three Arch Rocks and the Adjacent Oregon Coast



refuge became part of the Oregon Islands Wilderness Area. Three Arch Rocks was designated a national wildlife refuge and wilderness area because of the many species of migratory waterfowl and marine mammals that rely on the rocks for breeding, nesting, or pupping habitat.

Three Arch Rocks is the site of Oregon's largest nesting colony of migrating seabirds. At the height of breeding season, an estimated 220,000 nesting common murrelets can be found on the rocks (USFWS, 1987). Finley Rock also provides nesting habitat for thousands of tufted puffins. Pigeon guillemots, and rhinoceros and Cassin's auklets also use Three Arch Rocks. In addition to these alcid species, fork-tailed storm petrels, Leach's storm petrels, double-crested, Brandt's, and pelagic cormorants, black oystercatchers, and western and glaucous-winged gulls also use the refuge for nesting purposes. Undisturbed, Three Arch Rocks provides isolated, calm, and quiet nesting areas that seabirds require to breed and rear their young.

Marine mammals use the refuge for pupping and haul out purposes. The threatened Stellar sea lion breeds at only three locations in Oregon, one of which is Three Arch Rocks (USFWS, 1987). A small number of young ranging from 3-6 Stellar pups are born at the refuge each season, and if disturbance from humans continues to flush parents from the rocks, Three Arch Rocks may soon cease to be a breeding area. In addition to Stellar sea lions, California sea lions and harbor seals also use the refuge for haul out areas. Just like the refuge's seabird species, these mammals are sensitive to human disturbance.

The underlying cause of disturbance of Three Arch Rocks wildlife is due not so much to blatant disregard for rules and regulations, but rather a lack of public

understanding of wildlife needs. Contributing to this lack of awareness are the sometimes subtle wildlife responses to disturbance. Abnormal animal behaviors (such as increased heart rate, head bobbing, and wing flapping) are not always obvious or understood by observers. Furthermore, the result of disturbance may not be evident for many years. The lack of scientific evidence documenting these adverse effects makes it difficult to convince user groups of the consequences of their activities.

Management Jurisdictions and Authorities

Three Arch Rocks National Wildlife Refuge is currently managed under a somewhat fragmented regulatory system of state and federal government authorities. Table 1 describes the current jurisdictional responsibilities for the refuge. The USFWS has jurisdiction over the dry portion of the refuge above mean high water (MHW). The Division of State Lands (DSL) manages the submerged and submersible lands below MHW and out to the three-mile limit of the territorial sea. The National Marine Fisheries Service (NMFS) administers the Marine Mammal Protection Act and is thus responsible for management of the seals and sea lions that use Three Arch Rocks. Both NMFS and USFWS have responsibilities under the Endangered Species Act, and thus share in the management of the threatened Stellar sea lions. The Oregon State Marine Board (SMB) enforces all boating, and personal watercraft activity in the area surrounding Three Arch Rocks and would be responsible for enforcing a protective buffer zone if recommended by USFWS.

Though a number of agencies have management responsibilities for Three Arch Rocks and its resources, there are still no existing enforceable rules that directly

address human users and activities. Federal guidelines exist for the refuge, but these are only recommendations and not strictly policed. For example, refuge

Table 1
Jurisdictional Responsibilities for Three Arch Rocks NWR

AGENCY	JURISDICTION
USFWS	Manages the dry portion of the refuge above mean high water (MHW). Co-administers the Endangered Species Act (Stellars) with NMFS
DSL	Manages the submerged and submersible lands below MHW out to the three-mile limit of the territorial sea
SMB	Enforces boating regulations and is responsible for the designation of protected buffer zones
NMFS	Administers the Marine Mammal Protect Act (seals and sea lions) and co-administers the ESA with the USFWS

guidelines advise aircraft to remain at least one-half mile from the rocks. If aircraft should need to approach closer, they are asked to maintain a minimum altitude of 2300 feet above sea level and never pass directly over the rocks. (USFWS, 1987). All boats, including kayaks and personal watercraft, are advised to remain at least 500 feet from the rocks. Furthermore, boats are advised to never pass through the arches, between Seal Rock and Maxwell Point, or among any of the three rocks within the refuge.

These guidelines do not appear to deter boats, including those from local charter fishing companies and the U.S. Coast Guard, from passing through the arches. Aircraft continue to fly low over the rocks, and kayakers, fishers, and personal watercraft users continue to seek close-up views of the wildlife. Persistent disturbance in the area of Three Arch Rocks suggests that improved management strategies are

needed to protect its wildlife, and discussions of various alternatives have ensued over the years.

