OREGON TERRITORIAL SEA MANAGEMENT STUDY

Executive Summary

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Marine Resource Management Program
College of Oceanography
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Ocean and Coastal Law Center
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prepared for the

Oregon Department of Land Conservation and Development

by

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S.1. INTRODUCTION

Oregon, like a number of coastal states, is becoming increasingly interested in ocean management, not only within the three nautical mile (n.m.) territorial sea, but also beyond in the 200 n.m. Exclusive Economic Zone (EEZ).

There are several reasons for Oregon's new interest in ocean resource planning and management. First, the ocean off Oregon is a valuable economic resource that supports a commercial and recreational fishing industry, pleasure boating, commercial navigation and waste disposal. Other uses are on the horizon or have potential, among them oil and gas development, marine mineral mining and increased waste disposal. While these new uses present opportunities for economic diversification, they also have potential for causing adverse environmental effects, and for creating disputes over use of ocean space and resources.

Another important force that is driving nearshore planning and management efforts is the specific ocean policy that Oregon adopted as part of its statewide land use planning program. Statewide Goal #19, the Ocean Resources Goal, is a comprehensive statement that includes overall policy, resource inventory and impact assessment requirements, decision-making criteria and state agency implementation requirements. While the Ocean Resources Goal provides the broad policy framework necessary to develop coordinated management regimes for uses and activities within the territorial sea, state agency implementation of its provisions has been slow.

In response to these offshore management issues and existing policy, the Governor of Oregon established a Nearshore Ocean Planning Task Force in 1984. The Task Force subsequently contracted with the Oregon State University College of Oceanography, and the University of Oregon Ocean and Coastal Law Center, to evaluate the legal and institutional capability of the State of Oregon to manage the ocean resources under its jurisdiction.

The two objectives of the Territorial Sea Management Study were to (1) "provide a clear accounting of Oregon state government's role in nearshore ocean management" and (2) "to identify problem areas in nearshore ocean management, such as outmoded laws, gaps in responsibility, overlaps and duplication of efforts, and conflicts among units of governments trying to achieve their respective goals". Chapters 2 through 10 of this study are the authors' attempt to accomplish these objectives for present and potential ocean uses and activities off Oregon.

Many resource and institutional issues, problems and opportunities were discussed in individual chapters of the full study. This executive summary highlights the most important of these, and offers specific recommendations. The authors believe that certain legislative changes and more complete implementation of existing laws will lead to better coordination and more effective management of the nearshore ocean and its resour-

ces. They recognize that some of the issues dealt with here are complex and that agreements on policy and procedures will not be easy. Further analysis, debate, and evaluation of alternative proposals will be needed.

The 1987 State Legislature, in passing the Oregon Ocean Resources Management Act (S.B. 630), has provided further impetus for state planning and management of the territorial sea, and for coordination with federal agencies in management of the 200 n.m. EEZ. It is hoped that this study will be a useful resource to the new Oregon Ocean Resources Management Task Force created by that legislation, and to others interested in wise ocean use and management in Oregon.

S.2. INTERGOVERNMENTAL RELATIONS, INTERAGENCY COORDINATION, AND CONSISTENCY

Chapter 2 presented a summary of state agency authorities for nearshore ocean management, and an overview of the agency coordination requirements that are detailed in state land use law. These included (1) procedures for certification of agency rules and programs and (2) state permit consistency. Each subsequent chapter of this report then covered these topics in more detail for the resource of activity concerned (e.g., marine minerals, kelp harvesting, etc.).

There are both explicit and implicit coordination and consistency requirements in a number of state laws dealing with nearshore activities (e.g., Division of State Lands' requirement to consult with the Department of Geology and Mineral Industries when issuing a lease. ORS § 273.551). None, however, are as comprehensive, detailed and explicit as those in state land use law (ORS Chapter 197) and the Ocean Resources Goal 19. As a consequence, the conclusions and recommendations in this section focus on the need to improve coordination and consistency procedures related to these latter laws.

Oregon's statewide land use planning goals are mandatory, and govern all state agency "programs affecting land use" and all local government comprehensive plans. ORS §§ 197.015(8), 197.175(2)(a), and 197.080(1)(a). When an agency is found to be disregarding the goals, LCDC must order goal compliance. In addition, the Oregon Supreme Court has held that agencies must demonstrate their compliance with the goals. See Federation of Seafood Harvesters v. Fish and Wildlife Commission, 291 Or. 452, 461, 632 P.2d 777, 782 (1981). If the goals are to be a comprehensive guide for proposed agency actions within and adjacent to Oregon's territorial sea, effective coordination and consistency procedures are essential.

The authority or obligation of coastal counties to extend their comprehensive plans offshore should be clarified by the legislature. Under the county boundary statute, ORS § 201.370, coastal county boundaries extend out to the western edge of Oregon's territorial sea. Under the land use law, counties are mandated to plan comprehensively within their jurisdictions, ORS § 197.175(2)(a), and a "comprehensive" plan must cover the geographic area and all functional and natural activities and systems within it. ORS § 197.015(5). Therefore, coastal counties may have the authority to regulate portions of Oregon's nearshore ocean.

It is not clear that the legislature intended that coastal counties have this authority. Theoretically, Goal 19 could provide a common basis for the oceanic component of each county plan, but in practice, independent county planning decisions could result in inconsistent treatment of nearshore resources that cross county oceanic boundaries. Logically, such resources should be managed coastwide, rather than county-by-county, by state agencies pursuant to their statutory authorities, Goal 19, and coordination agreements in close consultation with adjacent local gov-

ernments. Thus, the legislature should modify the land use law in favor of state agency planning and management. Alternatively, the legislature could modify the boundary statute to establish the line of mean low tide as the western boundary of coastal counties. Section 22 of 1987 Oregon Senate Bill 630 preserved existing county boundaries but amended ORS § 201.370 to state that planning for ocean resources and the territorial sea should be accomplished pursuant to S.B. 630.

In general, agency actions must be consistent with both the statewide goals and local comprehensive plans. ORS § 197.180(7). At this time, however, agency actions conducted or contemplated within the state's territorial sea must be consistent only with Ocean Resources Goal 19, because no coastal counties have yet asserted their planning authority offshore. If counties incorporated offshore areas into their plans, then agencies would be bound by both the goals and local plans. In the event that agency actions offshore have onshore effects, consistency with both the applicable goals and local plans is required.

Consistent with the intent of the land use law, OAR 660, Division 30 has been amended to remove the inference (formerly found at OAR 660-30-040(3)) that state agencies may take actions affecting land use that do not comply with the statewide goals. Now that this issue has been clarified, it should be a high priority for resource agencies to expeditiously implement the specific requirements of Goal 19. These requirements apply to leases, permits, inventory information, contingency plans, and emergency plans. In addition, Goal 19 guidelines for issuing permits for development on the continental shelf should be followed wherever possible.

State agencies also should be aware that the Court of Appeals has held that agencies must inventory their resources in sufficient detail to show that proposed activities will be consistent with the statewide goals. Audubon Society of Portland v. Oregon Department of Fish and Wildlife, 67 Or. App. 776, 780, 681 P.2d 135, 137 (1984).

All agency actions within and adjacent to the territorial sea must be coordinated so that the needs of "all levels of governments," agencies, and citizens have been "considered and accommodated as much as possible." ORS § 197.015(5). Through the submission of "coordination programs" state agencies must demonstrate to LCDC that their rules and programs comply with the goals and are compatible with local government comprehensive land use plans.

The coordination and consistency procedures are the primary means by which the goals are integrated into routine agency operations so that the goals can have concrete effect. It is vital to this process that DLCD expeditiously negotiate coordination programs with DSL, and other agencies having nearshore authority, so that the programs may be certified by LCDC pursuant to revised OAR 660, Division 30, and 1987 H.B. 2758 (incorporating S.B. 16) establishing December 31, 1990 as the certification deadline. In this manner, activities within the nearshore ocean subject to the State Land Board's and DSL's paramount constitutional, statutory and regulatory authority will be better coordinated with other offshore and onshore uses and developments.

Quality coordination agreements could expedite the incorporation of the Ocean Resources Goal's requirements into agency programmatic activities such as rulemaking. During the study

the Oregon DSL proposed rules governing offshore oil and gas geological, geophysical, and seismic surveys. The agency's initial proposal merely stated that the rules were consistent with the statewide land use planning goals including the Ocean Resources Goal and provided DLCD ten days to comment upon individual permit applications from the perspective of coastal zone management policy coordination. With no certified DSL coordination agreement or other mechanism in place for incorporating goal considerations into DSL decisionmaking, the interagency process for improving the proposed rules from that perspective was not a smooth one. However, a much improved final rule resulted which requires the DSL director to apply the Ocean Resources Goal's substantive criteria with respect to impacts on fishing, navigation, recreation, and long-term protection of renewable resources in deciding whether to issue a permit. In the absence of goal compliance, the rules state that the permit shall be denied. In reaching permit decisions, the rules authorize the director to rely on existing data and studies, so long as information gathered by permittees and turned over to the department pursuant to the rules is incorporated into the data base used for future permit decisions. DSL's development of similar rules for minerals other than oil, gas and sulfur should benefit from this first agency experience in meeting the Ocean Resources Goal's stringent requirements.

Above all, the Ocean Resources Goal provides a good framework for interagency coordination and individual state agency decisionmaking offshore. Its strict requirements for resource inventory, analysis of impacts, avoidance of pollution, and coordination of agency actions seem justified by the need to protect the current economic return from renewable resource utilization. Commercial and recreational fishing, tourism activities such as boating and whale watching, and other similar uses could be adversely affected by nonrenewable resource activities like mining and oil and gas development, if carried out unwisely.

Meeting the goal's mandates will not be easy. Of critical importance will be the coordination agreements. The study highlighted current statutory provisions requiring the state submerged lands, minerals, environmental quality, and transportation agencies to consult with the state Department of Fish and Wildlife (DFW) during some of their nearshore leasing and permitting processes, and suggested that a natural and useful extension of these statutory requirements would be to build into all certified coordination agreements explicit requirements to consult with DFW. Again, the justification for such requirements would be that current economic returns from nearshore activities mostly involve renewable, living resources for which DFW has expertise and regulatory responsibility.

The Ocean Resources Goal also requires consideration of conflicts with navigation in nearshore resource development activities, but no state agency currently represents nearshore navigational interests analogous to DFW's representation of living resources. The Oregon Department of Transportation or the state Marine Board would seem to be the logical agencies to do so. Certified coordination agreements could require consultation with one or both of them about navigation impacts.

The use of ocean resources rarely occurs without the need for onshore support facilities. Failure to consider the onshore effects of proposed ocean resource developments could create conflicts with approved local comprehensive plans, other agency pro-

grams, coastal resource Goals 16, 17, and 18, or the state's federally-approved coastal zone management program.

The need to consider onshore effects is reinforced by the fact that agency "coordination programs" must include a program for "coordination of the agency's activities affecting land use with similar activities of other state and federal agencies, local governments, and special districts." ORS § 197.090(1)(b) and OAR 660-30-060-(2)(c) and (5). Therefore, agencies should broadly assess proposed nearshore ocean uses so that associated development of onshore support facilities is coordinated and consistent with other goals, local plans, and other agency programs.

In addition, where a decision to permit a use of the territorial sea has onshore effects, and there is no acknowledged local comprehensive plan, it appears that OAR 660-31-025(1) would allow incompatible agency and local government determinations regarding a permit's consistency with the goals. The rule should explain how conflicting determinations must be harmonized. One logical approach could be the invocation of DLCD mediation, as described in OAR 660-30-070 and ORS § 197.190(1).

Any significant changes in state regulations, statutes, and programs made pursuant to this report should be submitted to the National Oceanic and Atmospheric Administration's Office of Coastal Resource Management (OCRM) as routine implementation or amendments to Oregon's federally-approved coastal management program. When approved by OCRM, the federal consistency provisions of the Coastal Zone Management Act will apply to the changes.

Finally, many of the activity-specific legal-institutional recommendations below have to do with the need for state agencies other than DLCD to address provisions of Goal 19. However, the principal burden of complying with the Ocean Resources Goal should not fall on individual agencies considering individual requests for permits, leases, or other state authorization to engage in nearshore resource exploitation activities. Instead, significant state resources in people, time, and money should be devoted to development of a general methodology for goal compliance usable by all agencies with nearshore responsibilities. Development of an effective methodology probably would require an interagency staff effort coordinated by DLCD. The methodology would: (1) tell agencies how to assess impacts on fishing and navigation and reference available data useful in impact assessment, and (2) begin the huge task of data location and gathering connected with the goal's resource inventory requirements. Procedurally, this interagency effort could proceed activity by activity, e.g., marine minerals mining, offshore oil and gas, kelp harvesting, thereby organizing and focusing the use of valuable agency expertise one step at a time.

Thus, it is recommended that a series of workshops be held by DLCD and relevant agencies to outline the programs, policies, legislation, and rules needed to fully make use of Goal 19's potential as a state ocean management and coordination tool. Inclusion of representatives of industry and public interest groups in this process would help identify and avoid unnecessary conflicts.

The foregoing exercise would provide state agencies opportunities to consolidate or to recommend that the legislature eliminate overlapping and duplicative state permit requirements governing nearshore activities identified in the study. It also presents an

opportunity to evaluate and revise state ocean policy where appropriate. As an example, while petroleum prices are low, should state policy be to promote offshore oil and gas exploration and developments, or to take back (with compensation as necessary) any outstanding permits and leases as Alaska is doing in Cook Inlet? Also, should state seabed minerals be available for development if current economics and technology appear to favor onshore over offshore deposits.

The process recommended aiso offers opportunities to coordinate federal and state permit requirements in the territorial sea. Even though the states generally own and manage ocean resources seaward to three miles pursuant to the Submerged Lands Act, federal agencies such as EPA and the Army Corps of Engineers (under statutes such as the federal Clean Water Act) still regulate activities within three miles of the coast. The study cataloged applicabie federal permit requirements and found that few opportunities for federal-state permit coordination had been implemented. Exceptions include the close coordination between the Corps and DSL regarding dredging and filling, and the federal consistency review process under the federal Coastal Zone Management Act (CZMA). More federal-state coordination and the elimination of overlapping or duplicative state permit requirements would significantly reduce regulatory costs for nearshore resource users. This could be accomplished without sacrificing the integrity of the public sector decision-making process with respect to the use and development of state owned and managed resources.

Finally, a well-executed state nearshore pianning exercise would strengthen the state's credentials in dealing with federal ocean initiatives such as Interior Department petroleum and minerals leasing activities, Navy proposals to sink decommissioned nuclear submarines offshore, and EPA authorization of ocean incineration of hazardous wastes. In responding to federal ocean initiatives beyond three miles, Oregon frequently finds itself in a negative, reactive position due to perceived adverse effects on state interests and state and local costs exceeding corresponding benefits. Getting the state offshore management house in order would give Oregon stronger positions on federal initiatives in the EEZ. For example, in responding to federal oil and gas lease proposals, state recommendations for buffer zones around economically important fishing areas beyond three miles would carry much more weight if the state has used equal care to protect fishing areas within three miles.

Recent federal court decisions have significantly reduced a coastal state's legal power to command federal respect for state interests offshore under the CZMA's federal consistency provisions. Now, coastal states must earn federal (Congressional) respect through some progressive state offshore planning such as Goal 19 envisions. Furthermore, with the reauthorized CZMA providing for a diminishing flow of federal coastal planning dollars to the states, state legislatures must be prepared to adequately fund state agency participation in state interagency nearshore planning processes like the one recommended in this study and recently carried out by other states. High quality planning and management of territorial sea resources can only strengthen the case currently being make by Oregonians in the Coastal States Organization, Western Legislative Conference, and elsewhere for a greater state role in management of United States EEZ resources. Furthermore, demonstrated state ocean

management capabilities will be an important factor in Congressional decisionmaking concerning the allocation of federal and state responsibilities if and when the United States joins most other nations by widening its territorial sea from three to twelve miles.

S.3. MARINE MINERAL MINING

The possibility of mining marine minerals, both within the Oregon territorial sea, and further offshore within the 200 nautical mile Exclusive Economic Zone, has attracted a good deal of interest in the last several years. It is also one of the principal reasons for increasing state interest in ocean management.

In this section, nearshore mineral resources are discussed, including heavy mineral placer deposits, and sand and gravel. While placers are discussed first and in more detail, many of the recommendations are applicable to both. This is particularly true for the legal-institutional section.

S.3.1. Offshore Placers

Placer deposits are found on beaches throughout the world and contain a variety of valuable minerals and metals. They are also found on relict beaches, some submerged out on the continental shelf, and others inland on uplifted marine terraces. Placers are formed by wave dynamics on beaches; the heavier, fine-grained materials are sorted and concentrated into distinct deposits. Beach placers are found all along the Oregon coast, usually in pockets on the south side of headlands. There are also significant placer deposits found on uplifted terraces in southern Oregon, and just offshore on the narrow continental shelf. Minerals and metals found in these and other Oregon placers include magnetite, ilmenite, chromite, garnet, zircon, gold, platinum and others.

Placer deposits in southern Oregon, both onshore and offshore, contain significant concentrations of the strategic mineral chromite. Recently, both scientific and private industry interest have focused on these resources. Estimates of placer chromite resources onshore range up to 2.6 million metric tons; while no credible estimates have been made of offshore chromite resources, scientists hypothesize that they may be many times larger. Offshore surface samples with significant amounts of heavy minerals, including magnetite, chromite, ilmenite, garnet, zircon, gold and platinum, have been found off the Rogue River and Cape Blanco areas (see figure 3-3, Chapter 3). Marine geologists speculate that these are only outcroppings of more significant deposits that lie below, having mostly been covered up by less valuable sediments.

Evaluating the development potential of Oregon's offshore placer deposits will involve a number of activities, including: (1) exploration to determine the location, extent and characteristics of offshore placer deposits, (2) an economic analysis of the potential markets for the minerals of interest, (3) an assessment of extraction and processing technology, and (4) an evaluation of potential environmental effects and use conflicts. Prior to initiation of these activities, however, the state needs to establish an effective management regime governing ocean mining, including exploration, leasing or licensing, and development. Each of these are discussed below.

S.3.1.1. Exploration for Offshore Placer Deposits

More information is needed about the location, extent and mineral characteristics of Oregon's offshore placers to assess the feasibility of their development. Modern geophysical and geological techniques will be needed to make such an assessment and the expense will be significant. Without such data, however, needed economic studies, assessment of mining technologies and environmental impact evaluations will not be possible. For example, information on the size and concentration of deposits is needed to determine whether or not the resource is sufficient to support a long-term mining operation. Information on the location of deposits, the depth of water, and the amount of sediment overburden is needed before alternative mining methods and technology can be evaluated. This information is also needed to determine the likely environmental impacts and conflicts with other uses of the ocean.

Research underway or planned by scientists at Oregon State University will provide much of the initial data needed to suggest likely target areas for industry prospecting. This work will take several years to complete, and is contingent on continued public and private financial support. The principal scientific interest is in evaluating hypotheses regarding formation and concentration of placers on the continental shelf.

Because of the United States' dependence on imports of strategic minerals from uncertain suppliers like South Africa, the Soviet Union and the Philippines, the exploration and inventory suggested here also has national security implications. Knowing the status of our own mineral resources like chromite reduces our vulnerability to supply interruptions. The generation of such information would also comply with the LCDC Ocean Resources Goal 19 inventory requirements.

S.3.1.2. Economic Feasibility of Offshore Placer Mining

To succeed economically, a placer mining venture off Oregon would probably need to market a variety of the minerals and metals present. While chromite is considered the principal economic mineral in these deposits, the simultaneous recovery and marketing of other constituents, such as gold, platinum, ilmenite and garnet would make a mining operation more feasible, if sufficient quantities and markets are available. Chromite, however, is the key.

The economics of domestic chromite resources are complicated by worldwide supply-demand relationships, changing processing technologies, the variety of markets and uses, special mineralogical and other requirements for different end uses, and the wide range in prices for different types and grades of ore.

The U.S. uses about 15% of the world production of chromite each year, averaging 442,000 metric tons annually from 1980-84. There is no domestic chromite industry; 80-90% of U.S. demand is filled by foreign imports and the remainder by recycling. Domestic resources are relatively small on a global scale; nearly all are low grade and not competitive with foreign sources.

The principal uses of chromite in the U.S. are in the metallurgical industry to make stainless steel and other chrome alloys (68%), the refractory industry for heat-resistant bricks and mortar (13%), and the chemical industry (19%), where principal products are dichromates and chromium metal. Prices range from $40-50/short ton for low iron chromite (such as Ore-

gon placer chromite) to $125/short ton for high-grade, low-iron chromite.

It is difficult to predict what Oregon's placer chromite might be used for. Because of its high iron content, it is unlikely to be used in the refractory industry, though it could be blended with higher grades of chromite for this purpose. It is more likely to be used as feedstock for the chemical industry, or to make the lower grade charge chrome variety of ferrochrome. Higher grade ferrochrome used in many metallurgical applications requires low iron chromite not available in Oregon placers. Another important factor to consider is the status of the chromite processing industry in the U.S. The domestic ferrochrome industry has almost disappeared, because we are importing virtually all of the ferrochrome we need for metallurgical uses directly from chromite-producing countries. The few remaining domestic facilities are all located on the east coast, presenting significant transportation problems and costs. The fine particle nature of chromite sand is another drawback, because the ferrochromium production process requires large chunks of material for smelting. Placer sands would have to be agglomerated, adding additional costs.