MANAGEMENT TECHNIQUES FOR MARINE PROTECTED AREAS

Kennington (1990), suggests a typology of management strategies for marine protected areas that includes three basic techniques: prohibitions, limitations, and education (table 2). In selecting what techniques might be appropriate in a given case, Kennington states that the management of marine protected areas requires an analysis of existing controls or regulations regarding human activity and their effectiveness in reducing impact to the protected area. However, good management also requires some audience analysis as well. Managers need to understand the interests, needs, and values of the user groups and their view of existing controls. How each of the techniques Kennington outlines applies or might apply to the Three Arch Rocks area is discussed below.

Prohibition

Kennington divides prohibition into two categories - prohibition of entry and prohibition of certain classes of activities. While both seem to be unambiguous and clear cut management techniques, regulatory agencies must still be able to apprehend individuals in restricted areas or prove that a prohibited activity was actually conducted in the area. Both the prohibition of entry and of certain activities are used as a management technique at Three Arch Rocks.

Table 2
Management Techniques for Marine Protected Areas (after Kenchington, 1990)

Technique	Type	Purpose
Prohibition	Entry	To provide well understood and easily regulated management that is clear cut (Yes/No issues) with no gray areas.
	Activity	
Limitations	Spatial	To manage multiple user groups using the same resource, to protect resources, and to prevent disturbance during sensitive periods.
	Temporal	
Education	Awareness Campaign	To enhance current regulatory strategies by increasing knowledge of marine resources.

Because of the biological significance of the refuge's wildlife, Three Arch Rocks is closed to the public. The following statutory acts are examples of the current regulatory scheme to prevent human disturbance. The National Wildlife Refuge Administration Act of 1966 prohibits trespass and any other human activities from occurring on refuge territory. Seabirds are protected under the Migratory Bird Treaty Act, which prohibits the "taking" of birds, including the killing of eggs or chicks. The Endangered Species Act, which protects the Stellar sea lion, also prohibits the harassment of other threatened and endangered species such as the Aleutian Canada goose, peregrine falcon, bald eagle, and the California brown pelican. All of these species are known to use Three Arch Rocks.

Limitations

Limitations are divided into spatial and temporal categories (table 2). This technique is more practical and appropriate for areas in which the coexistence of multiple activities threatens to harm protected resources and for areas that are

particularly vulnerable during certain times of the year. At Three Arch Rocks, disturbance caused by a variety of human activities threatens the reproductive success of the refuge's wildlife, especially during breeding and rearing season.

Spatial limitations such as buffer zones maintain a protected boundary around the area. A seasonal 500 foot buffer zone is presently recommended but not strictly enforced at Three Arch Rocks. Although buffer zones are ideal in theory, in reality they are difficult to enforce and to delineate. The most practical options are buoys and flags, which are difficult to see, radar (not always reliable), and the honor system. Although they have been warned numerous times by USFWS, recreational and charter fishing boats continue to pass through the arches of the rocks, thereby demonstrating the ineffectiveness of the honor system.

Temporal limitations such as seasonal closures are ideal for areas that are especially sensitive to disturbance during a particular time of the year. Although seasonal closures are not in effect at Three Arch Rocks, if implemented, they should be from April to September during the critical waterfowl nesting and rearing season.

Education

Marine protected area management plans that affect the general public face certain failure without their understanding of both the resources involved and the policies designed to protect them. Kenchington (1990) asserts that the management of marine protected areas is actually the management of human activity. The prevalence of disturbance at Three Arch Rocks provides evidence that user groups

are not getting the message that human activity threatens the breeding, rearing, and subsistence activities of marine wildlife.

Education can no longer be considered a supplement to regulatory management, but instead a valid technique on its own. Education is most effective through a system that targets appropriate user groups from multiple approaches and presents to them a straightforward message. Kenchington (1990) advises managers to determine: (1) the concerns of the user groups, (2) their level of understanding of the protected resources, and (3) the type and extent of their use. These suggestions provided a basis for my study of the user groups of Three Arch Rocks and a framework to determine the reasons for their use of the area, their views of the surrounding resources, and their opinions on the existing controls to protect these resources.

THREE ARCH ROCKS AS A CASE STUDY

The USFWS is concerned with the possible long-term negative impact on bird and mammal reproduction. Recognizing that existing laws do not appear to adequately protect these natural resources, USFWS wants to emphasize public education and media communication to promote the wise use of all marine resources.

In the summer of 1992, OPAC in partnership with USFWS initiated a study to examine human use of the Three Arch Rocks area as well as the public attitude toward the refuge's wildlife. Because of the area's public accessibility, it is necessary to examine the reasons for disturbance and the individuals involved before preparing management plans for the refuge and for other nearshore marine bird and mammal

habitat areas. The objectives of this study are (1) to identify the user groups of the area and (2) to determine how best to communicate with each group through an education and awareness program. Study results will aid USFWS and OPAC in the development of a plan that, once implemented, will promote enforcement through self-regulation by user groups.

METHODS

The data were collected as part of an interview survey of Tillamook county residents and visitors during the Summer of 1992. The sample interviewed consisted of 120 individuals who were surveyed at various times of the day during weekdays and weekends. The interview sites were: Oceanside beach, Netarts Bay, Cape Lookout State Park, Cape Meares, and the Garibaldi Marina. At the Garibaldi Marina, surveys were administered at the boat launch ramps, the bait shop, and at the charter boat company offices.

Three separate questionnaires were developed to target specific user groups: (1) the general public (divers, kayakers, personal watercraft users, pilots, and wildlife enthusiasts), (2) recreational fishers and boaters, and (3) charter boat operators and clientele. Actual surveys are included as Appendices A, B, C. All three surveys determined the residence of individuals, their purpose for visiting the area, the activities they planned to engage in, and their knowledge of Three Arch Rocks.

Nonsurvey data were also collected from Portland area dive shops, the Oregon State Marine Board, USFWS, Tillamook County sporting goods stores, the Tillamook Chamber of Commerce, and local motels and campgrounds. Telephone interviews

with dive shops documented the occurrence or absence of chartered dive trips to Three Arch Rocks, the frequency of occurrence, the skill level and dive interests of clientele, and the willingness of dive shops to participate in a plan to improve environmental public awareness of the area among divers. Information gathered from the State Marine Board, the Chamber of Commerce, and local stores and lodging establishments documented their willingness to aid in the distribution of marine educational pamphlets, posters, and fliers.

User groups were determined prior to the study, based on local and agency documentation of disturbance. These groups were identified as wildlife watchers, commercial and recreational fishers, charter boat fishers, scuba divers, kayakers and personal watercraft users, and pilots of low-flying aircraft. Documentation of these user groups was achieved through interviews, surveys, and on-site observation, and the results were analyzed to determine group opinions.

RESULTS

General Public

Surveys of the general public were conducted at Oceanside beach, Netarts Bay, Cape Lookout and Cape Meares. The results reported here are from Oceanside beach (figure 3) because of its easy beach access and its close proximity to Three Arch Rocks. The majority of the people interviewed at Oceanside had visited before, and of those staying overnight, many were lodging at local motels or private rentals. The most popular responses to the question of "what activities individuals planned to

engage in during their visit" (table 3) were walking or running on the beach (94%), photography (50%), bird watching (33%), and kite flying (25%). The majority of

Figure 3. Oceanside Beach, Oceanside, Oregon



Oceanside respondents cited intertidal life, waves, and rocks as well as the uncrowded and secluded nature of the beach as the main reasons for their visit (Appendix A, Question #8).

In response to the question "From what you know or have heard" (table 4), 19% of those interviewed were aware that crab season is year-round in Tillamook Bay (53% responded "I don't know"), while 50% knew the bay was closed to clamming at certain times of the year. Fifty-four percent responded 'yes' to the status of Three

Arch Rocks as a national wildlife refuge, and 43% were not certain whether it was designated as a refuge. When asked whether or not seabirds and northern sea lions used the refuge, 75% indicated they knew of seabirds' use of Three Arch Rocks, and 72% were aware of the presence of Stellar sea lions. However, 44% responded 'no' to the status of the Stellar as a threatened species.

Table 3
Percentages of Respondents Engaging in Specific Recreational Activities
around Three Arch Rocks. N=50.

Question: People visit this area for a variety of reasons. As I read through the list, please tell me whether or not it was a reason for this trip.

	'Yes' Respondents (%)
Walking or running on beach	94
Fishing from bank,dock,surf	14
Crabbing or clamming	17
Scuba or skin diving	0
Windsurfing or sailboarding	0
Photography	50
Bird Watching	33
Kite Flying	25
Hangliding	0
Airplane Flight	0

Table 4.
Percentages of Responses from the General Public Survey to
Environmental Knowledge Questions. N=50.

Question: From what you know or have heard:

	<u>YES</u> (%)	<u>NO</u> (%)	<u>DK</u> (%)
Is crab season year round in Tillamook Bay?	19	28	53
Is Tillamook Bay sometimes closed to clamming?	50	3	47
Is Three Arch Rocks a Nat'l Wildlife Refuge?	54	3	43
Do seabirds use TAR as a nesting/rearing site?	75	3	22
Do N. Sea Lions use TAR?	72	8	20
Are N. Sea Lions a threatened species?	50	14	35

Individuals were asked to indicate what types of information they would deem useful to visitors of the area (table 5). Information found to be most helpful among the general public were fishing areas (98%), boating regulations and safety (96%), shellfishing (88%), and camping sites (80%). When asked what would be the most effective way for individuals to find out about this information, the most popular response was the Chamber of Commerce. Respondents also felt that information booths or kiosks at beaches and campgrounds as well as pamphlets in local restaurants and motels would be useful. Other responses included natural resource articles in the Oregonian and other news publications, and a mailing list.