Costs of mining Oregon's offshore placers and processing them to make chromite concentrate have been estimated and range from $87 to $125 per ton, about twice the market price for high-iron chromite. Similar estimates have been made for U.S. land-based chromite resources. More information is needed about all the minerals present in the deposits to make accurate estimates of the marketability of Oregon's offshore placers.

Despite these obstacles, a proposal has been put forth to construct a modern low-carbon ferrochrome production facility on the North Spit of Coos Bay. Principals in the proposal are PSM Technologies, a Vancouver, B.C. based firm, and Wooding Corporation of New Jersey, jointly operating in Oregon as Sherwood Pacific, Ltd. It is unclear where the chromite feedstock for such a facility would come from, but its promoters claim to have developed a new process for production of ferrochrome. The location of significant onshore and offshore chromite resources may have a bearing on the decision to locate in southern Oregon.

At present, the economics of chromite do not make development of Oregon's offshore deposits seem particularly attractive. However, if the deposits prove to be large, highly-concentrated and relatively easy to recover, that situation could change. This is especially true if foreign supplies were interrupted for any reason, or the U.S. government deemed it in the national interest to maintain a viable domestic industry and provided needed incentives to private miners and processors. New technologies could also have a bearing on the economics of development. More information is needed about these deposits to assess the true economic and development potential.

S.3.1.3. Technology Assessment for Offshore Placer Mining

Before questions dealing with environmental concerns or use conflicts can be raised and answered, more information will be needed about the types of technology and processes that would be involved in extracting and processing placers. The exploration suggested above should provide the information necessary for evaluating possible mining and processing technologies. Table 3-3 in Chapter 3 listed factors that are involved in the design of a marine mining system.

The most important of these for extraction included deposit and site characteristics such as water depth, amount of overburden, sediment type, distance from shore, and average and extraordinary sea conditions. Federal and state regulations would also be a factor when choosing mining methods.

Factors involved in processing systems design include the nature of the deposit and the minerals of interest, the markets and proposed end uses, and the distance to the market. Government regulations both offshore and onshore (e.g., land use) also are critical.

A likely placer mining scenario would include: (1) extraction by a hydraulic hopper dredge, either a trailing suction or submerged head variety, (2) primary processing at sea, by size screening and perhaps gravity separation, with the unwanted fraction pumped overboard or piped back to the bottom, and (3) further onshore processing to concentrate the minerals for shipment. Additional processing onshore (e.g., ferrochrome production as suggested above) might take place, or there might be no shore processing at all, with ore concentrate shipped directly to the market from the mining site. The actual scenario would also depend on the availability of mining equipment, the scale of the operation proposed, and the costs associated with possible alternatives.

S.3.1.4. Environmental Effects and Use Conflicts Associated with Placer Mining and Processing

In Chapter 3 of this report, potential environmental effects of offshore placer mining and use conflicts were discussed. In doing so, assumptions were made about the types of technology that might be employed, i.e., the development scenario described above. Possible environmental effects cited included bottom alterations, increased coastal erosion, the removal of benthic organisms, particulate matter and toxic chemical effects on both bottom and water column organisms, increased turbidity, retardation of photosynthesis, aesthetic effects, and land use and estuarine impacts at processing areas. Many environmental problems may be avoided or mitigated through judicious choice of mining methods, and good operational mining practices.

Principal nearshore use conflicts identified had to do with the fishing industry, the recreation industry and competing uses onshore. Competition for ocean areas important for both mining and fishing may be important, and involve both navigation rights, and ecological/habitat considerations. Mining nearshore may adversely effect sand supply on the beach and lead to erosion of ocean shorefront property. Processing facilities onshore would be in competition with other facilities for limited space and water access.

Actual environmental issues and use conflicts will depend on the results of exploration and subsequent decisions about mining and processing methods. Until more is known, the types of impacts and conflicts suggested in Chapter 3 serve as a guide for discussion and further study.

S.3.2. Sand and Gravel

Oregon's deposits of gravel within the nearshore zone are scattered and relatively small, especially in comparison to those off the Washington coast. The deposits and their estimated size are shown in Figure 3-3 and Table 3-2 of Chapter 3. They are roughly estimated at 100 to 500 million cubic meters, depending on assumptions about deposit thickness. Despite their relatively small size, there may be some potential for

mining these deposits in the future to supplement dwindling coastal and inland supplies of aggregate.

As with placers, a more detailed inventory of offshore sand and gravel deposits is needed, particularly estimates of size and quality of individual deposits. Economic evaluation of offshore gravel mining is also needed, and would be relatively easy compared to placers. This is because there is available information on demand, prices, and the proven technology used to mine gravel in many parts of the world.

A development scenario for sand and gravel mining would be similar in some respects to that of placers. Dredging would likely be accomplished with a trailing suction-type hopper dredge. Markets for the material would either be local, or as suggested by several experts, major urban areas along the west coast.

Many of the same environmental impacts and use conflicts associated with placer mining might be expected for sand and gravel mining, especially in regard to the fishing industry. This will in large part depend on the relative location of gravel deposits and fishing grounds. However, given the coexistence of extensive gravel mining and a viable fishing industry in the North Sea, this may not prove to be a serious problem, particularly if good mining practices are employed.

S.3.3. Legal and Institutional Issues

State and federal agency authorities related to mining of minerals within Oregon's territorial sea boundary were described in Chapter 3 of this report. Existing legislation as recently amended does provide the Division of State Lands with clear authority over minerals exploration activities, ORS § 274.735(1) as amended by 1987 S.B. 606. In March 1987, DSL began developing rules to govern commercial exploration for hard minerals and academic research in hard minerals, oil, gas, and related sulphur resources. The amended statute cited above gives DSL additional guidance for this rule-making. However, no statute or regulation currently provides detailed rules for mining hard minerals from the seabed. DSL's existing authorities could provide a structure for a state nearshore ocean mining program; however, the legal basis for such a program would be loose and somewhat fragmented.

For example, the Submerged and Submersible Lands statute, ORS § 274.705-.860, gives the DSL "exclusive jurisdiction" over submerged lands. ORS § 274.710(1). More specifically, ORS § 274.710(2) gives DSL the authority to "administer and control all tidal submerged lands," and allows it to lease the submerged and submersible lands and dispose of the oil, gas and sulphur under them.

This section seems restricted to oil, gas, and sulphur leases. However, a subsequent section, ORS § 274.720(2), goes on to state that the Submerged and Submersible Lands statute shall not affect DSL's power to "lease mineral rights, other than oil, gas and sulphur underlying lands" (emphasis added) subject to the submerged lands statute.

In addition, ORS § 273.780(2) allows the DSL to control mining of state lands, which presumably includes seabed mining, by means of an "exploration permit or lease." ORS § 273.551(1) gives DSL further authority to lease minerals on state lands, including submerged lands.

Finally, ORS § 541.605 et seq. gives DSL authority to regulate removals (e.g., dredge mining) and fills (e.g., at-sea disposal of mine tailings).

Notwithstanding these general statutory authorities to lease minerals on submerged and submersible lands, there are no existing administrative rules derived from them that expressly govern nearshore ocean mining.

This study makes two legal-institutional recommendations regarding seabed mining. First, if the state wants to foster opportunities to mine its nearshore zone, the DSL should develop administrative rules that apply specifically to offshore mining operations. The framework of authorities discussed above arguably provides a workable basis from which to promulgate regulations specific to seabed mining.

Second, as a more comprehensive and long term measure, the DSL should consider recommending new legislation to govern ocean mining. It may be desirable for such proposed legislation to be similar to that found in the federal Deep Seabed Hard Mineral Resources Act, at 30 USCA §§ 1401 et seq., administered by the National Oceanic and Atmospheric Administration (NOAA).

These two major recommendations are taken up below.

S.3.3.1. Interim Regulations

The need for nearshore ocean mining administrative rules has been apparent to DSL since they first received inquiries from private mining interests several years ago. In material provided by the agency for this study, DSL outlined a suggested leasing and regulatory scheme that relies on their various authorities. The authors' interpretation of that scheme is summarized below:

1. Circulation of public notice.
2. Public hearing.
3. Evaluation whether leasing would be in the public interest based on the statutory evaluation criteria now used for oil and gas leasing and onshore minerals leasing.
4. State Land Board decision on DSL recommendation to lease or not lease (which itself would be based on results of steps 2. and 3. above).
5. Public auction.
6. Development of lease. Conditions would be set through consultation with all interested governmental agencies and special interest groups.
7. Lessee develops (a) a site-specific impact assessment, and (b) a development and operation plan. State agencies review and comment.
8. DSL recommends on whether or not to issue a "surface occupancy permit." This will require State Land Board approval and a review of the proposed mining for consistency with Ocean Resources Goal 19. Concurrently, the lessee will apply for a Removal/Fill permit from DSL, and necessary regulatory permits from other governmental agencies. Issuance of a surface occupancy permit is considered a final decision.

Recognizing that this scheme is a very preliminary outline, it still poses a number of important questions. The proposal is unclear regarding how the location and size of potential mining areas will be determined. If exploration and precise delineation of mineral deposits is required prior to leasing, would this data be made public, or would it be the private property of the explorer? If so, how long would the industry data remain proprietary? If the exploration occurs as a cooperative effort of industry, academia, and government, and mineral information is made public, will the industry group that has contributed to the exploration research receive any special advantage in the lease process?

1987 Oregon Senate Bill 606 answered these questions by making exploration data public and providing explorers with a preference right to lease tracts they explored if they were offered for lease by DSL after December 31, 1989 consistent with a territorial sea submerged lands management plan adopted by the State Land Board.

Once leases and permits are issued, how much supervision will DSL or DOGAMI maintain over the mining operations? Will DSL reserve rights to modify the lease in response to environmental damage or other contingencies? These issues are not fully considered in the outlined proposal.

Another major concern is how and where potentially conflicting interest groups and the public get involved in the decision-making process. The above process seems to provide a place at the outset, and then at the end through the Removal/Fill permit process, but it would be to the advantage of all parties to have conflict resolution built into the process at each stage. This may be possible with the outlined process, but it is not clearly stated.

A large-scale seabed mining program certainly would require DSL rulemaking that should address these and other issues. Although the Legislature intended that DSL's power to lease minerals other than oil and gas was not to be affected by the passage of the submerged lands statute, ORS § 274.720(2), it is not certain that extensive seabed mining was contemplated when it the statute was passed. Opponents of such a program might argue that insufficient statutory authority exists to conduct hard mineral mining in Oregon's territorial sea.

Given the likelihood that such mining will be controversial, and because there is no statute explicitly governing ocean mining, DSL's promulgation of rules for such operations should only be an interim measure. The Legislature should develop a statutory regime to govern nearshore ocean mining.

S.3.3.2. New Legislation

Adoption of legislation similar to the federal Deep Seabed Hard Mineral Resources Act (DSHMRA), 30 USCA §§ 1401 et. seq., should be considered as a more effective means to regulate nearshore ocean mining in Oregon. Most importantly, this would substitute a license and permit system for exploration and development, instead of the leasing system implied in present Oregon law.

The chief advantage of a license and permit system is that the minerals are retained in state ownership until their removal from the seabed, rather than transferring lease property rights in the state seabed to a private company. Thus, DSL could effectively control a hitherto undetermined resource and retain sufficient flexibility to respond to any unanticipated effects of the mining without unconstitutionally interfering with property rights or incurring any obligation to compensate the mining company.

Other relevant characteristics of the DSHMRA and their relation to Oregon law and procedures are detailed below. The authors are aware that the Mineral Management Service, Department of Interior, is presently preparing regulations for marine mining in federal waters under the Outer Continental Shelf Lands Act and that the recommendations made here may not parallel that scheme.

Under the federal DSHMRA system, a miner may obtain a 10-year license for exploration, and subsequently a 20-year permit for commercial recovery. 30 USCA § 1413(a)(1). An exploration plan must be submitted with the license application, and a commercial recovery plan must be submitted with the permit application. The plans must detail the area to be explored or mined, methods to be used, and measures taken to monitor and safeguard the environment. Each application must also contain financial, technical and environmental information relevant to the planned operation. 30 USCA § 1413(a)(2)(A,B, & C).

NOAA may disapprove a specific area proposed for exploration or recovery, if commercial recovery would result in "significant" environmental damage "which cannot be avoided by the imposition of reasonable restrictions." 30 USCA § 1413(a)(2)(D). No license or permit may be issued or transferred if the exploration or recovery would have adverse environmental effects, or inordinately threaten life and property at sea. 30 USCA § 1415(a)(4) and (5).

Under existing Oregon law, mining within the territorial sea must comply with Goal 19's requirement of giving "clear priority to the proper management and protection of renewable resources" such as "food production, water quality, navigation, recreation and aesthetic enjoyment." Because these are resources that involve the responsibilities of numerous agencies and interest groups, new state mining legislation could incorporate appropriate interagency coordination and conflict resolution mechanisms. Such questions as onshore or at-sea processing, waste disposal methods, the extent of onshore development anticipated, and the adequacy of contingency plans could all be considered through the process of issuing licenses and permits. Thus, the compliance of the seabed mining with Goal 19 and other statewide planning goals would be easier to insure.

Also, court decisions interpreting the coastal goals require DSL to inventory seabed mineral resources adequately enough to demonstrate that proposed mining will be consistent with Goal 19's broad mandates. Audubon Society of Portland v. Oregon Department of Fish and Wildlife, 67 Or. App. 776, 780, 681, P.2d 135, 137 (1984). If Oregon had a statute similar to the DSHMRA, DSL's granting of an exploratory license would probably be consistent with the Goal 19 inventory requirement, provided the license conditions required information sharing with the agency. However, such information is generally considered to be proprietary. Therefore, the license terms would have to accommodate the need to protect a miner's investment in exploration information, and DSL's mandates for public risk assessment and decision-making.

Further, an exploratory license may or a commercial recovery permit would certainly be significant enough to warrant classification as a "Class A" permit under Oregon permit consistency requirements. OAR 660, Division 31. A DSL decision to issue either would be subject to discretionary public hearing by the agency. Any new state legislation should mandate public hearings before both licensing for exploration and permitting for commercial recovery.

The federal Act allows the imposition of "specific terms, conditions, and restrictions" on licenses and permits. 30 USCA § 1412(b)(1). NOAA may also modify any "term, condition, or restriction" after consultation with other interested agencies and the licensee or permittee, provided the modification is necessary to protect

the environment or promote safety of life and property at sea. 30 USCA § 1415(c)(2)(B). License or permit applications may be denied for the same reasons. 30 USCA § 1416(a)(1).

NOAA may order an emergency suspension of a license or permit, or suspend or modify particular activities under them, if necessary to protect the environment or for safety reasons. 30 USCA § 1416(c). Further, NOAA may suspend or revoke licenses or permits for failure to comply with the statute, its regulations, or conditions imposed upon them. 30 USCA § 1416(a)(2)(A).

Where a lessee has violated a statute or regulation, DSL has similar authority to cancel any mining or drilling lease for violations of statutes or regulations "in force at the date of invitation for bids." ORS § 274.850. However, ORS § 274.835 provides only that periodic mutual negotiations "may be carried out" to make lease conditions and regulations current "as warranted by changes in environment or operational methods."

The statute does not grant DSL the authority to cancel a lease because of a threat to the environment or the use of out-of-date or inefficient operational methods. Because lease rights are generally regarded as property rights, a cancellation for environmental reasons based on insufficient statutory authority may subject DSL to a lessee's compensation claim for the total value of the lease.

When requested, NOAA has discretion to grant revision of a license, permit, or the accompanying plans, so long as the scope of the revision is within that previously established by regulation. 30 USCA § 1415(c)(2). However, the regulations may require a public hearing for certain revisions. 30 USCA § 1415(c)(3). The federal statute's flexible authority to impose and revise conditions, restrictions, and operational plans, could be of great utility to DSL, especially in its initial supervision of resource extraction under untried conditions.

Federal provisions requiring consultation with "interested" agencies may be compared to the existing Oregon statutory requirement of DSL consultation with DOGAMI prior to issuing mineral leases. DSHMRA section 1413(e) demands NOAA's "full consultation and cooperation" with other federal agencies having "programs or activities" affected by seabed mining. These agencies may recommend that NOAA deny the proposed license or permit. However, the recommendation must also indicate any terms, conditions, or restrictions which might eliminate conflicts with the programs or statutory responsibilities of the consulted agency.

Any proposed Oregon seabed mining statute should continue to require DSL consultation with DOGAMI as well as the Departments of Fish and Wildlife and Environmental Quality regarding license and permit conditions. DSL should continue to rely on the expertise of these agencies when considering offshore mining operations.

Under the federal Act, the 10-year exploration license is issued on a first-come, first-served basis. 30 USCA § 1413(b). Each applicant for a license, or for a 20-year commercial recovery permit, must demonstrate financial responsibility and technical capability to operate prior to its receipt. 30 USCA § 1413(c). Both a license and a permit are exclusive once granted, and a valid exploration license entitles the holder to a recovery permit. 30 USCA § 1412(b)(2) and (3).

If a licensee has "substantially complied" with the license and explora-

tion plan, extensions for as long as five years "shall" be granted. 30 USCA § 1417(a). However, with some exceptions, if a permit holder is not recovering minerals in "commercial quantities" at the end of ten years, the permit "shall be terminated." Otherwise, permits shall be re-issued so long as commercial quantities of minerals are recovered annually. 30 USCA § 1417(b).

Licensees and permittees are required by DSHMRA 1418 to "pursue diligently" the activities described in their plans. This requirement includes "periodic reasonable expenditures" for exploration, and continuous commercial recovery throughout the permit period. 30 USCA § 1418(b) and (c).

Such provisions reward the serious and competent miner. If included in an Oregon statute, they would promote the state's interests in efficient mineral extraction and development. The DSL would be able to consider the costs of exploration and development, and the value of the resource, to establish a price adequate to encourage development yet maximize the state's revenues.

The requirement for due diligence (which is mandated at ORS § 273.-551(2) for onshore mining and drilling leases, § 274.645 for leases of navigable bay and riverbed, and § 274.810 for mineral leasing on submerged lands), along with other conditions imposed by license and permit, would allow DSL to exercise flexible control over the state's nearshore mineral resources while mining operations proceeded.

Other features of the DSHMRA scheme, however, may not be suitable for state ocean mining legislation covering the nearshore zone. Specifically, given the DSHMRA's orientation toward international high seas mining, the Act does not require NOAA approval of mapping, geophysical, geochemical, and random sampling activities. Geophysical activities would seem to be adequately covered by existing state legislation (see section 3.6.), which should be expanded to cover mapping, geochemical, and random sampling activities as well. Furthermore, under the DSHMRA, mining companies are permitted to select the size and location of exploration and commercial recovery areas subject to NOAA disapproval only if "significant" environmental damage would result as discussed above.

Conflicts between other users of the relatively narrow three-mile nearshore zone, such as fishermen and recreationists, might result under such a system. The authors recommend that any new state legislation provide DSL a much stronger role in exploration and commercial area size and selection than the DSHMRA provides NOAA, specifically including the authority to balance competing uses in such decisions. Given the likelihood that some significant offshore mineral deposits will straddle the three mile federal-state line, the state should also consider a cooperative resource management approach similar to the federal-state Gorda Ridge Technical Task Force.

S.4. OIL AND GAS DEVELOPMENT

Chapter 4 of this study covered a variety of subjects related to possible oil and gas development in the territorial sea. This included the potential size and location of Oregon's offshore oil and gas resources, the proposed 1992 oil and gas federal lease sale in waters off Oregon and Washington, oil and gas exploration and development technology, some possible environmental and use conflicts, and the present legal-institutional regime for exploration, development and production of oil and gas in state waters. Because little data is available that applies exclusively to state waters, parts of the discussion in that chapter drew on material that describes oil and gas potential on the continental shelf as a whole.

S.4.1. Oregon Oil and Gas Resources

The Oregon continental shelf has several sedimentary basins that have some potential for oil and gas. The main basins are located off Coos Bay-Winchester Bay, Newport-Depoe Bay, and Tillamook-Seaside. However, any area where sediment thickness exceeds 3000 feet (900 meters) must be considered as having potential. It appears that, in general, sites off the southern coast may hold more promise than those off the northern coast. Sediment thickness generally increases offshore toward the edge of the continental shelf, making it more likely that oil and gas would be found in deeper federally controlled waters than in the nearshore state waters. Little data from exploration is in the public domain, however, and prediction of actual oil and gas potential within the territorial sea is virtually impossible. Expression of industry interest prior to leasing for exploration and development will be a better indicator than available public data.