Recreational Fishers

Recreational fishers were surveyed at Garibaldi Marina and Netarts Bay. These individuals were mainly Portland area residents who owned their own boats. Fishers launching boats from Garibaldi were generally interested in fishing the open

Table 5

Percentages of those Interviewed Responding 'Yes' to Information Programs as Useful. N=50.

Question: I have a list of information programs that could be developed. I need your help in determining what types of information programs would be useful to visitors of the area. As I read through the list, please tell me whether or not each item would be useful to you.

	Fishers (%)	General Public (%)
Fishing areas	50	98
Shellfishing	50	88
Bird watching	58	34
Marine mammals	89	48
Camping sites	83	80
Picnic areas	94	80
Boating regs/safety	56	96

ocean (depending on whether it was open or closed to salmon), and 40% interviewed planned to fish at or near Three Arch Rocks. Tillamook Bay was rarely cited as the primary destination for fishing unless the weather prevented ocean fishing. When asked to indicate which recreational boating activities they planned to engage in (table 6), respondents were mainly interested in fishing (96%) and crabbing (29%). Bird watching was also cited as a possible activity (14%), but never as the primary reason for the trip. While no one responded 'yes' to the option of scuba diving, dive groups were observed leaving the marina from charter boats on a few occasions.

The question "From what you know or have heard" yielded responses from the fishing community that were similar to those of the general public (table 7). Fishers appeared to be more aware of the wildlife using the refuge because they had more closely observed seabirds and sea lions using the rocks. However, more

Table 6

Percentage of Respondents Engaging in Specific Recreational Boating Activities around Three Arch Rocks.
N=50.

Question: I have a list of recreational boating activities. As I read through the list, please tell me whether or not you will engage in this activity on your boat today.

	'Yes' Respondents (%)
Fishing	96
Crabbing	29
Bird Watching	14
Sea Lion Viewing	8
Scuba Diving	0
Water Skiing	0

fishers than members of the general public were unaware of the Stellar sea lion's status as a threatened species. In terms of potential information programs,

recreational fishers were mainly interested in picnic areas (94%), marine mammals (89%), camping (83%), and boating regulations and safety (56%), (table 5).

Respondents indicated that information would best be distributed through the Oregon State Marine Board, local marinas and bait shops, and Oregon Department of Fish and Wildlife publications.

Nonsurvey Data

Data collected from dive shops indicated that many shops charter dive trips out of Garibaldi to Three Arch Rocks two to three times a year with six to eight people per trip. Trips are year-round, weather permitting, and boats are either privately owned or chartered from one of the Garibaldi companies. The clientele is

Table 7

Percentages of Responses from the Recreational Boating Survey to Environmental Knowledge Questions.
N=50.

Question: From what you know or have heard:

	<u>YES (%)</u>	<u>NO (%)</u>	<u>DK (%)</u>
Is crab season year round in Tillamook Bay?	66	18	16
Is Tillamook Bay sometimes closed to clamming?	72	12	16
Is Three Arch Rocks a Nat'l Wildlife Refuge?	40	10	4
Do Seabirds use TAR as a nesting/rearing site?	88	4	8
Do N. Sea Lions use TAR?	62	12	26
Are N. Sea Lions a threatened species?	30	56	14

of varied dive experience with dive interests ranging from spearfishing to sightseeing and photography. All of the dive shops surveyed were very supportive of improving public awareness of the area. However, concern was expressed about publicizing the Three Arch Rocks area, since divers enjoy the refuge for its relative anonymity among the diving community.

Individuals interviewed from the Oregon State Marine Board, local stores, and motels and campgrounds all pledged support for a public awareness plan. Respondents indicated that they do receive inquiries concerning the natural resources of the area, and that pamphlets and various other educational packets would help them provide a valuable service to their clientele. The State Marine Board suggested distributing boating-related information at local marinas and bait shops along with their own publications, while local lodging personnel indicated that information targeting all user groups would be useful to them.

Conversations with Roy Lowe, Nancy Morrissey, and Palmer Sekora of USFWS revealed that despite their attempts to communicate with local fishers and charter boat operators, boating-related disturbance is still relatively high at Three Arch Rocks. Many people are unaware of the current restrictions of activities around the refuge, and of those that are aware of these regulations, some still persist in disregarding them.

RECOMMENDATIONS

The area surrounding Three Arch Rocks National Wildlife Refuge is used by a variety of people each with a specific objective. "Wildlife watchers" see this area as an opportunity to view and photograph wild animals up close, while divers enjoy the refuge's relative seclusion and anonymity, and fishers its available stock of fish. Even though human disturbance of Three Arch Rocks is a documented occurrence, the level of environmental awareness of its natural resources and their vulnerability is not. Results from interviews and surveys indicate that an understanding of the impacts of this disturbance is lacking among the various user groups. Therefore, education and

communication may be an effective management technique to influence the understanding of both the general public and refuge area user groups so that adverse impacts can be minimized.

For an area wide communication plan directed at user groups to be effective in promoting awareness of wildlife vulnerability at Three Arch Rocks, information must be tailored to each group. Results from the surveys indicate that different user groups have different reasons for using the area around the refuge. For example, wildlife enthusiasts and recreational boaters enjoy the aesthetic benefits of wildlife watching near Three Arch Rocks while fishers reap from the economic benefits of fishing in areas around the refuge. For all groups, it would be effective to stress the repercussions that would occur if disturbance were to persist and they were denied access to the areas around Three Arch Rocks. Different user groups have different values, and it is important to understand these values when developing a communication plan.

Educational information should be distributed in areas frequented by members of each user group so individuals will have direct access to information that will encourage appropriate behavior in areas adjacent to the refuge. Continued commitment from both the public and regulatory agencies will be important for this management strategy to be effective. Recommendations for each potential audience are presented below.

Wildlife Enthusiasts

Wildlife enthusiasts who approach the rocks must be informed that this type of nonconsumptive wildlife use does not necessarily guarantee zero impact (Duffus and

Dearden, 1990). These wildlife watchers have an obvious knowledge of the existence of wildlife at Three Arch Rocks, but may not be aware that their activities can and do have adverse effects on seabirds and marine mammals. Information provided should emphasize problems that occur during peak nesting and breeding seasons, causes of chick or pup mortality, and more appropriate times to safely approach the refuge outside of designated boundaries.

Wildlife lovers include both tourists and local residents, and therefore information could best be distributed through the local Chamber of Commerce, local lodging establishments and restaurants (Appendix D), campgrounds (Appendix E), wildlife publications, state and local newspapers such as the Oregonian, the Tillamook Headlight Herald, and the Nehalem Bay News, The Audubon Society, and perhaps via a documentary-style program on Oregon Public Broadcasting (e.g. on Oregon Field Guide). General material could also be distributed at the Tillamook County Fairgrounds, Convention Center, Community Center, City Hall, and the YWCA.

Information can be packaged in a variety of ways, from written articles to posters, pamphlets and videos. Posters provide an eye-catching, low-effort source of material in motel lobbies and local libraries. Many people prefer pamphlets so that they can have them with them on site and take them home as souvenirs when they leave. Articles with photos of brilliantly colored wildlife also are strongly attractive to readers. Videos could be sold at dive shops, sporting goods stores, marinas and in local motels. While an informative program on OPB could be costly to produce, the information would be received by a large audience, and could be televised repeatedly throughout critical times of the year such as the height of breeding season.

Recreational and Commercial Fishers

Individuals involved in recreational and commercial fishing could be effectively reached through posters and pamphlets distributed at the Garibaldi Marina and bait shop, Garibaldi Aqua Sports, and the Garibaldi Marina charter boat companies (Appendix F). Fishers would be reminded of these messages immediately prior to launching. Educational material could also be distributed through the State Marine Board and boat rental dealers such as the Bayshore RV Park & Marina in Netarts and Jetty Fishery in Rockaway. Local publications such as the Hunting and Fishing News and the Tillamook County Fishing Guide could also be used to distribute relevant material.

In order to defuse the often contentious relationship between government agencies and the fishing community, it might be beneficial to solicit written ideas for improved management and communication from commercial and recreational fishers, charter boat captains, and others. Providing these groups with a forum to express their own opinions may stimulate peer support of wildlife conservation as well as give USFWS an insight into how to approach the fishing community concerning Three Arch Rocks management. By strengthening the relationship between government and industry, communication will be enhanced.

Scuba Divers

Scuba divers should be informed of the importance of responsible diving around wildlife. Interpretive material emphasizing the aesthetic benefits of wildlife preservation should be distributed to novice and expert divers at both dive schools and dive shops

along with other orientation information such as potential dive sites, dive trips and diving safety tips (Appendix G). Posters, pamphlets, and viewable videos at both of these sights as well as at charter boat companies would be effective in presenting this message. Contact with Portland area dive clubs such as Tide Riders Scuba Club (associated with Under Water Works dive shop), Pacific Dive Club (Pacific Water Sports), and Sea Searchers would provide direct communication with the diving community. These scuba clubs also publish newsletters in which interpretive material could be distributed. Dive magazines such as Underwater U.S.A., Scuba Times, and Diver Magazine are widely read publications among cold water scuba divers and should also be considered when distributing educational material.