The federal Minerals Management Service (MMS) released new estimates of undiscovered economically recoverable oil and gas resources as of July 1984. These estimates were based on public as well as confidential industry data. For the combined Oregon-Washington OCS planning area, mean estimates were 180 million barrels of oil and 3.26 trillion cubic feet of natural gas. Combining oil and gas figures as barrel of oil equivalents (BOE), this comes to 760 million BOE. However, the probability that economically recoverable reserves exist was estimated to be only 20%. Taking this probability into account, the risked estimate for the region was only 150 million BOE. In the draft proposed 5-year lease schedule released in March 1985, the MMS further reduced the Oregon-Washington estimate to 56 million BOE of risked "leasable resources," with a net social value of $399 million. For comparison purposes, this is about 1/8 of the leasable resources estimated for the Northern California planning area and 1/20 of those for Southern California. Industry can be expected to have a corresponding degree of interest in exploration and development. This is not to say, however, that interest in one or more specific areas off Oregon and Washington will not be high.

S.4.2. History of Leasing and Exploration Activity

An Oregon and Washington OCS lease sale was held in October 1964. Bids were received on 74 of the 149 tracts offered off Oregon. Eight exploratory wells were drilled between 1965 and 1967, with indications of oil and gas in five, but not in commercially recoverable quantities. The federal lease sale was followed in December 1964 with a state lease sale, where 18 tracts were offered from just north of the Umpqua River to just south of the Coquille River. Bids were received on only two tracts, located just south of the Umpqua, but no exploratory wells were drilled. No offshore lease sales have been scheduled or held in the Oregon-Washington OCS planning area or state waters since the initial sale in 1964.

S.4.3. Federal 5-Year OCS Oil and Gas Leasing Program

The Oregon-Washington planning area has been included as a "frontier area" in the next 5-year (1988-1992) federal leasing program. (At the time of writing the program had not been signed by the Secretary of the Interior.) As a frontier area, formal activities for the Oregon-Washington planning area would commence with a "call for interest", scheduled for November 1989. If sufficient interest was expressed by industry, this would be followed by a call for information and lease tract nominations, lease area identification, a draft EIS, a public hearing or hearings, a final EIS, a proposed notice of sale, a due date for Governor of Oregon comments, a notice of sale and, finally, the sale itself, which is currently scheduled for April 1992.

If the Oregon-Washington planning area remains on the federal lease schedule, significant related federal activity will begin almost immediately. This could include studies to fill gaps in information needed to evaluate potential adverse effects of exploration and development, offshore oil spill contingency planning, state solicitation of input from present users of the ocean, and consideration of the need for and desirability of a lease sale in state waters. Already, an MMS-sponsored workshop-conference to determine environmental data needs for the area has been scheduled for January 1988. However, if the Oregon-Washington area does not remain on the federal leasing schedule, oil-and-gas related activities in state and federal waters can be expected to be minimal for at least the next five years.

Since the Oregon-Washington planning area will likely remain on the leasing schedule, Oregon and Washington, together with the MMS, should begin a process that: (1) seeks the advice of major ocean users, public interest groups and state agencies involved in the management of ocean resources in defining criteria for the exclusion of tracts from the leasing process, and (2) uses these criteria in making specific recommendations for tract exclusions. State territorial sea waters should be included in this evaluation process.

Other regional offshore oil and gas initiatives relevant to management of Oregon's nearshore include Interior's proposed lease sales off Northern California and Alaska and the possible resumption of exploratory drilling in Canadian waters north of Vancouver Island under joint federal-provincial management. Both could result in support activities onshore and offshore Oregon. Because of northerly current flows, oil and gas development off Northern California also raises pollution concerns in Oregon. Both the Northern California and Canadian initiatives also raise

concerns about adverse effects on anadromous fish that originate in Oregon.

S.4.4. Technology and Development

Exploratory drilling in state waters, all of which are less than 100 meters depth, will make use of shallow water jack-up rigs. In deeper offshore waters, semi-submersible platforms or drilling ships will be used.

Some major factors effecting oil and gas development decisions include water depth, weather conditions, and transportation systems--especially pipelines. For offshore Oregon, these factors represent considerable constraints to the prospective developer. Expensive technology will be required to explore promising areas farther offshore. Winter operations are likely to be particularly hazardous, though industry has gained substantial rough seas operating experience in the last 20 years in areas like Alaska and the North Sea. The lack of an oil pipeline system on the coast increases development costs, though the gas pipeline and LNG storage facility in Newport are a positive factor.

Despite the relatively small resource estimate for the Oregon-Washington area and the high costs likely to be associated with development, industry interest remains moderate, the industry having given it an average rating of 18th out of 26 planning areas in 1985. No such rating has been applied to state waters near shore.

S.4.5. Environmental Effects and Use Conflicts

Oil and gas exploration can affect the environment through seismic survey operations, drilling mud discharges, the physical presence of drilling and production platforms, noise and visual intrusion, and releases of hydrocarbons. These were detailed in Chapters 5 and 6 and judged to be a significant but not insurmountable concern. Projected effects of exploratory drilling and development can be predicted realistically only after specific lease sites are determined. The most sensitive sites should be excluded prior to the lease sale. Given the dynamic open ocean environment, however, prediction of impacts is a highly uncertain business.

In addition to possible environmental damage, use conflicts will center around the fishing industry. Exploratory drilling and later development means lost fishing area, potential for gear damage and other space conflicts offshore and onshore. Other ocean transport users also will experience navigation-related conflicts. Navigation hazards and fish catchability and gear conflicts can be mitigated by timely notification and education of personnel in both industries.

For example, vessels operating in federal waters pursuant to Interior Department permits sometimes have destroyed Oregon and Washington fishermen's valuable gear such as crab pots. The techniques to reduce such conflicts adopted by Interior at the urging of the Oregon Department of Land Conservation and Development (DLCD) and the Washington Department of Ecology discussed in section 10.8.1.8. should be reviewed by DSL for use in state waters. DSL may also want to publish and distribute a handbook for survey operators like the Washington DOE's *Handbook for Geophysical Survey Operators for Washington's Offshore and Inland Marine Waters* (1986) and, together with DLCD and the Oregon Department of Fish and Wildlife, organize a fishing industry/oil and gas industry newsletter and forum similar to the one developed in the Santa Barbara area. (Oil and Gas Project Newsletter for Fishermen and Offshore Oper-

ators, published by University of California Marine Advisory Program).

S.4.6. Legal and Institutional Issues

Agency authorities and responsibilities for managing offshore oil and gas exploration, development and production in state waters were detailed in Chapter 4. Primary control over such activities is vested in the Division of State Lands (DSL). The Department of Geology and Mineral Industries (DOGAMI) oversees drilling practices and technology, and the Department of Environmental Quality (DEQ) is responsible for pollution control related to drilling and oil spills. In addition, the Department of Fish and Wildlife (DF&W) may become involved if fish and wildlife are threatened.

Easements, permits and certificates must be obtained from DSL, DOT's Parks and Recreation Division (P&RD), and the Energy Facility Siting Council (EFSC) for certain key support facilities for nearshore oil and gas development, principally pipelines. Finally, the Department of Land Conservation and Development (DLCD) is responsible for ensuring compliance with provisions of Ocean Resources Goal 19 that are applicable to oil and gas operations.

Specific recommendations regarding these agencies and their regulatory authorities follow.

S.4.6.1. Division of State Lands (DSL)

Without defining the term, ORS § 273.051(2)(b) requires DSL to give "due consideration" to natural resource conservation prior to proceeding with oil and gas development. Absent a statutory definition, "due consideration" should be defined by regulation to incorporate Goal 19's emphasis on protection of renewable resources and long term benefits of the ocean. The regulations should also state that "due consideration" of natural resource conservation could not be effected without a resource inventory adequate to demonstrate that oil and gas leasing is compatible with Goal 19's mandates.

In addition, OAR 141, Division 10 should be expanded to indicate that prior to offering lands for oil and gas leases a public hearing must be held. This would make the regulation consistent with ORS § 274.755, which requires a public hearing. The hearing should also seek comments from other relevant agencies. The regulations also should declare that an oil and gas lease is equivalent to a Class A permit for consistency and coordination purposes.

An oil and gas lessee is currently required to exercise "due diligence" in drilling and developing a lease, and failure to do so subjects the lessee to a possible loss of the lease. ORS §§ 274.810 and .850. DSL lease regulations should also require due diligence in operating safely and cleanly, so that Goal 19 values of renewable resources and long term benefits from the ocean are protected. These safety conditions should be imposed in consultation with DOGAMI, recognizing DOGAMI's role in assuring safe and efficient drilling operations. Perhaps the statutory scope of due diligence should be expanded via legislative amendment also, but DSL's existing authority to impose such lease conditions can be derived from ORS § 197.180 et. seq. requiring agency compliance with the goals.

Finally, as mentioned above, DSL should classify oil and gas leases as Class A permits for the purposes of agency coordination and goal consistency. Such a change would make Goal 19 permit Guideline E (regarding assessment of onshore support and operation facilities, and the social,

economic, and environmental effects of their development) more clearly applicable to oil and gas leases.

S.4.6.2. Department of Oil, Gas, and Mineral Industries (DOGAMI)

DOGAMI has oversight responsibility to see that drilling is done in a safe and efficient manner. ORS §§ 520.-055 - 520.095; OAR 632-10-012 to-220. By regulation, DOGAMI should require lessees to incorporate a DOGAMI-approved contingency plan when submitting their exploration and drilling permit applications. This would be consistent with the third Implementation Requirement for Goal 19, Contingency Plans, which states, inter alia, that prior to issuing permits for offshore development, agencies "shall establish contingency plans and emergency procedures to be followed in the event that the operation results in conditions which threaten to damage the environment."

S.4.6.3. Related Statutory Amendments

(a) ORS § 520.025(3) should be amended to require a public hearing prior to the issuance of a drilling permit by the State Geologist. For the purposes of coordination and consistency, a drilling permit should be reclassified as a Class A permit.

(b) ORS § 274.820(1) should be amended to delete "avoidable" when referring to pollution or contamination of the ocean from oil and gas operations. The state should not have to prove negligence on the part of the operator to recover pollution damages. Pollution is a recognized risk of oil and gas development and the producer should clearly understand that he is strictly liable for damages as provided by ORS § 468.-790(1).

(c) ORS § 274.845 should be amended to make clear that lessee surrender of lease rights does not also release the lessee from any liability for clean-up or obligation to remove structures, etc. In addition, ORS § 274.835 should be strengthened by eliminating the reference to "periodic mutual negotiations between lessee and lessor," and adding an authorization for DSL to make changes in terms and conditions as warranted by environmental conditions and operational methods.

(d) ORS § 274.805 should be amended to remove any implication of broad lessee discretion regarding drilling locations and methods without further state agency approvals.

S.4.6.4. Pipelines

(a) OAR 736-20-040 should be amended to reflect the requirement in ORS § 390.715(1) of payment of "just compensation" by pipeline permittees. Compensation should be determined by the Parks and Recreation Division (P&RD) after it has been decided to issue a permit.

(b) In administering OAR 736-20-040(11) regarding pipeline permits, P&RD should require permittees to post bonds and/or establish compensation funds in case of leaks, breaks, or other pipeline malfunctions. A contingency plan for such malfunctions or accidents should also be developed in accord with Goal 19 permit Guidelines.

(c) ORS § 390.715 requires the Department of Transportation (DOT) to provide public notice of a pipeline permit, and requires a public hearing if sufficient persons request one. By regulation, pipeline permits should be classified as Class A permits, and OAR 736-20-040 should be amended to reflect the statutory provisions of notice and public hearing.

(d) Notwithstanding DSL's constitution and statute-based exclusive jurisdiction over submerged lands, ORS § 390.715 authorizes DOT to issue permits for pipelines crossing ocean shores and adjacent submerged lands. However, under ORS § 274.040, DSL may have concurrent jurisdiction with DOT over pipelines in nearshore waters. (See also ORS §§ 273.551(3); 274.915; 274.910(1); 274.710(3)(a).) A formal memorandum of understanding between DOT and DSL could be used to clarify their respective roles and responsibilities. Legislative clarification should be sought if the joint permit process still does not work smoothly.

(e) Under ORS § 469.300 EFSC has jurisdiction over pipelines over a certain length, "synthetic fuel plants", and barge basins. EFSC recently promulgated rules governing the siting of natural gas pipelines. OAR 345-125-010 through 345-125-100. EFSC should develop rules or standards for siting the other two types of facilities consistent with its statutory authorities and the goals prior to any oil and gas development in federal or state waters.

S.4.6.5. Energy Facility Siting Council (EFSC)

Legislation should be introduced enlarging the scope of EFSC jurisdiction to include all facilities that store, process, transmit/transport, generate, or otherwise handle energy resources or products in liquid, gaseous or electrical form. Under that legislation, EFSC should designate areas within the state that are suitable or unsuitable for facilities that store, process, transmit/transport, generate, or otherwise handle energy resources or products in liquid, gaseous, or electrical form. If it is not feasible for EFSC to conduct a suitability study on which to base these designations, then EFSC should adopt siting standards for such facilities under which a siting permit applicant would be able to determine whether a proposed facility met the standards and demonstrate that fact to EFSC. EFSC's land use program coordination agreement should assure compliance by EFSC with Goal 19 and the other coastal goals when nearshore related matters come before it.

S.5. OIL SPILLS

Oil spills from offshore oil and gas operations, ship operations and major or minor accidents was the subject of Chapter 5. Topics covered included the fate of spilled oil, technology used to control and clean up spills, environmental effects and conflicts, estimates of oil spills that might be associated with oil and gas development of Oregon's territorial sea or outer continental shelf (OCS), and the legal-institutional authorities and responsibilities for oil spill response and cleanup. This section presents conclusions and recommendations regarding oil spills.

S.5.1. The Risk, Fate, and Effects of Oil Spills in Oregon Waters

Using spill frequency statistics from the Gulf of Mexico, oil development off Oregon would result in up to an estimated 14,550 barrels of spills from platform operations, and tanker and pipeline transportation over the life of offshore fields. This figure might be low given the less hospitable offshore environment of the Pacific Northwest. Little or no data is available on the routine discharge of oil and other petroleum products in Oregon waters from transiting ships. An example of the type of accidents that might occur in nearshore waters was the *Blue Magpie* wreck on the jetties of Yaquina Bay in 1983. It resulted in the spillage of approximately 2000 barrels of bunker C fuel oil and diesel.

The fate of oil spilled on or near the Oregon coast will depend on wind, weather, currents, what type of product is spilled and the location of the spill. A variety of processes begin to take place once the oil is spilled. As oil spreads over the surface, some of it disperses into the water column, and some may sink. Evaporation, dissolution and photo-oxidation cause spilled oil to "weather." Microbial degradation is also important in dispersing the oil.

Except for existing harbors where there are petroleum shipments and other shipping that might result in accidents like the *Blue Magpie*, it is difficult to predict where the areas of greatest oil spill risk are on the Oregon coast. If oil and gas discoveries are made offshore Oregon, more precise estimates of risk associated with development, production and transportation can be made.

Dispersal and containment strategies for oil spills include natural dispersion, isolation and/or physical removal (from the surface or from areas of deposition after movement onshore), or chemical dispersal. If spills occur during very bad weather, which is a time of greater risk, natural dispersion may be the only alternative (e.g., as in the *Blue Magpie*). This may be the case even during relatively good weather because the ocean environment is so dynamic. In such cases, emphasis is placed on cleanup if there was oil movement onshore, or dispersal, if offshore. These conclusions, however, are largely speculative and will probably be modified when oil spill contingency planning mandated by Goal 19 takes place.

There is an immense literature dealing with the effects of oil in the

marine environment, a brief summary of which was provided in Chapter 5. It was suggested that effects on phytoplankton were likely to be minimal, but that zooplankters would be more heavily impacted, especially as regards sublethal effects. Adult fishes, being highly mobile, seem to be least effected, though fish eggs and larvae are quite sensitive. Sublethal changes in development, growth, and behavior appear to be possible, in all major organism groups, at hydrocarbon concentrations found beneath oil slicks. Impacts on benthic dwellers, intertidal organisms and marine macrophytes, while difficult to generalize, may be quite severe. This is especially true if oil becomes incorporated into the sediments or if it moves onshore in rocky areas.

The most apparent effects of oil spills are on birds and marine mammals. Birds in particular suffer when coated with oil because they lose the buoyancy and insulating properties of their feathers and drown or die of exposure. Ingestion of oil during preening has toxic effects. In addition, even very small amounts of oil, carried back to the next and deposited on the eggs, can result in significantly reduced hatching success.

S.5.2. Legal-Institutional Issues and Recommendations

Oregon state agency authorities and responsibilities for dealing with oil spills are clearly defined. Primary responsibility lies with the Department of Environmental Quality (DEQ), with supporting roles provided by the Department of Fish and Wildlife (DF&W) and the Department of Land Conservation and Development (DLCD). Specific recommendations regarding oil spills in the nearshore ocean area follow:

(a) As required by Goal 19, contingency plans for oil spills should be developed for nearshore waters. This is especially imperative because submerged federal lands off Oregon's coast remain scheduled for lease in the near future by the Department of Interior. Development of federal leases is likely to promote development within the territorial sea, and oil production in either area carries the risk of spills.

Contingency planning might best occur in stages, the first stage prior to leasing, the second associated with issuance of oil and gas exploration and development permits, and a third related to production activities. More information and a more accurate risk assessment should then be available for each stage of planning.

The contingency planning required by Goal 19 is compatible with DEQ's mandate to develop an "oil and hazardous material emergency response master plan." ORS § 466.620(1). The Master Plan is to include "ongoing training programs for local government and state agency employees involved in response to spills." Id. at (2). According to the DEQ, the plan will define the roles and responsibilities of local, state, federal and industry response personnel during emergency spills. The plan will also establish response procedures, and identify the planning, training and equipment needed to make the plan effective. The Master Plan was to be completed by December 1986.

Under ORS § 466.670, as much as $2.5 million (received by the state of Oregon from the U.S. Department of Energy's Petroleum Violation Escrow Fund) may be credited to Oregon's Oil and Hazardous Material Emergency Response and Remedial Action Fund. Money may be paid into the Oregon Emergency Fund "[a]s permitted by federal court decisions, federal statutory requirements and administrative decisions, after payment of

associated legal expenses," and if it is "not obligated by federal requirements to existing energy programs." ORS § 466.670(1).

Oregon's Emergency Fund may be used to train local and state employees involved in oil and hazardous material spill responses. ORS § 466.-675(1) and (2). In addition, ORS § 466.675(3) allows the Fund to pay for state clean-up and disposal costs, including legal costs. These costs may be incurred by DEQ under ORS § 466.645(2) and (3) when the spiller does not immediately and adequately clean up as required by ORS § 466.-645(1).

However, it is not certain that the DOE money will be available in the quantities authorized. Depending on the scope of offshore oil development and associated transportation, the authorized amount may not be sufficient to accommodate a disastrous spill or blow-out. Therefore, the contingency planning should include an assessment of the amounts available to the state from the Emergency Fund to finance training of local and state employees in emergency spill responses, as well as an estimate of amounts which may be needed for oil spill clean-up actions.

(b) If the assessment determines that sufficient money is not available to Oregon's Oil and Hazardous Material Emergency Response and Remedial Action Fund from the DOE Petroleum Violations Escrow Fund, DEQ should consider proposing legislation to augment the Oregon Fund. This legislation could be similar to the Oil Spillage Control Fund terminated by the 1977 legislature.

In addition to paying for state clean-up costs, an augmented Oregon Emergency Fund could be used to promptly compensate private damage claims without first waiting to determine the extent of the spiller's liability. The state could then recover the Fund's losses from the spiller on behalf of the state and injured private parties, if necessary through court action under ORS § 466.640 (strict liability, plus exceptions).

The Maine Oil Discharge Prevention and Control Act (Law of Maine of 1970, Ch. 572) might be used as a model for legislation to augment Oregon's Emergency Fund. Maine's Act creates a fund, financed by fees paid by the oil industry, to pay for the claims of persons suffering damage from oil discharge and for costs of oil pollution abatement. Although similar to the strict liability imposed by ORS § 466.640, the Maine Act more specifically imposes unlimited liability without fault on offending vessels and terminal facilities, and directs the state to recover from the polluter all funds expended. The legislation's funding mechanism should be designed to comply with the Oregon Attorney General's Letter of Advice OP-6066 (Feb. 6, 1987) to DEQ's Richard Reiter pointing out that taxes or excises on oil, natural gas, or motor vehicle fuel are dedicated to the state's Common School Fund or Highway Fund but permit fees on all storage tanks without regard to product could be used for oil spill clean up and compensation purposes.

In addition, the procedures for calculating and collecting from oil spillers the damages to natural resources within the state (as distinguished from clean up costs and private damages) should be reviewed and updated in light of Alaska's simple approach of charging $1 per gallon spilled, and 1987 Washington State Senate Bill 5986 appropriating $275,000 for study of damage assessment methodologies. Some criminal prosecutions of water polluters in Washing state have resulted in the creation of trust funds

for fish and game enhancement exceeding $100,000, a technique that could be adopted by Oregon with respect to natural resources damages by oil spillers.