Local newspaper articles written by and for dive enthusiasts should be included in publications of PADI, the Professional Association of Dive Instructors, and its associated diving group, Project Aware. The goal of this internationally known group is to promote environmental awareness and responsible behavior in divers. In addition to engaging in environmentally conscious activities such as beach clean-ups, they have also been featured on the OPB produced Oregon Field Guide program. An alliance with this education-oriented group will serve as an effective way to distribute material concerning Three Arch Rocks.

Personal Watercraft Users

While jet skiers and other personal watercraft users are not a daily occurrence at Three Arch Rocks, this group should not be ignored. Personal watercraft operators may be the least informed users of the refuge area and most in need of education

about wildlife vulnerability. Posters, pamphlets, and videos directed at jet skiers would be useful in Portland area sporting goods stores such as Ebb & Flow Paddlesports, Jet Ski Watercraft, and Watercraft Connection. Information could also be distributed in publications targeting these user groups, such as Water Scooter Magazine, Personal Watercraft Illustrated, Splash, and International Jet Sports Magazine. The Watercraft Connection suggested including interpretive fliers with their own material during times of mass mailings to their customer base list.

Aircraft

Low-flying aircraft are also a disturbance for the wildlife of Three Arch Rocks. Several of these small planes are leaving from Tillamook Airport, as well as from Portland, Astoria, and Corvallis. Eye-catching posters and fliers should be distributed or posted throughout the airport terminal and lobby areas, as this type of high profile communication may help to alter flight plans of pilots who were unaware of their impact on the wildlife. Contact with pilots can also be made through the Flight Standards District Office (FSDO) in Portland. This office holds regular FAA meetings throughout Oregon, and a brief discussion of the sensitivity of Oregon's coastal refuges could reach a number of fliers. An extension "bulletin" entitled "Flying along the Oregon Coast" could also be developed. This publication could include all types of information that pilots would need to know when flying along the coast, including information about winds, headlands, storms, and of course, sensitive habitat areas.

CONCLUSION

Many individuals in each user group of the Three Arch Rocks National Wildlife area are unaware of the adverse impact their activities have on marine animals. Education emphasizing the habitat needs and vulnerabilities of birds and mammals of the refuge could play an important role in reducing wildlife disturbance. While some disturbance may be intentional, perhaps the most challenging obstacle facing wildlife managers today is simply a widespread lack of knowledge. Rules and regulations alone are insufficient to protect marine wildlife resources from growing human interaction and disturbance. The use of interpretive and educational strategies as long-term management solutions will do much to determine the future of marine protected areas.

REFERENCES

- Duffus, D. and P. Dearden. 1990. Non-consumptive wildlife-oriented recreation: A conceptual framework. *Biological Conservation*. 53:213-231.
- Kenchington, R. 1990. The Great Barrier Reef Marine Park as a Multiple Management Approach. In *Managing Marine Environments*, 158-172. New York: Taylor and Francis.
- U.S. Fish & Wildlife Service. February, 1987. Refuge Management Plan: *Oregon Islands, Cape Meares, Three Arch Rocks*.

APPENDICES

APPENDIX A

THREE ARCH ROCKS USE STUDY

1. In what city/state do you live? _____

2. Are you a first time visitor to the area? YES 1
NO 2

2a) How often do you visit the area each year? _____

3) Is this a day trip? YES 1
NO 2

3a) Where are you staying during your visit?

RV PARK	1
MOTEL	2
STATE PARK	3
PRIVATE RENTAL	4
OTHER _____	5

4) Do you plan on doing any boating in the area during your visit? YES 1
NO 2 (GO TO #5)

4a) What kind of boat will you be using? _____

4b) Is this a privately owned boat, a rental, or charter?

PRIVATE	1
RENTAL	2
CHARTER	3

4c) What company? _____

5) What is the length of the boat in feet? _____

5a) From where will you launch the boat?

OCEANSIDE BEACH	1
NETARTS BAY	2
NESTUCCA BAY	3
TILLAMOOK BAY	4
GARIBALDI	5
OTHER _____	6

5b) Will you be using the boat in the:

	<u>YES</u>	<u>NO</u>
BAY	1	2
OPEN OCEAN	1	2
THREE ARCH ROCKS	1	2
OTHER_____	1	2

- 6) I have here a list of recreational boating activities. As I read each one, please tell me whether or not you will engage in this activity on your boat during this visit.

	<u>YES</u>	<u>NO</u>	<u>DK/NA</u>
Fishing	1	2	3
Crabbing	1	2	3
Cruising	1	2	3
Bird Watching	1	2	3
Sea Lion Viewing	1	2	3
Scuba Diving	1	2	3
Water Skiing	1	2	3

- 7) People visit this area for a variety of reasons. As I read you a list of some of these activities, please tell me whether or not it was a reason for this trip.