It would be prudent, of course, to draft Oregon legislation and regulations to be compatible with proposed federal oil spill "superfund" legislation such as H.R. 1632 approved by the House Merchant Marine and Fisheries Committee on May 5, 1987.

(c) DEQ should promulgate regulations to categorically prohibit any discharge of oily tanker ballast waters within the territorial sea. This could be done by specifically defining oily ballast as a "spill" that must be reported (ORS § 466.635), and which carries strict liability for clean-up costs (ORS § 466.640). Oily tanker ballast discharges may already fit within the DEQ's "spill" definition if it would "produce a visible oily sleek, oily solids or coat aquatic life, habitat or property with oil" (sic). OAR 340-47-010(4). However, specifically designating oily ballast discharges as a "spill" would put tankers on notice that all such discharges were illegal in Oregon waters, regardless of whether the state could ultimately establish that the discharge met the regulation's criteria for a spill.

Oregon's imposition of a strict discharge standard is supported by recent case law. The Ninth Circuit Court of Appeals in Chevron v. Hammond, 726 F.2d 483 (1984), cert. denied with opinions dissenting, 105 S. Ct. 2686 (1985), upheld Alaska's authority to impose within its territorial sea a higher tanker ballast discharge standard than that imposed by the Coast Guard. A strict Oregon standard would also be consistent with Goal 19's emphasis on protection of renewable resource.

S.6. MARINE POLLUTION AND ITS CONTROL

Chapter 6 dealt with several types of marine pollution, including municipal and industrial wastes, ocean dumping of dredged material, and marine litter. Some of the topics discussed were discharges into Oregon's nearshore waters, how these discharges were treated, specific pollutants of concern and their effects on marine organisms, possible conflicts with other ocean users, and agency authorities for control of marine pollution.

In general, it appears that none of the pollution sources discussed in Chapter 6 represent a serious threat to marine organisms, the marine environment or human health. There are several reasons for this conclusion. First, Oregon's nearshore ocean is a highly dynamic environment, due to strong tidal forces and nearshore currents, periodic storms and large waves. These produce an energetic environment where mixing is rapid and pollutants are quickly dispersed. Second, the volumes of marine and industrial wastes discharged are relatively small and have few of the toxic and persistent chemicals found in some areas of the country. Also, the dredged material that is dumped is generally clean sand. Thus, it appears that the wastes discharged into Oregon's nearshore waters are at a level well within the ocean's assimilative capacity.

Nevertheless, there is still concern about ocean disposal of waste. The principal reason for this is that there is so little information available about the ultimate fate of wastes dumped into Oregon's coastal ocean. Possible low level, sublethal effects on marine organisms are an additional concern. More research on these effects are needed, both to determine what they are, and to estimate the additional waste assimilation capacity of nearshore waters. This additional capacity, if any, represents an economic value of the ocean that can be exploited to the benefit of coastal community population and industrial growth.

S.6.1. Municipal and Industrial Wastes

Six municipal wastewater treatment plants dump directly into Oregon's nearshore waters. These plants, at Brookings, Depoe Bay, the Inn at Otter Crest, Netarts, Newport, and Yachats, employ secondary treatment and chlorinate their effluent. In 1984, together they discharged about 1.6 billion gallons of treated effluent, which for comparison is about 1.4% of the annual discharge of the largest ocean outfall off Los Angeles. The combined effluent from Oregon ocean outfalls contains approximately 250,000 pounds of total suspended solids (TSS) and 300,000 pounds of biochemical oxygen demand (BOD_5). Pathogenic organisms, persistent organic compounds and heavy metals are other materials of concern that may be found in treated municipal wastewater. Despite the low volume of effluent discharged and the rapid mixing and dispersion that takes place, there are occasional aesthetic problems because some of the outfalls are located too close to shore. Lengthening the outfall pipes should eliminate this problem.

All three industrial facilities that discharge wastewater into the ocean are pulp and paper mills, located at Coos Bay, Gardiner on the Umpqua River estuary, and at Toledo, which has an ocean outfall off Newport. In addition to suspended solids and biochemical oxygen demand, lignins, hydrogen sulfide, methyl mercaptan, resins, fatty acids and other compounds are discharged. High concentrations of these compounds are toxic to marine life. Therefore, concentrations that would be acutely toxic are not allowed under the NPDES permit, and toxicity bioassays are routinely conducted to assure that concentrations remain within permitted limits. Each of the three mills employs secondary treatment. Together, they discharged 8.1 billion gallons of effluent offshore in 1984. This effluent, which contained 9.82 million pounds of TSS and 5.88 million pounds of BOD_5, is more than 5 times that of combined municipal plants, but still only 7.1% of the single Los Angeles outfall noted earlier.

S.6.2. Dredged Material Disposal

Almost 7 million cubic yards of dredged material from 10 coastal harbors, channels and river mouth bars are dumped each year at 17 offshore disposal sites along the Oregon coast. Most is clean sand from Corps of Engineers channel maintenance projects dredged by hopper dredges. Upland sites are used for finer and more organic sediments. However, upland sites will soon be filled and these sediments may have to be disposed of at ocean sites. The environmental effects of dredged material disposal depend in part on the characteristics of the material. Heavy metals, petroleum compounds, pesticides and other persistent organic compounds tend to adhere to finer grained sediments. While these sediments are suspended in the water column, toxic substances adhering to them may be released. In addition, because these particles sink more slowly, they end up near the surface of the disposal mound where they will be further available to the water column and marine life.

The Corps of Engineers is in charge of maintenance dredging and disposal in Oregon waters, and the Environmental Protection Agency is responsible for designating the disposal sites. Section 6.3.3. discusses the criteria for selecting an ocean disposal site.

Current conflicts between ocean disposal of dredged material and other ocean uses appear to be minimal. They include potential conflicts with navigation and with marine animals that use the seabed. Future disposal of contaminated sediments may have adverse effects on marine organisms. Clean dredged material may be put to beneficial use as a source of material for beach replenishment. The state should consider this possibility.

S.6.3. Marine Litter

Most of the litter on Oregon beaches washes in from the ocean and may come from outside of Oregon waters. This is true even for beaches near campgrounds and picnic areas. Plastic items appear to be the predominant component of beach litter. Recreational, fishing and merchant vessels contribute a variety of types of litter, while small spherical plastic pellets apparently come directly from the plastics industry. Fish and other marine life and birds are harmed by becoming trapped or entangled in pieces of litter or by ingesting it. Marine litter also presents a hazard to scuba divers, fishing operations and navigation. It also interferes with aesthetic appreciation of the shore.

A state program backed by international, federal and state legislation, regulations, and enforcement authority should be developed to combat marine litter. This program could be modelled on the Port of Newport's pilot program to combat at-sea waste disposal from commercial fishing vessels, and include signs pointing out the detrimental effects of ocean litter and additional disposal facilities placed in marinas, coastal campgrounds, and picnic areas.

Beach litter has recently become a sensitive issue in other coastal states as well. In Texas, leases and permits governing minerals operations in state waters now expressly prohibit the dumping of solid wastes from platforms and vessels and authorize lease and permit cancellations as penalties for violations; furthermore, all boat operators have been make liable for litter offenses. In Oregon, such useful steps could be taken by DSL and the state Marine Board.

If passing commercial navigation traffic is the principal source, as some suspect, especially difficult practical and legal barriers to effective state countermeasures exist. State jurisdiction over navigation stops at the three-mile line and is shared with the federal government within three miles. Furthermore, state regulatory burdens on foreign and interstate (broadly defined) marine commerce are constitutionally vulnerable. Finally, the states have no navies to enforce any constitutional rules against marine litter they do adopt. Perhaps more than any other territorial sea issue studied, the marine litter problem calls for national (and international) responses like the Plastic Waste Reduction Act banning the use of nondegradable plastic six-pack holders (already banned by Oregon and several other states) and requiring EPA to assess the plastic debris problem which Senator Chafee (R-R.I.) and Congressman Panetta (D.-Cal.) introduced in the 99th Congress and H.R. 5380 introduced by Congressman Hughes (D-N.J.) calling for a joint study of the problem by EPA and the National Oceanic and Atmospheric Administration. Similar legislation was introduced in the 100th Congress. State legislative changes to enforce littering prohibitions against state-registered vessels and pending federal and international actions also are discussed in section 9.7.9.

S.6.4. Legal and Institutional Issues

Section 6.5. of this report describes state agency authority over potential sources of marine pollution. Although the primary authority for pollution control is vested in DEQ; several other state agencies have some authority over marine pollution. DLCD's authority is implicated because Goal 19 applies to pollution control activities in the nearshore zone. DSL administers the state Removal Fill law which controls dredging and disposal in nearshore waters. EFSC sets standards and promulgates rules for siting, construction and operation of large energy facilities, including thermal and nuclear power plants. An EFSC site certificate binds state and local agencies to issue other required permits. EFSC also as jurisdiction over transportation of radioactive material and disposal of radioactive waste.

ORS § 468.705 gives the Environmental Quality Commission ultimate authority over water pollution regardless of the powers of other agencies to regulate waste discharges into state waters. DEQ is authorized to regulate water pollution from nearshore mineral mining, oil and gas development, and kelp harvesting as well as from municipal wastes, thermal pollution, radioactive waste, dredge spoils and hazardous wastes.

A DEQ permit is required for waste discharge and/or construction of any outlet for waste discharge into state waters. DEQ also administers the federal NPDES permit program in Oregon.

Section 6.6. of the report examines DEQ's Coordination Program and describes procedures for Class A and Class B permits. It also discusses the application of Goal 19's requirements to the permit process in detail and makes recommendations on how DEQ's coordination program and permit process should be revised to comply with Goal 19. The primary recommendation is that DEQ's coordination program should be amended to reflect Goal 19's requirements such as contingency plans and emergency procedures to be used in connection with waste disposal activities requiring a DEQ permit.

There are a number of other legal-institutional recommendations which result from this study as well:

(a) As a "housekeeping" matter, DEQ should change OAR 660-31-012(2)(b) to show an NPDES permit as a Class A permit instead of Class B. An NPDES permit requires notice and a hearing if the public expresses significant interest. Therefore, an NPDES permit properly belongs in the Class A category.

(b) EQC has divided coastal Oregon into 5 "basins" for which water quality standards have been established (OAR 340-41-202 through -362). These standards apply to both inland, estuarine and adjacent marine waters out to the territorial sea boundary. Because of the vastly different nature of the marine environment, EQC should consider establishing a separate set of standards and regulations for the marine waters of the state based on the background work done for such a change by DEQ staff during 1986-87. Revision and upgrading of state ocean water quality standards should be coordinated with the federal Environmental Protection Agency's "Near Coastal Waters Strategic Planning Initiative" launched in the fall of 1985.

(c) The standards administered by EFSC for radioactive waste disposal facilities set forth in ORS § 469.375 should be expanded to cover offshore disposal sites within Oregon's territorial sea, in addition to land-based sites. Such standards may be needed if a future legislature repeals the current prohibition in ORS § 469.525 on the licensing of most types of radioactive waste disposal facilities.

(d) The regime for controlling transportation of radioactive material set forth in ORS §§ 469.605 and .607 should be reviewed and its applicability to waterborne transportation of such materials clarified. In the meantime, the Oregon Department of Energy has revised its rules governing transportation of radioactive materials to include waterborne transportation. OAR 345-60-001 through -050.

(e) EFSC's potential offshore jurisdiction, found in ORS §§ 469.525, .375, .320, and .300(10)(e) and (f), (18)(19)(24), should be clarified by the legislature. The rules for pipelines, processing plants and transportation referred to in section S.4.6.4.(e) above then should implement EFSC's jurisdiction over activities and facilities in nearshore and coastal areas.

(f) DEQ should monitor the Washington state experience with trust funds for fish and game enhancement created as a result of criminal enforcement actions against water polluters. A useful contact for this purpose is Duane Phinney, Washington

Department of Fisheries, (206) 753-3621.

(g) Oregon should consider adopting regulations to protect its environment from the dangers presented by oil tanker traffic. It is within state authority to require pilots on registered vessels and the use of tugs by all tankers. At least the choice should rest with a state agency, such as the Department of Transportation, rather than remain at the vessel captain's discretion. To clarify and facilitate state control over pilot service discretion, ORS § 776.435 should be amended or repealed.

(h) Tanker air emission standards can and should be adopted to protect air quality and public health. These efforts should be undertaken cooperatively with neighboring states. EQC should adopt regulations limiting engine and hydrocarbon vapor emissions near port communities and within the Portland air quality control region.

(i) The authors endorse DEQ's current monitoring and evaluation of Coast Guard regulations applicable to oil tankers. DEQ should encourage the Coast Guard to adopt stronger standards where necessary. The designation of safe passage lanes over the outer continental shelf, the establishment of a vessel traffic system for the Columbia River, and improvements in record-keeping and information dissemination should be urged by the state. Also, the Coast Guard should be encouraged to exercise its authority to deny entry into Oregon ports to those vessels not meeting federal standards for safety and design.

(j) Finally, the state may set additional safety standards for structures such as drilling platforms or rigs in or on the waters of Oregon. The state Department of Transportation should monitor Coast Guard and Corps of Engineers regulation of such facilities and recommend state legislative and administrative actions as necessary.

S.7. KELP HARVESTING

The potential for commercial exploitation of giant kelp resources found along the Oregon coast was the subject of Chapter 7. Included were discussions of the nature and extent of the resource, the economic and market considerations for kelp products, the technology used for harvesting and processing, the potential environmental effects and conflicts with other ocean users, and the governmental authorities for management of kelp resources. This section summarizes Chapter 7 and presents conclusions and recommendations.

S.7.1. Kelp Resources in Oregon

The principal commercial uses of kelp are algin extraction and kelp meal production. Algin is used in the food, paper, textile, pharmaceutical and cosmetic industries to control the properties of mixtures that contain water (e.g., it makes ice cream smooth). Kelp meal is produced mainly for human consumption. The principal giant kelp species in Oregon's nearshore waters suitable for these purposes is the brown alga *Nereocystis leutkeana* (hereafter *Nereocystis*), also known as bull whip or bull kelp. It grows in shallow waters along the rocky coast or on rocky reef outcroppings offshore.

Nereocystis is an annual that starts its growth in the spring from spores that attach to the rocky bottom. The plant develops one large gas bladder which floats on the surface. The leaf-like blades that grow from the top of the bladder produce the reproductive spores that will settle on the bottom and start the next years crop. Growth over the summer is rapid, with maximum biomass and spore production reached by September. By late fall, most of the crop has been destroyed by early storms, often finding its way to a nearby beach with other flotsam, jetsam and wrack.

Both the annual nature and morphology of *Nereocystis* are constraints to its commercial use. Its physical structure is such that harvesting destroys the entire plant, including its reproductive sites. As an annual, sufficient spores must be released to propagate a new crop the next season. Hence, only one harvest would be possible each year, and it would have to be timed near the end of the growing and spore release season (September). In contrast, the principal commercial species off southern California, *Macrocystis pyrifera*, is a perennial that can be harvested through much of the year.

Nereocystis beds along the Oregon coast are generally small and ephemeral, changing in both size and density from year to year. Most of the beds considered harvestable are south of Cape Arago. Limiting factors include available habitat and the high energy environment of the open coast. There has been no systematic survey along the Oregon coast since 1954 when 812 hectares (2006 acres) of harvestable bull kelp beds were shown with an estimated biomass of about 42,900 metric tons. This is small when compared with the giant kelp beds of British Columbia (11,638 hectares and 544,000 tons) or those off California (18,200 hectares and

962,000 tons). While a dramatic change in the total resource off Oregon is unlikely even after 30 years, a more up-to-date survey of harvestable kelp resources is needed to accurately assess its economic potential.

S.7.2. Technology and Economics

The southern California kelp industry, where *Macrocystis pyrifera* is exploited, is the only active one on the West coast. Large harvesters mow the kelp, taking up to 500 tons in one trip. Algin extraction is a $35 million a year industry there, but kelp meal has not been produced since 1980. Analysis of the industry shows that there is a demand for alternate supplies of dried kelp for the algin extraction industry, and there is apparently an unsupplied market for kelp meal.

Extraction of alginates from fresh kelp yields a higher economic return than does kelp meal production. However, a kelp processing plant for algin was estimated to cost $4.5 million in 1977, and require 32,000 to 44,000 metric tons of kelp to turn a profit. This is considerably more kelp than could be harvested off Oregon on a sustained yield basis and is thus not considered feasible.

Likewise, shipping of wet kelp to southern California is also not considered feasible, due to a variable demand there and the high transportation costs for the quick-to-spoil fresh kelp.

The final alternative in the algin market is to supply southern California with dried kelp it can use when there is not sufficient local fresh kelp. This too is probably not feasible because it is unlikely that Oregon could compete with cheaper foreign sources of sun-dried kelp.

Dried kelp from Oregon would more profitably be used to make kelp meal. In 1980, when the last Pacific kelp meal was manufactured on the West Coast, there was demand for about 320 tons per year. A hypothetical operation on the southern Oregon coast taking about 5000 tons of kelp each year could produce about 600 tons of dried kelp meal and thus more than meet this demand. Recent feasibility studies in British Columbia, however, show that the entire 320 tons of supposed demand would have to be captured in the first year to be successful. The ability for a new domestic venture to capture some or all of this market is questionable; presumably, this demand is now being satisfied by foreign sources. Thus, in addition to the need for a survey of kelp resources noted earlier, a thorough analysis of the market and current supply would be necessary before considering investment of the estimated $2 million needed for vessels and processing facilities.

The technology used to harvest kelp off the Oregon coast would likely be different than that used off southern California. The British Columbia feasibility study noted earlier suggested that use of a smaller, more maneuverable 25 meter harvest vessel with a capacity of 136 metric tons. Even this size vessel might be too large for working in the shallow coastal waters where bull kelp is found. Given the patchy, spread-out nature of Oregon's kelp resource, vessel speed and range would also be important considerations.

S.7.3. Environmental Effects and Use Conflicts

Because there is little data available on the ecology of *Nereocystis* beds, it is difficult to evaluate what the potential effects of harvesting might be. A variety of fishes are found in bull kelp beds, including herring and

juvenile salmonids. Fishes probably use the beds for shelter from larger predators, for feeding on animals that live on or around the kelp, and possibly in reproduction. A number of studies underway in British Columbia may provide more information. In the meantime, both British Columbia and the state of Washington have taken a cautious approach to the harvesting of kelp, restricting the width of cut and allowing only 20% of the maximum seasonal biomass to be taken in any given area. Oregon should establish similar regulations to ensure conservation of the resource.

In addition to the possibility of a general fisheries ecology conflict noted above, the harvesting of kelp may also cause site-specific conflicts with recreational fishers. The shallow reefs where kelp grows are also good fishing areas, especially for a variety of rockfish.

S.7.4. Legal and Institutional Issues

The Division of State Lands (DSL) has exclusive jurisdiction over state-owned submerged lands and, under provisions of ORS §§ 274.885 - 274.-995, may lease these areas for harvesting the kelp that grows there. However, the exclusive jurisdiction DSL has over kelp harvests is subject to a number of legislative and policy caveats.

First, it must give "due consideration" to protection and conservation of the resource. It must also consult with the Department of Fish and Wildlife (DFW) prior to leasing kelp beds, though no particular action is mandated as a result of the consultation. More importantly, DSL's leasing actions must also comply with the Ocean Resources Goal 19 which has more specific conservation language and coordination requirements.

There are no specific administrative rules governing kelp bed leasing. However, it is possible for DSL to manage this resource as aquaculture under its general rules for leasing state-owned submerged land, OAR 141-82-005 to 141-82-050. More specific rules, tied directly to the kelp-leasing statute, are needed if Oregon's kelp beds are to be wisely utilized. Even if promulgated, such rules should be considered only an interim measure, because the existing kelp legislation (ORS §§ 274.885 et seq.) is itself seriously flawed.

Suggested legislative revisions are:

(a) Kelp resource surveys (or in Goal 19 language, inventories) should be carried out before areas are leased, rather than after leasing, as now stipulated.

(b) DSL should be authorized and required to set a maximum allowable kelp harvest from any leased tract, consistent with resource availability and ecological constraints.

(c) The present minimum harvest requirement of 1000 tons in any one year should be eliminated.

(d) The present authorized area of lease (up to 40 miles of coastline), and term of lease (up to 50 years) should be eliminated. Neither have any relationship to the nature of the resource or economic considerations for exploitation. Specific geographic limits are not recommended because they are not as important as other considerations, such as the percent of kelp harvested at any one site or the amount of kelp needed to make a particular business economically feasible. A more reasonable lease term would be 10 years, with an option for first right of renewal.

(e) Provisions should be established for lease modification or cancellation if the sustainability of the resource is shown to be threatened, or if other living resources dependent on the kelp beds are jeopardized by the lessee's operation.

Ocean Resources Goal 19 singles out the kelp leasing statute as one of particular concern and directs DSL to review its procedures and standards to assure that they comport with the goal. The above legislative suggestions are consistent with the goal and can be considered a starting point. Once new legislation is in place, administrative rules should be used to detail inventory requirements, leasing procedures, harvest methods and other provisions to protect marine life and promote the long term maintenance of the resource.

S.8. ENERGY FROM OREGON'S OCEAN WATERS

Four types of ocean energy conversion to electrical power are reviewed for applicability to offshore Oregon; none have potential for the foreseeable future. These technologies include ocean thermal energy conversion (OTEC), tidal power, wind power and wave energy. Principles of operation, existing technology, development potential, and regulatory aspects are discussed.

S.8.1. Ocean Thermal Energy Conversion (OTEC)

Ocean thermal energy conversion (OTEC) is a method of producing electricity from the temperature difference between the warm surface waters present in tropical and subtropical oceans and the much colder water present in the ocean depths. OTEC is a solar energy technology, with the ocean surface serving as the solar collector. OTEC has some advantages over other solar energy technologies. There are no fuel costs, energy production would appear to be relatively non-polluting, OTEC plants could be used to supply power to the existing electrical grid on a con- tinuous basis, OTEC designs are generally unobtrusive, some designs would also produce fresh water, and nutrients from deep waters could be used in some aquaculture operations.

As with any other heat engine, an OTEC power plant requires a heat energy source and a heat sink. The warm surface water serves as the heat source, while the much colder water present at great depths serves as the heat sink. Heat energy from the surface water is used to vaporize a working fluid, while the cold water is used to condense that same fluid. Although a number of different OTEC power system processes have been proposed, the two most promising ones are the closed-cycle and the open-cycle sys- tems. In the closed-cycle system a separate working fluid such as ammonia or Freon is pumped through a heat exchanger. In the open-cycle system the warm water itself serves as the working fluid.

For an OTEC plant to be economically feasible, an annual average temperature difference between the warm and cold water intakes of approximately 20°C is needed. This requirement is dictated by constraints on the OTEC design, particularly the design and construction of the heat exchangers, and by the financial rate of return needed to offset the high capital cost of plant con-struction. A temperature difference of this magnitude is available between the surface water and that at a depth of 1000 m at most sites within 20° of the equator. Unfortunately, a temperature differential of this magnitude is not present off Oregon, where maximum temperature differences range between 2° to 7°C. Thus, OTEC generated electricity is impractical for waters off Oregon.

S.8.2. Tidal Power

The basic principles utilized to generate tidal power today are essentially the same that were used for hundreds of years. Water on a rising tide is allowed to fill a diked enclosure of the sea. As the tide recedes, the enclosed water is drained back to

the sea through some form of energy producing turbine. This is similar to the familiar hydroelectric power generation. One major difference between hydroelectric power and a basic tidal power system is that tidal power is only available during given periods of the tide, and because of this, tidal power is generally viewed as a supplement to an existing electrical producing grid.

To extend the electrical production period, variations of this simple basin operation have been suggested. For example, double acting turbines, which produce power on both rising and falling tides could be used. Another solution, used at La Rance, France, where one of the world's two large scale tidal power stations is located, is to use the turbines as pumps to maintain desired water levels. At the La Rance plant, a 750 m long dike housing 24 submerged turbo-generators was constructed to isolate 22 km^2 of estuary from the open sea. The location was ideal because tidal amplitude reached a maximum of 13.5 m. Costs of power generation are directly related to the efficiency of the conventional turbines utilized, and to the tidal amplitude. At water heads of 7-9 meters the turbines are 90% efficient. As the head shrinks to 3 m, their efficiency drops to 55% (Brin, 1979). Thus, water heads of between 8-10 m in height are considered necessary for conventional tidal power stations. Thus, the basic requirements of tidal power - high tidal amplitude and an enclos-able area of the sea - greatly limit the number of possible development sites. In the U.S., only Cook Inlet, near Anchorage, Alaska, has the necessary tidal amplitude.

To increase the locations where tidal power would be practical, new technologies have been proposed which would reduce the required water heads necessary for efficient energy generation. Such systems will also, it is hoped, reduce the traditionally high construction costs. Also, not all tidal power plants need to be large scale, as been demonstrated in China, where micro- stations produce electricity for small villages.

Sea conditions and water depth would probably make open coast construction of a tidal power station in Oregon totally unfeasible. Oregon estuaries are, however, are shallow and have many locations where diking would be feasible. Surface area of the larger Oregon estuaries is on the same order of magnitude as the La Rance, France facility's 5,434 acres. If all Yaquina Bay waters and tidelands were diked, approximately 6,700 acres would be available for electric production, and Tillamook and Coos Bays would have almost twice this area. Although adequate surface area is available for large scale tidal power development in Oregon, tidal range is not sufficient. Mean tide range at Yaquina Bay is 1.8 m, while the maximum range is only 3.5 m. Other Oregon estuaries have similar tidal ranges. All are much lower than that required for efficient turbine use. Thus, only new and yet unproven ultra-low head designs could be utilized in energy production. Even if such designs were proven practical, estuarine areas capable of being diked would most likely be limited to small portions or arms of Oregon's bays. Unobstructed water and ocean access would need to be retained for navigation, recreation, fisheries and other uses.

Finally, and perhaps most importantly, any proposed tidal power project would have to be consistent with management plans established for Oregon's estuaries. None contemplate the scale of development sufficient to install tidal power dikes, locks, turbines and generators that would be needed. Generally, environmental

impacts to the hydraulic and sediment regime, to wetlands and tidal flats, and to fisheries and other organisms would be significant. For the foreseeable future, it is unlikely that the demand for electric power, already relatively abundant and inexpensive in the Pacific Northwest, would warrant sacrificing major portions of these ecologically valuable ecosystems to tidal power development.

S.8.3. Wind Power

Wind power historically was a major source of energy in this country, particularly in rural areas. Interest was rekindled in wind energy in the early 1970's as oil prices jumped. Many new wind conversion device (WCD) designs were developed that employed modern aviation technology. These designs all include the same basic components: (1) airfoils or blades to convert wind velocity into mechanical energy; (2) a generator which to convert mechanical energy to electrical energy through a geared system; (3) a support structure to raise the unit to a height where wind velocity is greater; (4) a transmission facility or energy storage unit.

WCD's are divided into three categories based on power generating capability. Small wind conversion devices produce up to 9 KW, and are used for farms or homes requiring remote equipment. Intermediate size WCD's produce 10-99 KW and are at present the growth area of the industry. Large WCD's produce greater than 100 KW and are the units that government has experimented with.

Determination of the actual energy available from the wind is difficult. Wind speed is highly inconsistent from hour to hour, day to day, and month to month. This situation makes wind power suitable more as a supplement to an existing electrical grid than a permanent, dependable source. Also, wind power is proportional to the cube of the wind velocity. Thus, WCD's are much more efficient in strong winds. Wind power is also proportional to the square of the diameter of the blades. This means that two small WCD's will not be as efficient as one somewhat larger one.

The high variability of wind power from area to area has led to the concept of "wind farms" in particularly favorable locations. Large numbers of WCD's are placed on a given site, reducing construction and maintenance costs. Such farms in California, where 95% of the U.S. wind power output is generated, produced 195 million KWh of electricity in 1984, the equivalent of 340,000 barrels of oil.

With regard to cost, the efficiency of new WCD designs now makes wind energy competitive with nuclear energy, i.e., capital costs are approximately $3-5 billion per 1,000 MW of generating capacity. It is estimated that by 1990 advances in equipment efficiency will reduce the cost of wind power generated electricity to 6-10 cents per KWh, approximately the same as for power generated by coal fired plants. A the same time, nuclear power costs are expected to rise to 14-16 cents per KWh.

Given the strong and steady wind characteristics of the nearshore ocean, it would seem a logical region for wind farm construction. In general, Oregon's coastal waters have higher wind speeds than coastal or interior land areas. Wind measurements made at the Columbia Lightship indicate that wind strength and duration are adequate for efficient WCD operation. Present cable technology is such that power generated a few miles offshore could be transmitted to land without serious power loss.

Despite these favorable characteristics for development of wind power offshore Oregon, it is unlikely that it will be developed in the foreseeable future. The major obstacle would be the cost of the required support structures. A supporting tower or mooring mechanism would likely be extremely expensive in order to withstand winter storm winds and waves off Oregon, and the corrosive effects of salt water over the probable 30-year life span of the facility. Development of an offshore wind farm might reduce these costs somewhat, as would incorporation of other ocean energy generation technologies, such as wave energy.

S.9.4. Wave Energy

Wave energy is one of the many alternative energy technologies that was given new research and development impetus by the energy crisis of the early 1970's. Since that time, large commercial prototype Wave Energy Conversion Devices (WECD's) have been under study in several areas around the world. Also, small scale units are being manufactured to provide electricity to isolated locations and to remote equipment such as navigation buoys.

Wave energy is originally derived from the effect of wind on the sea surface. Within a wave there are two distinct forms of energy; kinetic energy (energy of motion) is present in a wave due to its forward motion. Potential energy (stored energy), is available due to the difference in height between the crest (or top) of a wave, and its trough (or bottom). Generally, it is the potential energy of a wave which is largely harnessed in WECD designs.

The supply of wave energy is characteristically intermittent and seasonally dependent. Furthermore, a large proportion of the total energy generated occurs during relatively brief periods of intense wave activity. As such, wave energy is best viewed as a supplement to the existing power grid, unless storage of this variable power is called for.

There are a variety of proposed WECD designs, most of which are variations on a few basic approaches. "Heaving body" types utilize the potential energy in passing wave crests and troughs to alternately lift and drop a float or series of floats, the motion of which is converted to mechanical energy. "Salter's nodding duck" uses wave passage to rotate a specially shaped body upward and downward around a central axis, with this cranking motion converted to power. "Pressure devices" depend on the increase and decrease in water pressure under passing crests and troughs, which is used to expand and contract bellows-like devices which, in turn, drive a piston or turbine. "Contouring raft" designs utilize wave motion to undulate several interconnected, hinged, floating slabs, with mechanical energy extracted at the hinge points. The "oscillating water column" design util-izes the up and down wave motion to alternately raise and drop the water level in a sealed chamber, and alternately push and suck air through a top-mounted turbine. Two small WECD's of the latter type are in operation today in Japan and Norway, providing energy for small, isolated communities where traditional energy sources are not readily available.

The energy content of waves off the Pacific Northwest coast is greater than at other continental U.S. locations. The average power off Oregon ranges from 12 KW per meter of wave crest during winter months to a low of 4 KW per meter during the month of August. In contrast, winter power levels off California average about 8 KW per meter of wave crest.

East and Gulf Coast waters all have an average monthly power level of less than 2 KW per meter of wave crest. Therefore, if wave power were to be harnessed anywhere in the U.S., Oregon would be a logical location.

A number of factors, however, combine to make it unlikely that wave energy conversion devices will be installed in Oregon's territorial sea in the foreseeable future. These include the lack of equipment and structure standardization; the high risks associated with structural failure, particularly in the harsh Pacific Northwest environment; potential navigation and environmental conflicts; the current lack of federal investment; and the extremely high capital requirements for large scale implementation.

S.8.5. Legal and Institutional Issues

Despite the low probability of development of any of the energy technologies discussed above in the near future offshore Oregon, it is useful for the record to outline agency authorities for possible future reference. However, revising Oregon's offshore management regime as it relates to renewable energy development should be accorded a low priority at this time.

S.8.5.1. OTEC Development

OTEC development off Oregon, using present technology, is not feasible. Should a future technological breakthrough permit use of OTEC principles in waters with temperature differentials as small as those found offshore Oregon, the principal applicable law would be the federal Ocean Thermal Energy Conversion Act, 42 USC §§ 9101-67. This would be supplemented by individual state permit requirements applicable to specific aspects of the OTEC operation, e.g., easements and permits for OTEC cables and pipelines crossing state submerged lands and beach. Goal 19 coordination requirements would also be applicable.

The federal OTEC Act provides a "one stop" application process for all the federal authorizations required to put an OTEC facility into operation, with the exception of Coast Guard vessel documentation requirements. The act's definition of "OTEC facility" includes any integral part of a facility utilizing OTEC principles which is located "seaward of the high water mark." The act's licensing process is administered by the National Oceanic and Atmospheric Administration (NOAA), but other federal environmental legislation may also apply to an OTEC facility such as the Coastal Zone Management Act, the Endangered Species Act, and the various water pollution discharge and dumping permit re- quirements of the Clean Water Act and the Ocean Dumping Act discussed in section 6.5.5.

S.8.5.2. Tidal Power Development

If tidally generated electricity was found to be feasible in Oregon waters, the legal regime governing its development would consist of several state and federal permit requirements. Most likely, given the high energy offshore environment, such a facility would likely be within an estuary. Such a facility in a in a coastal estuary would involve diking and thus require a fill permit from the Division of State Lands (DSL) pursuant to its Removal-Fill regulatory authority. A lease from DSL may also be required pursuant to its proprietary interest as owner of tidelands. Cables and pipelines crossing estuary tidelands from a tidal power facility would require an easement from DSL. A tidal power dike with installed turbines located in an estuary might

be treated for regulatory purposes as a hydroelectric dam by the Water Resources Commission, DSL, and the Department of Fish and Wildlife, including mitigation of impacts on fish and wildlife through devices such as fish ladders.

federal requirements for tidal power stations in estuaries would include permits from the Corps of Engineers under section 10 of the Rivers and Harbors Act and section 404 of the Clean Water Act. Congressional consent to a tidal power dike would only be required under Rivers and Harbors Act section 9 if the dike completely spanned the estuary or perhaps important arm of it. The Federal Energy Regulatory Commission (FERC) might also assert jurisdiction over a tidal power dike with installed generators as hydroelectric development of a navigable waterway requiring a FERC license under the Federal Power Act.

Close coordination between DSL and the Corps on their respective fill permit requirements for tidal power development in an Oregon estuary could be expected based on their existing coordination program for those permits. In addition, all federal permits issued for tidal power development would have to be consistent with Oregon's federally approved coastal zone management program, and local comprehensive plans.

S.8.5.3. Wind Power Development

Wind conversion devices mounted on structures or platforms offshore would be regulated by a variety of state authorities in a manner similar to an OTEC facility. Transmission lines and cables from an offshore wind power facility crossing state submerged lands and beaches would require Division of State Land's Permits and Easements and a Department of Transportation permit.

At the federal level, offshore wind power facilities would be regulated by the Army Corps of Engineers, Coast Guard and the National Marine Fisheries Service. All federal permits issued for offshore wind power development would have to be consistent with Oregon's federally approved coastal zone management program. particularly Goal 19. Though Goal 19 makes no explicit reference to offshore wind power development, its provisions concerning priority for and protection of renewal resources, impact assessment, information inventories, contingency plans, and guidelines for issuance of permits for development on Oregon's continental shelf would apply and provide an adequate general framework for the consistency process.

S.8.5.4. Wave Energy Development

If wave generated electricity was found to be feasible in Oregon waters, the legal regime governing its development would consist of several state permit requirements combined with several federal permit requirements. As with tidal power and wind power, regulation of wave power is not centralized in either the state or federal level at this time; thus, interagency coordination at the federal and state levels as well as federal-state coordination of the various requirements would be necessary to avoid creating barriers to the exploitation of wave energy.

Wave power generation based on floating platforms in ocean waters would be regulated by the state similar to an OTEC facility as described earlier. Cables and pipes from an offshore wave power generation facility crossing state submerged lands and beaches would require Division of State Lands (DSL) permits and easements and a Department of Transportation permit. Gravity structures for wave power generation resting firmly

on the seabed would in addition require a DSL lease for any use of the state's seabed involved. Similar requirements would be imposed on underwater structures used to shape and focus incoming waves for wave energy power generation.

Federal authorities of the Army Corps of Engineers, Coast Guard, and the National Marine Fisheries Service would apply, to protect navigation and fisheries. Federal permits issued for offshore wave power development would have to be consistent with Oregon's federally approved coastal zone management program. Given the positive and negative impacts on coastal processes, estuary mouths, navigation, recreation, aquaculture, fishing and esthetics, the principal consistency references would be statewide planning goals 19, 18, and 16, as well as acknowledged local comprehensive plans governing shorelines adjacent to offshore wave power facilities. In addition, these impacts probably would be evaluated in an EIS prepared by a federal agen-cy with regulatory authority over offshore wave power development, most likely the Corps of Engineers, and the EIS would be quite useful in evaluating the consistency of the particular proposed wave power facility against relevant goal and acknowledged plan provisions.

Although Goal 19 makes no explicit reference to offshore wave power development, that goal's general provisions concerning priority for and protection of renewable resources, impact assessment, information inventories, contingency plans, and guidelines for issuance of permits for development on Oregon's continental shelf would apply and are probably adequate. Since wave power development seems to have the greatest potential of the four ocean energy sources discussed in this chapter, refining Goal 19's general framework for wave power should be given priority over the other three. Consistency of state permits for wave power development with relevant goal and acknowledged plan provisions would be obtained through the state agency coordination programs and permit consistency procedures.

S.9. MARINE TRANSPORTATION AND NAVIGATION

The use of nearshore ocean waters for surface navigation is one of the most important and beneficial ocean uses. Marine transportation is a safe, efficient and economic means to move goods, both within Oregon waters, and between Oregon and other states or countries. Most of the other activities discussed in this study, such as marine mining, oil and gas development, commercial fishing and recreation, also require the use of the ocean surface for navigation and/or operations. Ports, ranging from the major deep water facilities to small coastal boat basins, play a key support role in these navigation-related uses.

S.9.1. Ports and their Role in Oregon

Ports in Oregon are special purpose units of government, established by the voters within a specific geographic district. The primary goal of ports is to stimulate economic development within their district, using a broad range of authorities and financial tools specified by state law. Ports have many functions. They may own and operate marine terminals, marinas, ship repair facilities, dredges and snag removal equipment, industrial parks, public docks, airports and even bridges. To support these ventures, ports may charge for services, levy taxes, issue bonds for port or private development, compete for government grants and loans, and develop trade agreements. In short, ports can and do make significant contributions to their regional economies.

Oregon has two classes of ports, deep draft and shallow draft, based on federally-authorized navigation projects. Deep draft ports serve as important centers in the network of world and regional transportation. They collect and store local or regional products for eventual export; they offload imports, and store and distribute them to market areas via connecting rail and highway transportation links.

Three of Oregon's deep draft ports are located on the Columbia, River: the Port of Astoria at river mile (RM) 14, the Port of St. Helens at RM 84, and the Port of Portland, Oregon's principal port, located at RM 105, at the end of the 40-foot Columbia and Lower Willamette navigation project. Coastal deep water ports include the Oregon International Port of Coos Bay, and the Port of Newport, with maintained channels of 35 and 30 feet respectively.

Shallow draft ports also play an important economic role in Oregon, particularly in smaller coastal communities. Shallow draft navigation projects along the coast with ocean access include the Nehalem (Port of Nehalem), Tillamook Bay (serving both the Port of Bay City, and the Port of Tillamook Bay), Siuslaw (Port of Siuslaw), Umpqua (Port of Umpqua), Coquille (Port of Bandon), Port Orford (Port of Port Orford), Rogue (Port of Gold Beach), and the Chetco (Port of Brookings). The principal function of these ports is to service commercial and charter fishing fleets, and/or private recreational boaters.

The larger ports also serve these functions.

S.9.2. Nearshore Ocean Use for Navigation

Vessels of all types operate in or transit through nearshore waters off Oregon, including tankers, freighters, container ships, barges under tow, dredges, oceanographic research vessels, survey ships, fish catcher-processor ships, commercial fishing vessels of many types, charter boats, private fishing boats, sailboats and other craft. They use the ocean surface, and often portions of the water column, seafloor, and subsurface as well. These uses underscore both the importance of ocean for navigation, and the potential for related disputes.

Large ocean-going ships involved in international trade normally transit well beyond Oregon's territorial sea boundary. Even ships in transit between Seattle and Southern California stay much further offshore. In general, then, with the exception of Oregon inbound or outbound traffic, the use of nearshore ocean surface area for ocean-going shipping is minimal and not a major issue. The greatest potential navigation hazards are at the entrances to individual ports, particularly the Columbia River, but also Coos Bay and Yaquina Bay. Navigation is particularly hazardous in these areas during winter storms, and during peak summer recreational boating periods.

Nearshore commercial towboat-barge traffic is significant, and is important to several of Oregon's shallow and deep draft ports. Commodities carried are mostly forest and agricultural products, gravel and other bulk cargo. Towed barges from the north and south also contribute to nearshore traffic off Oregon. Towboats normally operate much closer to shore than do deep draft vessels, generally following the 60 fathom contour, four to five miles offshore. This same area is also important to fishermen, particularly crabbers, and the overlap in operating areas has resulted in serious disputes, discussed further below.

Commercial fishing vessels, and recreational charter boats, though representing only a small percentage of Oregon's registered boats, make intensive use of the nearshore ocean, both for fishing and for transit to other fishing grounds further offshore. During certain seasons, these vessels may be concentrated in certain locations, sometimes close to similar concentrations of private recreational boats. When nets and other gear are in the water, maneuverability of the commercial vessels is limited, increasing the possibility of collision. These factors combine to make new or increased ocean use (e.g., oil and gas development), and related navigation issues very important for commercial fishermen, and for charter boat operators. These two groups, more than any others, stand to benefit by measures that would help avoid conflicts.