	<u>YES</u>	<u>NO</u>	<u>DK/NA</u>
Walking or running on beach	1	2	3
Fishing from bank,dock,surf	1	2	3
Crabbing or clamming	1	2	3
Scuba or skin diving	1	2	3
Kayaking or canoeing	1	2	3
Windsurfing or sailboarding	1	2	3
Photography	1	2	3
Bird Watching	1	2	3
Kite Flying	1	2	3
Hangliding	1	2	3
Airplane Flight	1	2	3
Company_____			
Other_____			

- 8) What would you say is the **main** reason for your visit to this particular area?

9) From what you know or have heard:

	<u>YES</u>	<u>NO</u>	<u>DK/NA</u>
Is crab season year-round in Tillamook Bay?	1	2	3
Is Tillamook Bay sometimes closed to clamming?	1	2	3
Is Three Arch Rocks a National Wildlife Refuge?	1	2	3
Do seabirds use TAR as a nesting/rearing site?	1	2	3
Do N. Sea Lions use TAR?	1	2	3
Are N. Sea Lions a threatened species?	1	2	3

8) I have a list of information programs that could be developed. I need your help in determining what types of information would be useful to visitors of the area. As I read through the list, please tell me whether or not each item would be useful to you.

	<u>USEFUL</u>	<u>NOT USEFUL</u>	<u>DK/NA</u>
Fishing areas	1	2	3
Shellfishing	1	2	3
Bird watching/seasons	1	2	3
Marine mammals	1	2	3
Camping sites/avail./cost	1	2	3
Picnic areas/facilities	1	2	3
Boating regs/safety	1	2	3

(INT: IF (1) USEFUL IS AN ANSWER TO ANY OF QUESTION #8 ASK 9 OTHERWISE PROCEED TO #10)

9) You have indicated that certain types of information would be useful to you. What would be the best way for you to receive this information?

I have a list of recreational boating activities. As I read each one, please tell me whether or not you will engage in this activity on your boat today.

	<u>YES</u>	<u>NO</u>
Fishing	1	2
Crabbing	1	2
Cruising	1	2
Bird Watching	1	2
Sea Lion Viewing	1	2
Scuba Diving	1	2
Water Skiing	1	2
Other _____		

From what you know or have heard:

	<u>YES</u>	<u>NO</u>	<u>DK</u>
Is crab season year round in Tillamook Bay?	1	2	3
Is Tillamook Bay sometimes closed to clamming?	1	2	3
Is Three Arch Rocks a Nat'l Wildlife Refuge?	1	2	3
Do seabirds use TAR as a nesting/rearing site?	1	2	3
Do N. Sea Lions use TAR?	1	2	3
Are N. Sea Lions a threatened species?	1	2	3

I have a list of information programs that could be developed. I need your help in determining what types of information would be useful to visitors of the area. As I read through the list, please tell me whether or not each item would be helpful to you.

	<u>USEFUL</u>	<u>NOT USEFUL</u>
Fishing areas	1	2
Shellfishing	1	2
Bird watching	1	2
Marine mammals	1	2
Camping	1	2
Picnic areas/facilities	1	2
Boating regs/safety	1	2

What would be the best way for you to receive/find out about this information?

APPENDIX C

CHARTER BOAT USE SURVEY

What city/state are you from? _____

Is this your first time out on a charter boat?

YES

NO

How often do utilize charter boat services?

What charter boat company did you fish with today? _____

What was the name of the boat? _____

How far out(miles)did you travel today? _____

Other than fishing, did you hope to do any:

	<u>YES</u>	<u>NO</u>
Bird watching	1	2
Whale watching	1	2
Sea Lion watching	1	2
Other _____		

From what you know or have heard:

	<u>YES</u>	<u>NO</u>	<u>DK</u>
Is crab season year round in Tillamook Bay?	1	2	3
Is Tillamook Bay sometimes closed to clamming?	1	2	3
Is Three Arch Rocks a Nat'l Wildlife Refuge?	1	2	3
Do seabirds use TAR as a nesting/rearing site?	1	2	3

Do N. Sea Lions use TAR?	1	2	3
Are N. Sea Lions a threatened species?	1	2	3

I have a list of information programs that could be developed. I need your help in determining what types of information would be useful to visitors of the area. As I read through the list, please tell me whether or not each item would be helpful to **you**.

	USEFUL	NOT USEFUL
Fishing areas	1	2
Shellfishing	1	2
Bird watching	1	2
Marine mammals	1	2
Scuba diving	1	2
Camping	1	2
Picnic areas/facilities	1	2
Boating regs/safety	1	2

What would be the best way for **you** to receive/find out about this information?