Recreational boats registered in Oregon numbered nearly 145,000 in 1985-86, with about 20% of these in coastal counties. While more than half of these boats were less than 20 feet in length, and probably not used on the ocean, many of the larger vessels registered in other counties are used seasonally at the coast. The State Marine Board estimates recreational use for the nearshore ocean at about 153,400 vessel-days, more than 90% of which are for fishing. Most of this use occurs during summer months in the vicinity of the port channel entrances and jetties.

This, as noted earlier, creates severe congestion in areas which also happen

to be the most hazardous with respect to waves and tidal currents. These hazards, combined with the lack of experience of many small boat operators, and the irresponsibility of a few, result in a number of boating fatalities each year. Increased education is needed, along with inspections and strict enforcement of safety requirements.

S.9.3 Navigation-Related Conflicts

A number of existing and potential navigation-related conflicts were mentioned above. Of particular interest is conflict between towboaters and crab fishermen.

Towboat routes and principal crab fishing areas overlap. This resulted in significant gear losses for the crabbers. Towboats ran over crab pot floats and severed lines attached to the pots below, which then could not be recovered. Many thousands of dollars of gear loss were occurring each year. In 1971, an informal agreement was established between crabbers and towboaters, consisting of a set of tow boat lanes along the coast and into various ports. The towboat lanes were two miles wide, with their landward edge located generally three miles from major headlands, with side lanes into ports. Towboaters agreed to stay in these lanes, weather and safety permitting. At the same time, the crabbers agreed not to set pots in these lanes, and forfeited the right to make claims if they chose to do so. Representatives of both groups continue to meet at least once a year to discuss problems, make modifications if needed, and reaffirm the agreement. The agreement has worked well for over 15 years, with crab gear losses reduced an estimated 90%. This negotiated dispute resolution serves as a model for dealing with similar ocean use disputes, in Oregon and elsewhere.

Existing and possible new ocean uses. such as oil and gas development and marine mineral mining, may generate additional navigation-related disputes and competition for ocean space. These were discussed in detail in Sections 3.5, 4.5, 6.3.4 and 9.6 of this study, and are summarized here.

Navigation issues related to mining of offshore minerals will depend on several factors: the location of deposits being mined relative to other established uses; the type and capacity of the dredge used for extraction; and the number of trips required to and from port to offload the material. During the mining process, when dredging equipment is in the water, right-of-way conflicts may occur with other vessels that are equally difficult to maneuver, such as draggers, trollers and towboats. At the very least, this may add to congestion problems. Self-contained hopper dredges with a fixed storage capacity are the probable type of vessel that would be used to mine either placers or aggregate. Using Corps of Engineers channel dredge operations for comparison, dredge mining in nearshore waters would probably generate significant new traffic into the port where the material would be stockpiled.

Oil and gas exploration and development would also increase the potential of navigation-related conflicts. Seismic survey ships tow a two to three mile long cable equipped with air guns and hydrophones. While these vessels have the navigational right-of-way over other vessels not towing gear, they nevertheless may interfere with fishing and other vessel operations. Drill-ships and platforms require an exclusion area around them whose width depends on water depth, again raising potential for conflict with fishing. Production platforms also have designated areas around them where other activities

are excluded. These platforms, being fixed in one location, may also pose a navigation hazard; they can also serve as a navigation aid. Pipelines from production facilities to shore may also limit use of areas for certain types of fishing. Production facilities also have support bases ashore, with steady traffic between them.

Navigation channels and river mouth bars of Oregon's deep and shallow draft ports require dredging on a regular basis to keep shoals from building and closing channels. These dredges, though they make a substantial number of trips (e.g., more than 1700 in 1986 at the Columbia) and operate in navigation channels, reportedly have not posed substantial navigation problems for other vessels, partly owing to their regular schedules, designated dredging and disposal areas, and timing to avoid conflicts with certain fisheries. Nevertheless, given the traffic they represent, dredging and disposal operations have potential for involvement in navigation conflicts.

As illustrated by the towboater-crabber agreement, navigation conflicts can be lessened by effective communication and negotiation. Ways to avoid or lessen navigation conflicts include establishing coordinated operating areas and lanes; setting up different operating time periods for potentially conflicting activities; and keeping all ocean users informed of each others operating characteristics, constraints, and schedules. It is recommended that a comprehensive approach to navigation conflict resolution be designed and evaluated, using the crabber-towboat agreement and similar arrangements as models.

S.9.4. Legal and Institutional Issues

Navigation and marine transportation are governed by a complex array of international, federal and state agreements and authorities. These are briefly summarized here.

S.9.4.1. International Authorities

International regulations applicable to navigation include the 1972 International Regulations for Preventing Collisions at sea, also known as the 72 COLREGS. The 72 COLREGS establish international "rules of the road", which have been accepted by the U.S. for navigation in all but inland waters. Establishment of sea lanes and traffic regulation schemes are governed by customary international law, as reflected in Article 22 of the Convention on Law of the Sea.

S.9.4.2. Federal Control Over Navigation

The federal government, principally through the U.S. Coast Guard, has virtually total authority over navigation in the three nautical mile (nm) territorial sea. Title 33 CFR Parts 1-199 is the comprehensive set of regulations that govern navigation-related activities, and includes such things as the implementing provisions for the "rules of the road" ((Part 81), the regulation of aids to navigation (part 62), a Uniform State Waterway Marking System (USWMS) (Part 66), aids to navigation on artificial islands or fixed structures (e.g., oil and gas platforms) (Part 67), and marine information (part 72). The placing of fixed and floating navigation aids also comes under the purview of Section 10 of the Rivers and Harbors Act of 1899; a nationwide permit has been issued for this activity by the U.S. Army Corps of Engineers. The Oregon State Marine Board (SMB)is permitted to supplement certain federal navigation regulations, with approval of the Coast Guard.

S.9.4.3. State Agencies and Navigation

The SMB is the agency responsible for regulating watercraft in Oregon, and therefore the most logical lead state agency with respect to navigation issues in the territorial sea. The five-member, governor-appointed Board is responsible for cooperating with federal agencies to promote uniformity in boating laws and enforcement; devising and implementing a boat numbering system; exempting classes of boats from state regulations as warranted, making rules for uniform marking of state waters (the USWMS applies); making rules for marine toilets; and protecting Oregon waters from navigation obstructions. The Board also conducts periodic boating surveys.

Other state agencies also play roles in navigation and marine transportation. The Economic Development Department (EDD), through the Ports Division, implements state policy for the promotion of international maritime trade and development of ports. The Division of State Lands (DSL) is responsible for the management of submerged and submersible lands of the territorial sea and inland navigable waters as guardian of the public trust for navigation, commerce, fishing and other public uses. DSL also regulates dredge and fill activities in these same areas, applying similar public interest criteria in its decision-making.

An important part of the state management framework for navigation and related issues is the Ocean Resources Goal 19, which is applicable to all state agencies. Goal 19 requires that navigation needs for the coastal region be determined reflecting the capability of each port to handle different types of vessel traffic. Goal 19 also requires that navigation lanes and facilities be maintained free from interference from other uses. Relevant state agencies should include provisions in their state agency coordination agreements that implement these Goal 19 requirements. Earlier recommendations regarding methods that might be used to avoid, lessen or resolve navigation-related conflicts also apply and should be considered as possible implementing mechanisms.

S.9.4.4. Artificial Islands and Fixed Structures

Artificial islands or fixed structures such as oil platforms, if located in the nearshore area off Oregon, would have an impact on fishing activity and commercial traffic. Coast Guard regulations at 33 CFR Part 147 should be consulted for procedures that may be used to establish "safety zones" around such oil and gas facilities. Corps permit authority relating to obstructions to navigation, and DSL authorities, within the territorial sea, would also apply to artificial islands or structures.

S.9.4.5. Regulatory Limitations on Ports

The location of Oregon's coastal and lower Columbia River ports, and the broad range of development authorities and financial tools they have were discussed earlier. State economic development goals give added impetus to ports, promoting development of facilities for world maritime trade, and development of "deepwater ports" (meaning Oregon's deep draft ports as opposed to the federal definition which refers to ports outside the territorial sea boundary used principally to transfer oil from large tankers). Despite these seemingly broad mandates, ports are subject, as are private developers, to a variety of state and federal authorities controlling development. These authorities include Section 10 of the Rivers

and Harbors Act and Section 404 of the Clean Water Act, which together are part of the Corps of Engineers regulatory program for navigable waters of the United States and parallel state requirements administered by DSL.

S.9.4.6. Extending Navigation Authority Through Pilotage

The state is responsible for establishing pilotage grounds for ships entering a deep draft port. Pilots, regulated by the Oregon Board of Maritime Pilots, are experienced ship masters who are familiar with specific areas hazardous to navigation, such as river entrances, bays or rivers. Extension or strengthening of present state control over pilotage is one possible means of exerting greater state control over navigation in the nearshore area. An evaluation of this and other possible alternatives for strengthening state navigation controls in the territorial sea should be requested from the state attorney general if the potential for conflicts increases significantly due to new ocean uses such as oil and gas development.

S.9.4.7. Priority in Navigation-Fishing Conflicts

Under Goal 19, both navigation and fishing are high priority, "renewable" ocean uses. In cases of conflict, however, which has priority? Oregon case law and statutes appear to establish the following principles: To provide for safe transportation, navigation lanes should remain free from interference from other uses; navigation is the paramount right. However, vessel navigators must take reasonable precautions to avoid fishing vessels and fishing gear in the water, or be liable for resulting damage. Coast Guard regulations are designed to help avoid such conflicts through combinations of lights and other signals which communicate to passing vessels the status of a fishing vessel's operations. Nevertheless, incidents do occur and stand to increase as traffic increases. Increased incidents in the may lead to further separation of uses through establishment of transit lanes, and open fishing areas.

S.9.4.8. Dumping of Wastes from Vessels

The dumping of ship ballast waters, of garbage, and of sanitary toilet wastes is another important navigation-related issue in Oregon waters. State regulations (ORS § 783.600) prohibit the dumping of harmful ballast waters within the jurisdiction of the state, which should include the territorial sea. However, the regulations go on to state that such discharges shall not harm bays, harbors or rivers, all of which are inland waters. This statute should be revised to explicitly cover ballast discharges in the territorial sea as well as inland waters, and the minimal fine for violations ($500) increased significantly. Similarly, ORS § 468.780, which specifically prohibits the discharge of oil into state waters, should be amended to specifically address discharge of oily ballast from tankers.

In an effort to reduce other wastes dumped in the ocean by vessels, existing legislation prohibiting dumping of garbage from buildings and structures (ORS § 468.770) should be extended to vessels operating in or passing through Oregon waters, regardless of whether or not it reaches shore. Offending vessels, when able to be identified, should be subject to revocation of state licenses or registration. The state also should actively support proposed federal legislation designed to help states cope with marine debris and dumping problems.

Pollution from marine sanitation devices on boats operating in the territorial sea is another possible area of concern. This appears adequately covered by SMB regulations in ORS § 488.830 (14) as well as Coast Guard regulations, with boater compliance and enforcement being the principal issues.

S.9.4.9. Military Navigation

Nearshore waters off Oregon are not used extensively for military navigation, though air operations over the ocean are common, and subsurface submarine transiting takes place in the north-south direction in specified lanes. Offshore development activity such as mining, or oil and gas development, may be restricted from certain areas offshore southern Oregon due to the location and possible interference with navy communication equipment. Therefore coordination with the Department of Defense is strongly recommended in connection with ocean development activities off southern Oregon.

S.10. COMMERCIAL AND RECREATIONAL FISHERIES

The principal finding of Chapter 10 of the Oregon Territorial Sea Management Study is that Oregon's commercial and recreational fisheries are alive and well. In the commercial fishery, demand for Oregon seafood products should increase, and could increase considerably. Catch levels experienced for traditional species during the early 1970's should be sustainable, though the much higher catches in the late 1970's likely are not. The most promising opportunity for increased landings in Oregon is in the mid-water trawl fishery for the currently underutilized Pacific whiting. The value of distant water fisheries in which Oregon fishermen participate is also likely to increase as U.S. catcher/processor vessels replace foreign vessels.

Probably the most critical problem facing the industry is the rapidly escalating cost of hull and liability insurance. Conflicts with recreational fishing and with other ocean uses can also be expected to increase in the years to come. However, barring major changes in ocean conditions (e.g., another severe El Niño event), the commercial fishing industry should enter a period of relative stability and prosperity.

Recreational fishing will also increase in the future as Oregon's population and the level of tourism increase. Allocation of fish between the recreational and commercial fisheries will continue to be an issue, with allocation of the coho resource being the major issue for the near future. Halibut and nearshore rockfish allocation may also become major issues.

In general, however, recreational fishing faces a period of increasing stability.

S.10.1. Oregon's Commercial Ocean Fisheries

Just a few years ago, in the gloomy aftermath of the 1982-83 El Niño, a number of prognosticators were writing off the commercial fishing industry as a viable contributor to the future economy of Oregon. Such predictions have not borne out, and in fact were based on incomplete information or faulty perceptions. Quite to the contrary, Oregon's commercial fishing industry has rebounded rather dramatically. Its fishermen and the vessels they operate are flexible and adaptable, and readily take advantage of new opportunities.

S.10.1.1. Economic Importance of Commercial Fisheries

Commercial fisheries are an important part of Oregon's economy, particularly for coastal communities. From 1978 through 1985 the total ex-vessel or landed value of Oregon commercial fisheries averaged $64 million (in 1987 dollars), ranging from a high of $89 million in 1979 to $36 million in 1984. Added to this are monies Oregon fishermen bring back from distant water fisheries in Alaska or in joint venture operations with foreign processors. Value added to landed fish through local processing is also significant, as is the secondary income generated in support of the commercial fleet and processing firms. All of these contribute to the personal income impact of Oregon's

commercial fisheries. In 1985, a year when the commercial fisheries were still recovering from the 1982-83 El Niño event, the personal income generated in Oregon as a result of commercial fishing totalled over $162 million. In 1986, with landings in some fisheries beginning to approach historical levels, that total reached almost $233 million. More than two-thirds of this personal income generated ($161 million) was in coastal communities. Though small by statewide standards, this was a significant proportion of the total personal income in communities like Astoria and Coos Bay. Commercial fishing contributes indirectly to the tourism industry, adding character, color and authenticity to busy waterfronts.

Another way of looking at economic impact is the number of jobs generated. While no concrete job figures are available, the personal income generated by commercial fisheries can be translated into full-time job equivalents by dividing it by $20,000, the average earnings of a full-time worker in Oregon. Using this formula, commercial fisheries generated the income equivalent of 11,645 jobs in 1986.

S.10.1.2. Historical Background

After several decades of relatively stable fisheries, the 1960's and 1970's brought dramatic changes to Oregon's commercial fisheries. One of these changes was the firm establishment of the shrimp industry, which is now one of the industry's keystones. Another was the development of improved hatchery techniques for salmon. Yet another was a series of programs to stimulate boat repair and new construction, including 1969 legislation authorizing fishing vessel financing through Production Credit Associations; the 1970 Capital Construction Fund; and the 1977 Fishing Vessel Obligation Guarantee Program. These changes were capped by passage of the Magnuson Fisheries Conservation and Management Act (MFCMA) in 1976, which buoyed optimism throughout the industry. These changes and programs led to the refitting or building of several hundred fishing vessels in Oregon, including many large trawlers that could be used a wide variety of fisheries. These new entries led to significant expansion of shrimp, groundfish and other fisheries in the late 1970's and early 1980's.

S.10.1.3. Oregon's Fishermen and Fishing Vessels

The principal characteristics of Oregon's fishermen and the vessels they use are flexibility and adaptability. Because of the high degree of uncertainty associated with any given fishery, fishermen must be able to move easily from one fishery to another, or one location to another. For example, if shrimp abundance or price is low, groundfish trawling or crabbing is an alternative. Or when opportunities off Oregon are limited, distant water fisheries off Alaska are available.

Though there are a variety of vessel types used off Oregon, most of the larger boats are a variant of the western combination boat, which is characterized by the far-forward location of the deckhouse, leaving a large working area aft. Most of these vessels are equipped to participate in at least two fisheries, and can be easily converted for use in others.

Adaptability and flexibility in vessels, gear and location are important to the financial success of Oregon's fishermen and industry. These characteristics, as well as the increased use of advanced technology and more intensive regulation of fisheries, have

resulted in an increasingly professional fishing industry.

S.10.1.4. The Salmon Troll Fishery

Chinook and coho salmon are the target species in Oregon's salmon troll fishery, with small numbers of pink, chum and other fishes taken incidentally. Trolling at speeds of one to four knots, salmon fishermen catch fish with hook and line gear. Their boats have two outriggers, each of which has two to four steel lines with up to 15 baited hooks or lures per line. Salmon boats range in size from 20-foot day boats to 60-foot multi-purpose vessels. Many of these boats are also used in other fisheries, including albacore and crab. Though the majority of boats are less than 30 feet in length ((52%), the boats larger than 30 feet take more than 80% of the salmon.

Commercial salmon seasons vary from year to year, but generally occur between May and October. Most salmon trolling takes place beyond the three nm territorial sea boundary, with especially heavy fishing in the vicinity of Stonewall and Heceta Banks, between Seal Rock and Florence, and from Cape Arago south to the California border. Trips last from one to five days, depending on the vessel size.

Environmental conditions associated with upwelling are thought to be the major factor influencing the survival of salmon off Oregon. The number of smolts released, and subsequent competition between them does not appear to be a major factor in survival. The release of large numbers of hatchery smolts results not only in more adults, but in much greater fluctuations in adult abundance. The 1982-83 El Niño and resulting poor upwelling dramatically illustrated this effect.

The salmon troll fishery began in 1912, when modified Columbia River gillnet boats took to the ocean during closures in the river fishery. Until the 1960's, landings of troll-caught salmon were relatively low. Improved hatchery production, strong ocean upwelling conditions, and increased fishing effort resulted in greatly expanded catches in the early 1970's, peaking at 1.8 million fish in 1976. Landings decreased significantly in the early 1980's, hitting bottom in 1984, the year when the effects of the 1982-83 El Niño on salmon were most apparent. Both coho and chinook populations are recovering, however. Other factors have also affected the commercial salmon catch, including a limited entry permit scheme, falling ex-vessel prices and competition.

In 1979, a moratorium on troll salmon permits was passed, establishing a limited entry permit system that was made permanent by 1987 legislation. Between 1980 and 1986, the limited entry scheme resulted in a 37% reduction in permits. It is likely that the number of permitted vessels will stabilize slightly below the current level of about 2700 boats.

Prices for salmon landed in Oregon have been steadily declining since the mid-1970's. There are several reasons for this: the flood of Alaskan salmon on the market; the greater use of air transportation to ship fresh and fresh-frozen product; the influx of pen-reared imported salmon; and the high value of the dollar relative to the Japanese yen.

Just how valuable is the salmon troll fishery to Oregon and what does the future hold for this fishery? Total ex-vessel value of troll caught salmon landed in Oregon in 1986 was almost $9 million, with overall personal income impact nearly double that figure. Average annual personal

income impact since 1976 has been about $16 million, making salmon one of the most economically important fisheries in the state. For the foreseeable future, it is likely to continue to be very important, despite fleet size limitations, and increased competition from Alaskan salmon, foreign imports, and domestic aquaculture. Current trends that emphasize careful shipboard handling and improved quality should help keep troll-caught salmon competitive.

S.10.1.5. The Albacore Troll Fishery

The albacore is a moderate sized tuna, weighing up to 40 pounds, with a maximum length of about four feet. Albacore, like salmon, are caught with hook and line using plastic "squid" lures or jigs. As many as 14 individual lines with single hooks are set from two outriggers. The boats that fish for albacore are generally the larger salmon vessels. Larger boats are needed because the principal fishing areas are 100-200 nm from the coast, requiring longer trips and larger storage capacity.

While there are no official seasons, the migratory albacore are generally fished from July to September. They are an extremely temperature sensitive fish, preferring water that is 58° to 64°F; albacore also frequent areas where horizontal temperature gradients are steep, along what are known as "oceanographic fronts". Water temperature data thus becomes very important to fishermen seeking this fish.

Albacore has historically been an important second source of income to salmon trollers. Though the fishery dates back to 1906, the first commercial albacore landings in Oregon were made in 1936. The fishery expanded rapidly after that, but has fared poorly in recent years. The collapse of the U.S. tuna canning industry has depressed the market, with prices and landings both dropping more than 300% since 1978. Many albacore fishermen have left the fishery, or alternatively taken to direct marketing of their fish to the consumer. Albacore abundance, however, appears to remain high.

S.10.1.6. The Groundfish Trawl Fishery

Oregon's groundfish trawl fishery has several segments or subfisheries, including the nearshore mixed-species fishery, the deepwater fishery, and the mid-water fishery. The groundfish trawl fishery experienced dramatic growth during the late 1970's, reflecting a West Coast trend. Oregon landings increased from 20 million pounds in 1975 to a peak of about 92 million pounds in 1982, but since have dropped to about 57 million pounds in 1986. The rapid growth was due to several factors: increased optimism following the 1976 passage of the MFCMA, and new loan and loan guarantee programs, which led to construction of many new trawlers; several years of low shrimp abundance, which caused shrimp trawlers to switch over to groundfish; and the start of the mid-water trawl fishery in 1979. The post-1982 decrease in catch was partly a result of management controls instituted by the Pacific Fisheries Management Council (PFMC), including quotas, trip limits and season closures on overfished species like widow rockfish. These controls apply to the whole West Coast, not just waters off Oregon.

♦ The nearshore mixed-species fishery catches ling cod, Pacific cod, Pacific whiting, rockfish, several sole species, sanddabs, starry flounder and other bottomfish. Fishing takes place both within and outside the territorial sea, from 10 to 250 fathoms (60 to 1,500 feet) in depth, and all year around, though landings may be less

in winter due to adverse weather. Nearshore trawlers, ranging from 45 to 100 feet in length, fish directly on the bottom using bottom trawls. Bottom trawls are large funnel shaped nets, with a wide net tapering down to a narrow "cod end" where the caught fish collect. While there are no seasons per se, several species or groups are in this fishery are managed on the basis of quotas or trip limits. English sole, petrale sole, other flatfish, the "Sebastes Complex" are considered fully utilized; steps have even been taken to reduce the catch of certain species, such as yellowtail rockfish.

♦ The **deepwater fishery** mainly catches Dover sole and sablefish (black cod) using bottom trawls. Fishing takes place entirely outside the territorial sea, in water from 250 to 700 fathoms (1,500 to 4,200 feet). As with the nearshore groundfish fishery, quotas are used to manage deepwater trawling. The 1982 groundfish management plan adopted by the PFMC underestimated the allowable biological catch for Dover sole, and the quotas have increased accordingly. However, fishing effort on Dover sole has actually decreased. As with groundfish in general, this is because many trawl vessels switch over to the more profitable shrimp when price and abundance are up. Sablefish, also taken in the fish pot and setline fisheries, are probably at or near the maximum sustained yield (MSY), so little increase in catch can be expected.

♦ The **mid-water fishery** targets on widow rockfish, a schooling species that spends considerable time off the bottom, and on Pacific whiting, most of which are caught as part of joint venture operations where the catch is delivered to foreign processing vessels. Mid-water trawlers are larger (70 to 100 feet) and more powerful than bottom trawlers, fishing both inside and outside the territorial sea all year around. Widow rockfish are fished all year around, and whiting, a migratory species, are fished from April, when they appear off southern Oregon, to midsummer, when they are off northern Washington.

S.10.1.7. The Shrimp Trawl Fishery

The target of the shrimp trawl fishery is the small pink shrimp, *Pandalus jordani.* Most of the Oregon shrimp boats today are double-rigged vessels, 45 to 85 feet in length. Separate trawls attached to the two outriggers are dragged close to the bottom, and equipped with chains to stir up the shrimp buried in mud on the bottom. Mesh size on shrimp trawls is 1½ inches, much smaller than that used for groundfish.

Pink shrimp are found in beds in areas where there is green mud, generally at depths of 50 to 100 fathoms (300 to 600 feet). With only a three to four year life span, pink shrimp are vulnerable to environmental variations, and populations can vary significantly from year to year. Fluctuations appear to be related in part to the degree of coastal upwelling, with strong upwelling producing abundant year classes. Abundance may also be related to the abundance of predators, such as whiting, sablefish and sole.

Though the first pink shrimp landings in Oregon were made in 1952, it was not until 1957, when the shrimp peeling machine was introduced, that the fishery caught on. The late 1960's brought significant growth in the shrimp fishery that peaked in 1978 with a catch of nearly 57 million pounds. Landings decreased the next few years, and plummeted to about 5 million pounds in 1984, probably due to warm temperatures and poor upwelling associated with the 1982-83 El Niño event. Since then,

catches have recovered, reaching 34 million pounds in 1986. Given the extreme sensitivity of the pink shrimp to environmental factors, it can be expected that shrimp catches will continue to fluctuate from year to year. In order to maintain some control over fishing effort, the 1987 state legislature made permanent the temporary limited entry permit scheme that had been established earlier.

The pink shrimp is extremely important to the Oregon fishing industry as a whole, with average 22.3% relative contribution to total yearly landings value. The fishery is so important has a major influence on the participation in several other fisheries. At present, however, there are no coordinated management controls for this interjurisdictional fishery. Given the importance of the shrimp fishery to Oregon, coordinated management of shrimp stocks with California and Washington should be pursued, as discussed in S.10.6.8.

S.10.1.8. The Dungeness Crab Pot Fishery

Dungeness crab are caught in round pots of three to five feet diameter. The pots are made from steel stock covered with stainless steel wire mesh. To each pot a line is attached, with a marker buoy or float on the other end. The pots are set out in a line, usually parallel to the coast or along a particular depth contour, and fished or "soaked" for one to seven days. A variety of vessels participate in the crab fishery, from relatively small salmon trollers, to large trawlers or longliners. The only special requirements are a powered pulley or crab block, and a sea water circulating tank to keep caught crabs alive in the hold. The number of pots fished ranges from 100 to 1500, depending on vessel size.

Crab pots are fished all along the Oregon coast, in sand or sand-mud bottom areas. Most of the effort occurs close to shore, out to 65 fathoms (390 feet), but pots have been set as deep as 100 fathoms (600 feet) in recent years. About half of the catch comes from within the territorial sea. Crab gear is very vulnerable to damage from passing vessels; special agreements among different fishery groups and with towboaters to establish set fishing areas and navigation lanes have greatly reduced damage in recent years.

The crab season is closed from August 15 through November 30, when crabs molt and product is unacceptable. Only male crabs that are more than 6½ inches across the back of the shell may be kept. Heavy fishing occurs early in the season, with the abundance of legal size males decreasing rapidly. As a result, crab fishing begins to taper off by spring, with many fishermen moving to other fisheries or preparing for the approaching salmon troll season.

Crab catch, both off Oregon and off the West Coast as a whole, shows an eight to eleven year abundance cycle. The reason for this cyclical abundance is unknown, although several theories have been advanced, including the effects of cannibalism, oceanographic conditions, salmon abundance or other factors. Oregon crab landings, reflecting this cycle until the last few years, have fluctuated between a low of 3.1 million pounds in 1972-1973 and a high of 16.1 million pounds in 1976-77. Since 1980 it appears that the abundance cycle has been broken to some degree; catch over the last several years has remained low instead of increasing as was expected. This may be a lingering effect of the 1982-1983 El Niño event.

The crab fishery, because it is so heavily fished for a short period of time, may be a candidate for a limited entry scheme. Such a scheme would limit the present heavy participation in the fishery, spread the catch out over a longer time period, and perhaps help keep prices higher and more stable.

S.10.1.9. The Sablefish (Black Cod) Fish Pot Fishery

Sablefish caught in the pot fishery are of higher quality than those caught in the trawl fishery, and thus bring a higher price. The fish pots used are large, commonly measuring three by eight feet. Up to 50 pots are attached to a ground line, and are fished for 24 hours before retrieval. Pots are generally fished in 200 to 400 fathoms of water (1,200 to 2,400 feet), and fishing occurs year around. Recently, trip limits have limited the take toward the end of the year. Catches have ranged from almost 10 million pounds in 1979 to a low of one million pounds in 1981. For the last several years, catches have ranged from three to four million pounds.

S.10.1.10. The Longline Fishery

Halibut and sablefish are target species in the longline fishery. A longline, also called setline, consists of a "ground" line that lies on the bottom, held in place by anchors at each end. Each anchor is attached to a surface float, and each float has a flag, radar reflector or other device to make location and recovery easier. The ground line itself may be up to 1800 feet long, with baited hooks attached to short leaders. Hook spacing is 18 to 30 feet apart for halibut, or every three feet for sablefish. Longlines are fished for six to twelve hours for halibut, and four to six hours for sablefish. Halibut lines are set at depths of 15 to 150 fathoms (90-900 feet), while sablefish lines are set at depths of 100 to 400 fathoms (600-2,400 feet). A wide variety of boats ranging from 25 to 70 feet are used in the longline fishery.

The halibut fishery is tightly controlled by the International Pacific Halibut Commission (IPHC), a U.S.-Canadian organization created by treaty in 1923. The management framework established annually by the IPHC is implemented at the national, state and provincial level. The halibut season consists of several short fishing periods during the summer months. In 1985 the season off Oregon consisted of three periods totalling 31 days. There is no set sablefish season, so it could theoretically continue year round. However, in recent years trip limits and fishery closures have been necessary to limit landings, with the result that the season effectively ends in October.

The main trend in the longline fishery is rapidly increasing effort, particularly for halibut. Halibut stocks that were severely depleted by foreign fishing in the late 1960's and early 1970's have rebounded, with catch limits gradually increasing. Halibut fishing will continue to be tightly regulated, however. Statistics for halibut landings in Oregon can be misleading because most of the fish landed here are caught off Alaska. Another development is an increased recreational halibut fishery off Oregon, which may result in increased conflicts in the future.

S.10.1.11. Minor Fisheries

Squid, taken by purse seine, lampara nets or shrimp trawls, is a recently developed fishery off Oregon. The small market squid are present all year around, but the commercial fishery usually begins in April, with virtually all the catch taken within the territorial sea in sandy bottom

areas 10-55 fathoms deep (60-330 feet). The principal controlling factors for squid are processing capacity, market conditions and the status of other more valuable fisheries, especially shrimp. For example, the successful shrimp season in 1986, combined with a good catch of larger squid in California that met market demand, virtually wiped out the Oregon squid fishery in 1986. External factors are likely to continue to control the squid fishery.

Scallops, fished with a heavy, trawl-like dredge, were first fished off Oregon in 1981, when two New England scallopers headed for scallop grounds off Alaska discovered good beds off Coos Bay. Over 16 million pounds of scallops were landed that year, but the small beds were quickly played out. Landings in 1982 dropped to 1.5 million pounds, and have not exceeded 3.3 million pounds since then. Oregon's scallop populations apparently suffer low reproductive success most years and development of a major fishery is unlikely. It probably will remain an alternative fishery for a few local boats. Scallops were included with shrimp under the revised limited entry permit legislation enacted by the Oregon State legislature in 1987.

Sharks found off Oregon include the soupfin, blue, cowshark, thresher, basking, salmon shark, and dogfish. Historically, Oregon had a sizable fishery for soupfin and dogfish sharks, the livers of which were excellent sources of vitamin A. Demand ceased when synthetic vitamin A was developed in 1949. Recently, public acceptance of shark meat has increased, and in 1986 a thresher shark fishery developed off Oregon. This fishery was entirely vessels from the southern California thresher fishery, and while nearly half a million pounds were landed in Oregon, the product was shipped to California where it was processed. The Oregon Department of Fish and Wildlife (ODFW), concerned about maintaining stocks, has recently adopted commercial shark harvest regulations.

S.10.1.12. Relative Importance of Oregon's Commercial Fisheries

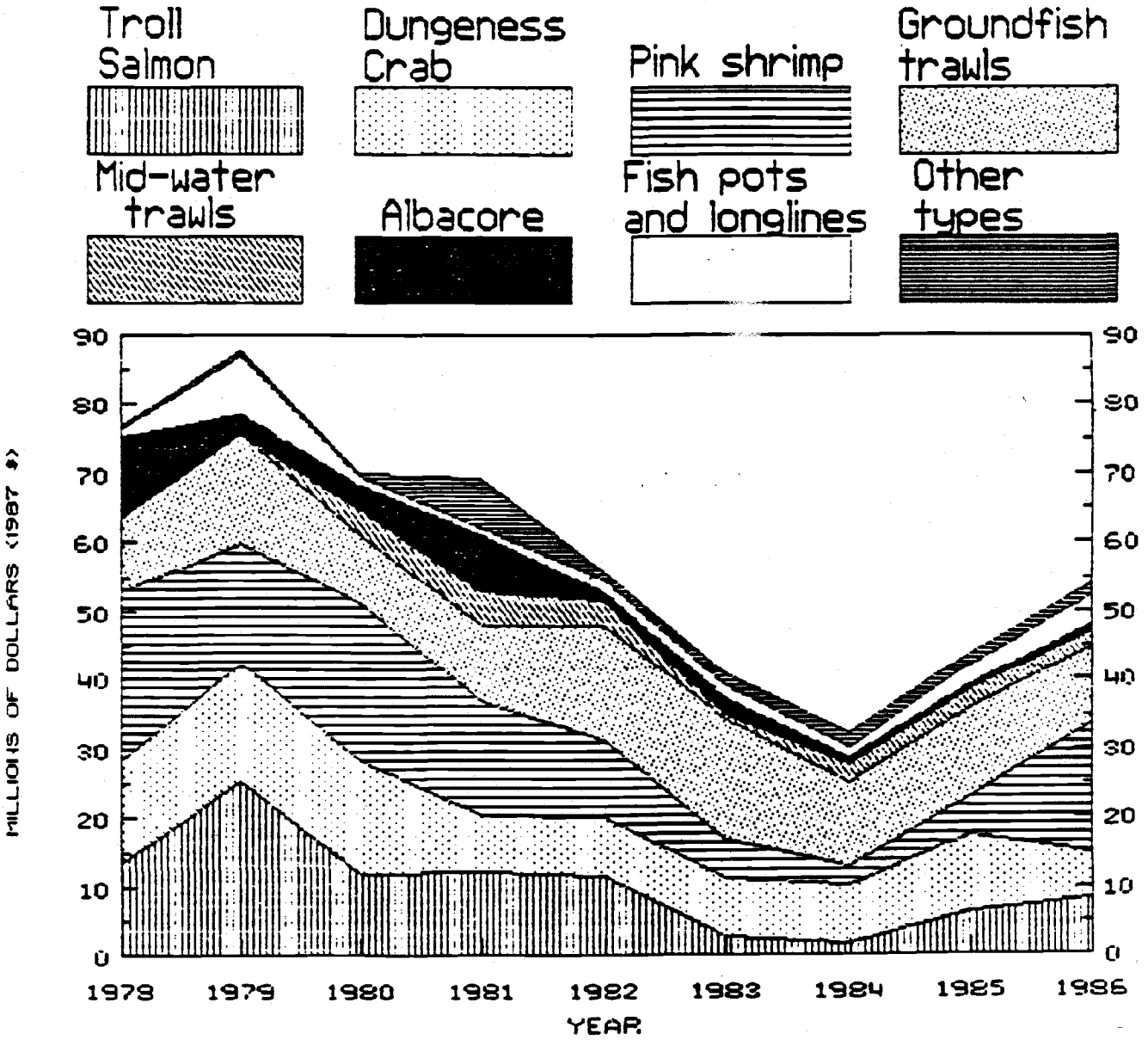
The truest measure of the relative economic importance of Oregon's various commercial fisheries would be the overall impact of that fishery in terms of personal income generated. This would factor in ex-vessel value, processing value, support and service industry job income, etc. Unfortunately, such data is not available for every fishery. The best measure of economic importance for which data is available is ex-vessel value, the value the fisherman is paid for his landed catch.

Figure 10-29 shows ex-vessel values of the different fisheries in 1987 dollars. The relative width of the patterns for each fishery depict the relative importance of the fishery for a given year. The decline in total value of landings from 1979 to 1984 is readily apparent, and due principally to decline in salmon and shrimp. As these fisheries recovered in 1985 an 1986, the industry as a whole rebounded. However, the groundfish trawl fisheries, and the Dungeness crab fishery remained relatively strong throughout, and are important contributors to Oregon's commercial fisheries.

S.10.2. Recreational Ocean Fisheries

Recreational ocean fishing, by both private and passenger-carrying charter boats, also contributes significantly to Oregon's economy. Its largest fishery, salmon, contributed an average of $13.1 million in personal income between 1976 an 1985. Recreational groundfishing is growing

FIGURE 10-29. Relative contribution of the various gear types to the total ex-vessel value of Oregon landings. Values are in 1/87 dollars. Source: ODFW, unpub. data.



in importance as well, for both private and charter recreational fishermen. Charter trips for all types of fishes make up nearly a quarter of all ocean angler trips, and one-third of those anglers are from out-of-state, bringing significant income to the state.

S.10.2.1. The Recreational Salmon Fishery

Coho and chinook salmon are the target in the salmon recreational fishery. Coho, which congregate closer to the surface and are thus more available, constitute 80-90% of the recreational catch. The fish are generally caught while trolling with rod and reel gear, using artificial lures, or herring bait and flashers.

Recreational seasons are complex. Managers try to keep the season open in most areas from Memorial Day to Labor Day, but often must use in-season closures, day restrictions and other means to limit catches. Fishing effort is normally greatest in July and August.

Most recreational salmon fishing takes place within 10 miles from port, within or just outside the three nm territorial sea. Often, large congregations of small private boats are found close to the jetty entrances of ports, sometimes creating navigation hazards.

Until about 1960, the ocean recreational salmon fishery remained quite small, with less than 100,000 coho taken. By the mid-1960's, coho catch grew to about 250,000, and with the exception of the 1984 catch, has never gone below 200,000 coho. The record year was 1976, when the coho catch was 500,000. On the average, about 25% of salmon angling trips are made on charter boats, with annual variation following the overall trend in catches. For example, in 1984 when recreational salmon catch bottomed out, only 16% of salmon trips were made from charter vessels. The charter boat industry in Oregon is thus closely tied to the coho salmon abundance variations. Whether this is driven mostly by angler demand (or lack thereof), or due to a lack of adaptability (i.e., switching to alternative species) on the part of some charter boat operations is unclear.

S.10.2.2. The Recreational Groundfish Fishery

In spite of the almost religious attachment by some to the salmon recreational fishery, groundfish make up an important and increasing share of the recreational ocean fishery off Oregon. The catch is made up of rockfish (82%), ling cod (14%) and a variety of other species. The sport halibut fishery is also gaining popularity. Some 500,000 to 1,000,000 groundfish are caught each year, on some 200,000 to 400,000 angler trips. Many more groundfish are caught in the shore fishery. While most of the groundfishing is from private boats, charter boats are increasingly turning to groundfish, especially in the spring, fall and other periods when salmon are not available. There are no seasonal restrictions for recreational groundfish and reef areas close to shore are principal target areas. Charter boats and larger private vessels with accurate radar and fish-finding gear are particularly successful in this fishery.

Groundfish will play an increasingly important role in the recreational ocean fishery off Oregon, though salmon, when available, will remain dominant. Groundfish are a viable fishery in their own right given the diversity of species and lack of seasonal restrictions. They also are an alternative during times when salmon abundance is low, particularly for the charter industry. Much of the future

success of the groundfish charter business will hinge on industry marketing efforts.

S.10.3. Commercial-Recreational Fishing Conflicts

The principal basis for past, present and future disputes between commercial and recreational fishermen is competition for limited fishery resources. Generally, the commercial fisheries take more fish and are much more efficient at harvesting than the recreational fisheries, and can effectively fish out an area, making the recreational experience unsatisfactory. The resource competition has a spatial component as well, given the habitat preferences of the different fish species. A related conflict has to do with navigation; commercial vessels need room to conduct their fishing activities. This may be a serious problem where large numbers of private recreational boats are in the vicinity of commercial operations.

Existing conflicts off Oregon fall into one of five main categories:

♦ Resource conflict between commercial and sport salmon trollers.

Harvest capacity of the sport and commercial fleets exceeds the allowable catch of salmon. Allocation agreements have mitigated this dispute, but it will continue to be problem as salmon populations fluctuate.

♦ Resource conflict between groundfish trawlers and sport groundfish hook-and-line fishermen.

Though some recreational fishermen believe that trawlers are decimating rockfish populations in nearshore reef areas, this conflict is more perception than fact. Nearshore trawlers are in fact targeting on flatfish, which are found in sandy areas. Also, the rocky inshore reefs are generally too rough for commercial gear, and the smaller rockfish found there are not of great commercial interest. This conflict could expand, however, as the recreational fishery explores new reefs further offshore.

♦ Resource conflict between commercial groundfish hook-and-line (jig) fishermen and sport groundfish rod and pole fishermen.

These two groups do fish the same areas for the same fish. There is disagreement as to the future of the groundfish jig fishery, but if it does grow substantially, the recreational-commercial conflict could get worse.

♦ Resource conflict between commercial longline halibut fishermen and sport halibut fishermen.

Recreational fishing for halibut, principally on charter boats on Heceta and Stonewall Banks, is growing as is the commercial effort and catch. There is potential for allocation and gear-related conflicts in this developing fishery. Further action by the International Pacific Halibut Commission may be needed.

♦ Spatial / navigational conflict between commercial and recreational boats.

The principal issues here are lack of adherence to accepted navigation rules on the part of small recreational vessels, and congestion at port entrances and fishing areas. Most of the complaints are from commercial fisherman. Increasing recreational ocean fishing will exacerbate this problem.

Alternatives for resolving commercial-recreational fishing conflicts include formal ODFW hearings followed by OFWC regulation adoption as occurred for the commercial-sport bay crabbing conflict (see OAR 635-05-045); commercial and recreational user meetings leading to allocation agreements ultimately adopted in fishery management plans (FMPs) as occurred for the PFMC 1987 salmon plan; the Oregon Coastal Zone Management Association (OCZMA) proposal for a governor-appointed task force on state salmon management; and the formal MFCMA FMP development process administered by the PFMC. The 1986 MFCMA amendments regarding gubernatorial appointments to the councils could have some impact on council makeup and therefore PFMC resource allocations between commercial and recreational fisheries.