**APPENDIX D
TILLAMOOK AND SURROUNDING AREA MOTELS**

NETARTS:

Antler Court
4800 Hwy W
842-4003

Sea Lion Motel
322-3405
355-2099

Terimore Motel on Netarts Bay
5105 Crab Ave
842-4623

OCEANSIDE:

House on the Hill
842-6030

Oceanfront Cabins
1610 Pacific NW
842-6081

Oceanside Inn
1440 Pacific NW
842-2961

TILLAMOOK:

Best Western Mar-Clair Motel
11 Main
842-6030

Nendels Inn
1125 N Main
842-8844

Shilo-Inn
2515 Main
842-7971

Tillamook Inn
1810 101 N; 842-4413

GARIBALDI:

Tilla-Bay Motel
8th & Hwy 101
842-5477

Trails Inn Motel
19230 SW Alder

ROCKAWAY:

**Broadwater Vacation
Rentals**
105 SW 6th Ave
355-2248

Ocean Locomotion Motel
19130 Alder
355-2093

Rock Creek Inn
145 N Miller
355-8488

Sand Dollar Motel
355-2301

Shifting Sands Motel
249 N Miller
355-2771

Sundowner Motel
432 S Hwy 101
355-2201

Tradewinds Motel
523 N Pacific
355-2112

**APPENDIX E
TILLAMOOK AND SURROUNDING AREA CAMPGROUNDS**

NEHALEM:

Nehalem Bay Trailer Park
36455 Hwy 101 N
368-5180

Nehalem Shores RV Park
37395 N Fork Road
368-6670

Nehalem Bay State Park
8300 Third St.
368-5943

NETARTS:

Happy Camp Resort
845 Happy Camp Rd
842-4012

Bay Shore Trailer Park
2260 Bilyea Avenue
842-7774

Big Spruce Trailer Park
4850 Netarts Hwy W
842-7443

TILLAMOOK:

Wilson River RV Fisherman Park
11300 Wilson River Hwy
842-2750

Trask Park (State Forestry)
Trask Rv. Rd.
842-4559

KOA of Tillamook
11800 Hwy 101 S.
842-4779

GARIBALDI:

Biak Trailer Court
606 Biak Avenue
322-3206

Old Mill Marina Resort
210 3rd St.
322-0324

ROCKAWAY:

Paradise Cove
32455 Hwy 101 N
368-6333

Jetty Fishery
27550 Hwy 101 N
368-5746

Barview Jetty Park
Barview Jetty
322-3522

Cape Lookout (State Park)
13000 Whiskey Creek Rd.
842-4981

**APPENDIX F
GARIBALDI MARINA CHARTER BOAT COMPANIES**

Fran F Charters

322-0333

Boats: *Fran F, Charlie,
Oakland Pilot***Garibaldi Charters**

322-0007

Boats: *Westward, Strider***Siggi-G Ocean Charters**

(Bird/Whale watching)

322-3285

Boats: *Siggi-G, Mischief***Reel Fun Ocean Charters**

322-3294

Boats: *Reel Fun***Troller Deep Sea Fishing**

322-3666

Boats: *Big G, Herbie,
Tiger, Solo***Kerri Lin Charters**Boats: *Kerri Lin***D & D Charters**Boats: *Tacky 2, D&D*

TILLAMOOK AND PORTLAND AREA BOAT RENTALS/CHARTERS

Dean's Guide Service

Netarts Bay

842-7107

The Guide Shop

12140 Wilson River Hwy

842-FISH (charters)

Oregon Fishing Adventures, Inc

P.O. Box 49 Bay City, OR

377-2063

Viking Charters

244-7611 (Portland)

368-5771 (Nehalem)

Garibaldi Aqua Sports

108 7th

322-0113

Pacific Watersports

17128 SW Shaw (Aloha)

642-3483

Bayshore RV Park & Marina

Netarts

842-7774

Jetty Fishery (Rockaway)

27550 Hwy 101

369-5746

**APPENDIX G
PORTLAND AREA SCUBA DIVE SHOPS**

Aquatic Sports & Scuba Schools

10803 SW Barbur
245-4991

Discover Diving

10227 NE Clackamus
257-0669

Dolphin Too, Inc

3021 NE 72, Vancouver, WA
206-892-1633

Horizon Water Sports

3110 SE TV Hwy, Hillsboro 640-9832
8635 SW Canyon Rd., Portland 297-8133

Steve's Scuba Center

19230 SE McLoughlin Blvd
205-656-1956

Streed's Scuba Unlimited

8450 SE 82nd
777-3347

Thunder Reef Divers

12104 NE Hwy 99
228-3767

Tri-West Scuba Center

13604 Powell Blvd
761-5435

Under Water Works Inc

12170 SW Main St.
620-6993

White Orca Divers

16316 SE Division
761-9643

Young's Scuba Supply

600 SE 181st Ave
667-1715

Ebb & Flow Paddlesports

0604 SW Nebraska
245-1756

Jet Ski Watercraft

13705 SW Farmington Rd
643-7111

Watercraft Connection

1450 SE Powell Blvd
232-9952