S.10.3.1. The Commercial/Recreational Catch Allocation Issue

Allocation of fish among different user groups becomes an issue when their combined harvesting capability becomes greater than the allowable biological catch, the allowable biological catch being the amount over that needed to maintain healthy fish populations. Once allocation becomes an issue for a given species, questions arise about allocation goals and how decisions are to be made.

Common examples of allocation goals are: to improve community income and employment levels; to maximize the net economic value of harvesting a given species; and to maintain fishing lifestyles and community character. With the advent of economic input-output models that can compare the value of a commercial-caught fish versus a recreational-caught fish, the relative value of commercial and recreational fisheries can be determined. These figures can then be used to help decide the allocation question. An important point, however, is that the per fish increase in income is not a constant. In particular, the increase in community income resulting from recreational fishing is not a function of the number of fish caught, but rather of the number of angler trips made. The amount spent on a sport fishing trip will remain roughly the same regardless of the number of fish the angler catches.

S.10.3.1.1 Commercial/Recreational Salmon Allocation

Allocation of the salmon resource between commercial and recreational groups off Oregon began with coho in 1980. Since then, the recreational fishery has been gaining a larger and larger share of the allocation, particularly when the number of available fish is low. For the last few years the allocation formula has been relatively stable, and in 1987 was negotiated by the fishermen themselves. Major changes in the future seem unlikely. Sport allocations may be close to the point where further increases are economically unjustifiable, because the higher harvest will not result in additional angler trips, but merely an increased catch per trip. This is particularly true for chinook, where the personal income value of a commercial-caught fish is already nearly equal that of a sport-caught fish.

Also important factors in salmon allocation are Indian treaty entitlements and the U.S.-Canada Pacific Salmon Interception Treaty. In an attempt to rebuild coastal chinook stocks in Oregon and Washington, the overall harvest ceilings set by the U.S.-Canada treaty for 1985 and 1986 represented a 25% reduction over 1984 catches. Starting in 1987, chinook harvest ceilings are set by the International Pacific Salmon Commis-

sion that was established by the treaty.

S.10.3.1.2. Commercial/Recreational Halibut Allocation

1987 is the first year in which a sport halibut allocation for the Oregon-Washington area has been made by the International Pacific Halibut Commission. The plan allocates 200,000 metric tons to the recreational fishery, 400,000 metric tons to the commercial fishery, 100,000 metric tons to Indian fishermen, with 50,000 metric tons held in reserve. Effort in the sport halibut fishery appears to be increasing rapidly, and future sport allocations may increase.

S.10.4. Environmental Effects and Conflicts with Other Uses

The principal environmental effect of commercial and recreational fishing is the harvest itself. Large numbers of both target and incidental fishes are taken. The harvest per se, however, does not significantly affect other ocean uses, and is increasingly regulated and monitored. The other main environmental effects of fishing are gear-related. Lost fishing gear that continues to "fish" can be a major problem. Marine debris that originates from both commercial and recreational boats (nets, wire, styrofoam trash, packing straps, etc.) entangle birds and marine mammals, and can damage propellers, shafts and fishing gear.

Though we generally think of other uses adversely affecting fisheries instead of the other way around, some fishing activities have adverse impacts on other ocean uses. Commercial fishing vessels with gear in the water may present navigation obstacles to towboats, seismic vessels, dredges and mining ships; fishing gear, particularly trawls, can also damage pipelines and electronic cables on the sea bottom. Marine debris dumped by fishermen can foul propellers of commercial vessels or tugs and litter beaches with bait trays and other plastic.

Conflicts between fishing and other uses are inevitable but manageable. A variety of dispute resolution techniques have been used in successful negotiations in Oregon and elsewhere and warrant consideration with respect to future conflicts. Examples include: (1) the DLCD-federal MMS Memorandum of Agreement regarding seismic exploration activity conflicts with fisheries, primarily crabbing and pot fishing; (2) the reflection of fisheries and marine mammal concerns in DSL's 1986 oil and gas seismic survey rules for state waters; (3) towboat lane agreements with crabbers and pot fisherman (see section 9.4.1.) which are reviewed at least annually under Sea Grant Marine Extension auspices; and (4) the somewhat analogous allocation of fishing areas between draggers and crabbers (see section 10.2.6.5.). The lessons learned from such dispute resolution processes should be reflected in efforts such as DSL's rulemaking for hard minerals exploration. Likewise, the results of ongoing ODFW research on conflicts between fishing and hard mineral mining and oil and gas development (*Interstate Living Marine Resource Information Development Project*) should be incorporated into existing and future conflict resolution arrangements.

S.10.5. The Future of Oregon's Ocean Fisheries

Predicting the future is risky business, but the information presented here suggests a number of important trends. As has occurred in the past, however, any number of factors could nullify or reverse current trends. "Fishing future" questions dealing with product demand, catch of tradi-

tional and underutilized species, the role of distant water fisheries, personal financial issues, and change in the recreational fishery are addressed below.

♦ What will the future demand for the products of Oregon's commercial fisheries be like?

Demand for Oregon's seafood products is likely to continue to grow. Factors contributing to this demand are the national trend toward low fat diets and the well-publicized health benefits of the omega-3 fatty acids found in fish oils. Oregon's national reputation for environmental quality contributes to the perception of its fishery products as clean and healthful. Demand may also be tempered by other factors, particularly for salmon, where Alaskan catches and pen-reared imports are competing with Oregon for limited markets.

♦ Will the stocks of commercially important species recover to historic levels? Are they large enough to support increases in the catch of traditional species in presently utilized areas?

With the possible exception of salmon, long term commercial catches of traditional species could again approach the amounts caught in the early to mid-1970's. The harvests of the late 1970's were excessive and probably will not be reached again in the future. Similarly, the low levels of the early 1980's, influenced by earlier fishing pressure and the 1982-83 El Niño, also are unlikely to reoccur. Minor expansion of traditional fisheries into geographic areas not previously fished may occur, as is the case for crab and sablefish, where pots are being set deeper each year.

♦ Will distant water fisheries continue to increase in importance?

Distant water fisheries are likely to make an increasingly important contribution to the Oregon fishing industry. Potential earnings in a variety of Alaskan fisheries, particularly in the developing U.S. catcher/processor operations, are likely to attract more and more Oregon fishermen who bring their earnings back to the state. Oregon harvesters currently engaged in joint ventures with foreign processors could lose out if the planned Americanization of Alaskan fisheries such as groundfish takes place without their participation.

♦ Will utilization of presently underutilized species or underutilized areas (for traditional species) allow long term increases in the harvest?

The most promising underutilized specie off Oregon is the hake or Pacific whiting. Historically, whiting has been a foreign fishery, caught and processed at sea by factory ships. Whiting caught and processed ashore in traditional American fashion was mushy and unacceptable to the domestic palate, so no market developed. To develop this as a domestic fishery, U.S. catcher/processor vessels must enter the fishery and use the special handling and processing techniques that ensure a quality product. This fishery could be significant, serving existing foreign markets and developing domestic ones. Squid also has some potential for growth, but the small size of the Oregon market squid, competition from the California squid fishery and more attractive alternative fisheries like shrimp make its future uncertain.

♦ Will commercial fishing remain a financially viable business in Oregon?

The darkest cloud over the financial future of Oregon's commercial fisheries is the present increase in vessel hull and liability insurance, averaging

300% over the last few years. This increase is due in part to national insurance industry trends, but also to a sharp rise in the number of accidents in the late 1970's and early 1980's. Future fuel costs and interest rates, now relatively low after being high just a few years ago, will also impact the financial success of commercial fishermen. Precise predictions regarding these factors are virtually possible, but it is more likely that they will increase than decrease.

♦ What will the demand for recreational fishing be like and how will the recreational/commercial allocation question be answered?

The demand for recreational ocean fishing will likely continue to grow, along with the population of the region, increased demand for recreational opportunities in general, and with the growth in disposable income. The sport salmon industry, based principally on coho, will likely request more and more of the allocation, even if such increases cannot be economically justified. Sport pressure on chinook will likely remain relatively low, and thus chinook will be primarily available to the commercial fishery. Recreational demand for halibut is likely to increase; the recovery of stocks may be such that increased demand by both commercial and recreational fisheries can be met, at least in the short term. Demand for recreational groundfishing will also grow, due to increased marketing and the opportunity it affords to lengthen sport fishing seasons on either side of the summer salmon season. In general, it can be expected that allocation disputes between commercial and recreational interests will continue and perhaps increase.

S.10.6. Legal/Institutional Issues

S.10.6.1. Fisheries Management Authorities

The Oregon Fish and Wildlife Commission (OFWC) is granted broad regulatory authority over fisheries management by ORS § 496.138. The seven-member, governor-appointed citizen commission may formulate fisheries management policies and programs, promulgate rules, and issue fishing permits. OFWC has the further responsibility of appointing a State Fish and Wildlife Director who is administrator of the Oregon Department of Fish and Wildlife (ODFW). OFWC may and has delegated a good deal of its authority to the Director. The Director is responsible to OFWC for administration and enforcement of fish and wildlife laws, and for supervision and control of employees. The Fish Division of ODFW is responsible for management of all fish and other marine life over which the OFWC has regulatory jurisdiction (ORS § 506.142).

State policy generally supports OFWC/ODFW as the state's fisheries manager. One reason given for the recent veto of 1987 H.B. 2613, which would have created a non-profit state salmon corporation with authority to take over private salmon ranching facilities, was to preserve OFWC/ODFW salmon management authority.

A critical issue with regard to management authority is the role of the legislature vis-a-vis OFWC, the Director, and ODFW. One concern is legislative "micromanagement" of specific fisheries, particularly through increasingly popular limited entry schemes. An important question is whether the legislature should delegate to OFWC general authority to impose limited entry management where appropriate pursuant to legislatively specified criteria, rather than

enacting fishery-specific statutes creating special limited-entry commissions as currently. The Oregon experience with limited entry is growing with the 1987 legislature's indefinite continuation of the salmon, shrimp, and scallop fisheries limited entry schemes, and the passage of 1987 H.B. 2439 which authorized rather than mandated OFWC to impose limited entry in the sea urchin fishery.

Continued state attention to limited entry as a management technique should serve state interests well as the PFMC gravitates towards imposing limited entry in fisheries important to the state, e.g., the groundfish fishery. Also, Washington state limits entry into its Puget Sound geoduck clam and dungeness crab fisheries to reduce conflict between commercial and recreational users of those resources. Since Oregon is experiencing more and more recreational versus commercial fishing disputes such as bay fishing for crabs (recently resolved by limiting commercial crabbing in bays to periods least threatening to recreational users and the resource through amendments to OAR 635-05-045 by OFWC), limited entry deserves further consideration in that context as well.

S.10.6.2. Fisheries Management Policy

A variety of statutes and regulations establish Oregon's fishery management policies. ORS § 506.109 states that "food fish shall be managed for the optimum economic, commercial, recreational and aesthetic benefits", while OAR 635-07-515(2) establishes regulatory objectives to obtain "the most favorable continuing benefits, including the value of food produced, fishing opportunity, economic values, social and aesthetic benefits". In addition to these broad fishery management policies and others in statute and regulations governing OFWC and ODFW operations, Ocean Resources Goal 19 also has far-reaching policy statements with regard to fishery management, and makes no distinction between commercial and recreational fisheries.

Goal 19 states that renewable resource management and protection, including food production, shall have "clear priority" over nonrenewable resource use. Agencies with management authority over ocean resources, including ODFW, are required to determine the impacts of proposed projects or actions, presumably including fisheries management. The goal also mandates "sound conservation of ocean resources," with specific requirements for scientific inventories regarding fish stocks, designating and enforcing fishery regulations to maintain the optimum sustainable yield (OSY) while protecting the marine ecosystem, and developing and encouraging improved fishing practices. These requirements are clearly directed at fishery management activities and programs carried out by OFWC/ODFW.

With respect to OFWC/ODFW policies, there are lingering inconsistencies between statutory policies for "food fish" management (ORS Ch. 506) on one hand, and "game fish" (ORS Ch. 496) on the other, left over from the merger of the merger of the fish and wildlife management into one commission. Different policies continue to govern the same state lands and in some circumstances the same species of fish. ODFW should review these statutes at the earliest opportunity to determine if there are scientific or regulatory reasons for maintaining these different standards. If no compelling arguments emerge to leave the present system as it is, then ODFW should work with the legislature to refashion these statutes so that recreational and commercial fisheries are managed on an equal

statutory footing. In addition, a review of state fisheries enforcement law, policy, and practice seems called for given the June 1987 state takeover of prosecution of fish and wildlife law violations in Clatsop County, due to insufficient county budget to prosecute major violations of the laws limiting commercial harvest of undersized shrimp and controlling salmon harvest.

It is the conclusion of this study that commercial and recreational fisheries management as now carried out substantially complies with Goal 19. However, OFWC/ODFW management decisions should be classified as Class A permits in ODFW's LCDC-certified coordination program, thereby formally subjecting fisheries management decisions to Goal 19 compliance review. In addition, Goal 19's more formal inventory and impact assessment requirements should be incorporated into ODFW's fishery management decisions. These recommendations comport with relevant judicial decisions such as Audubon Society of Portland v. ODFW, 67 Or. App. 776, 681 P.2d. 135 (1984) and Federation of Seafood Harvesters v. OFWC, 291 Or. 452, 632 P.2d. 777 (1981).

With regard to activities conducted or permitted by other state agencies that may affect fisheries, coordination programs and regulations of those agencies also should be modified to ensure compliance with Goal 19, particularly the mandate that renewable resources such as fisheries have clear priority in case of conflict with nonrenewable ocean resource uses. This principle accords with current economic reality with respect to economic benefits from ocean use off Oregon, and recognizes the importance of ocean fisheries management responsibilities assigned to OFWC/ODFW.

Although it has been suggested by some that fisheries management be excluded from the requirements of Goal 19, that would be counterproductive and not in the interests of Oregon's fisheries, especially considering that all other ocean-related activities and state agencies are subject to Goal 19. Compliance with Goal 19's fisheries mandates by all state agencies including ODFW will be aided by the multi-agency/user group ocean planning task force approach reflected in 1987 S.B. 630 of which ODFW's Director is a statutory member. That and other interagency ocean coordination efforts encouraged by DLCD should insure that the burden of implementing Goal 19's fisheries mandates will not fall solely on ODFW and OFWC. What is at stake is dramatically illustrated by the July 1987 spill in Alaska's Cook Inlet estimated to have caused fisheries losses up to $100 million. In a post hoc response to that incident, controls on tanker traffic to protect key seasonal fisheries from such effects were advocated in the absence of the necessary legal and institutional framework to coordinate and implement such a measure.

S.10.6.3. Fisheries Habitat Policy

The increased emphasis on the protection and enhancement of fish habitat as a fisheries management strategy in Oregon should be continued. OAR 635-07-515(6) states that "aquatic and riparian habitat shall be protected and enhanced to optimize production of desired species." Goal 19 also emphasizes habitat considerations, requiring identification and protection of areas important to fish, shellfish and other invertebrates, including feeding, spawning and nursery areas. These state provisions are supported by recent amendments to the federal MFCMA providing management councils such as the PFMC with the au-

thority to review state or federal actions that may adversely affect fish habitat. The PFMC also is preparing habitat sections for its FMPs.

S.10.6.4. Fishing as a Preferred and Protected Ocean Use

There are a number of sources that provide support for the preferred status of fishing vis-a-vis other uses of the territorial sea, including the habitat protection provisions above. ORS § 506.109(2) directs state officials "to develop and manage the lands and the waters of this state in a manner that will optimize the production, utilization and enjoyment of food fish...compatible with other uses." The "clear priority" given to renewable ocean resources by Goal 19 is also tempered by clear support for other development, if found to be compatible. This brings into focus the importance of the Goal 19 inventory and impact assessment requirements discussed earlier.

Several aspects of the Goal 19's inventory and impact assessment requirements need clarification, much of which may be provided by the *Model Inventory and Impact Assessment Methodology* being developed for DLCD by Fogelman, Blumm and Huffman. It is unclear, for example, how much information will be "necessary ... and sufficient" to understand and describe the short and long term impacts of development activities. Though the goal does say that complete inventories are not needed, the type and amount of information, and the degree of understanding an inventory needs to convey is unclear. These ambiguities, to some extent unavoidable, leave ocean resource development actions open to challenge in court.

Goal 19 also addresses the preferred status of fishing, though somewhat indirectly, when it specifies the need to develop a "scientific understanding of the effects of man's activities [e.g., mining, waste discharge, dredged material disposal] on the marine ecosystem," and that these activities shall not "substantially interfere with or detract from use of the continental shelf for fishing... and long term protection of renewable resources." Again, the lack of precision in phrases like "scientific understanding" and "substantially interfere" leaves the door open to litigation by those who oppose particular ocean resource use decisions.

S.10.6.5. ODFW's Role as State Biological Consultant

In a number of chapters of this study, including marine mineral mining, oil and gas development, and marine pollution, the role of ODFW as the state's "biological consultant" to other state agencies and federal agencies was emphasized. While some ODFW consulting roles are built into statutes and regulations, others are not. It is recommended that all state agencies with ocean resource management authority include provisions in their LCDC-certified coordination programs requiring consultation with ODFW about potential impacts on living resources and their habitats. Going a step further, these consultation provisions could provide that other agencies will defer to ODFW's biological advice in the absence of compelling evidence to the contrary provided by the applicant or other interested agencies or parties. Such deference seems economically justifiable given that current economic returns from nearshore activities mostly involve renewable, living resources for which ODFW has important regulatory responsibilities and expertise.

To support more extensive ODFW participation as a biological consultant with respect to potential impacts

of nearshore development activities on living resources, ODFW's current authorization under ORS §§ 496.815 through 496.835 to collect administrative fees and assessments on applications for hydroelectric projects reviewed by it could be extended to nearshore ocean development activities.

S.10.6.7. Federal-State Coordination in Fisheries Management

Passage of the federal Magnuson Fisheries Conservation and Management Act (MFCMA) in 1976 opened a new era for U.S. fisheries management. Under this act, the United States asserted jurisdiction over living resources between 3 and 200 miles of the coast. Domestic fisheries management was regionalized under the MFCMA, with regional councils charged with developing fishery management plans (FMPs) that regulated fisheries based on the "best scientific evidence available."

An important theme of the MFCMA is to promote cooperation among the state governments and the federal government through the fishery management council system. However, ten years of experience under the MFCMA has left a mixed record of success and acrimony. Federal-state relations with respect to fishing in the territorial sea were especially strained in the early 1980's when Oregon defied the PFMC's salmon FMP by extending the fishing season inside the territorial sea, first in 1982 and then again in 1984. This led the National Marine Fisheries Service to seek a permanent preemption of state fishery management authority, but proceedings were stopped when the OFWC issued a statement acknowledging PFMC's management authority over salmon.

Coordination in other fisheries has been less acrimonious. The pattern which has emerged is that Oregon regulations for the territorial sea parallel those of the PFMC for fisheries with FMP's and preemption potential, currently salmon and groundfish. There probably is better coordination in other ocean fisheries as well due to the potential of PFMC intervention through an FMP followed by preemption. Fisheries conducted landward of the territorial sea baseline, such as in the Columbia River, are not subject to the MFCMA/PFMC process at all. The significance of this point is illustrated by the fact that in recent years the recreational salmon fishery in the lower Columbia River at Buoy 10 in inland waters not subject to preemption has provided almost as much angling opportunity and catch as have the ocean recreational salmon fisheries managed under the PFMC salmon FMP or subject to federal preemption under the MFCMA. A proposal to extend MFCMA preemption to state inland waters was rejected by the 99th Congress.

Another possible federal-state fisheries management coordination device is the federal Coastal Zone Management Act (CZMA) consistency provision (§ 307(c)(1)) which require federal activities such as the approval and implementation of PFMC FMPs to be consistent with Oregon's federally approved coastal management program "to the maximum extent practicable." Some states have invoked the consistency provisions in attempts to obtain greater federal respect for state fishery management policies. With expanded treatment of fisheries management, Oregon's coastal management program, which already includes some ODFW fishery management authorities as well as Goal 19, could provide the state with additional leverage to promote its positions on PFMC fishery management decisions, e.g., with respect to entry restrictions, season lengths, and gear, size and catch limits. Disagreements

could be resolved through the consistency process as an alternative to the preemption process. A CZMA consistency bill (S.1412) introduced in the 100th Congress would exempt the MFCMA process from CZMA consistency, but similar bills in previous sessions have not made it to the floor of either house.

Under the MFCMA, when no federally-approved FMP exists for a fishery, Oregon may regulate vessels "registered" in Oregon fishing beyond the three-mile territorial sea. The shrimp fishery is an important example of such a fishery. While ORS § 508.265 makes it clear that licensing of any boat by ODFW for commercial fishing purposes constitutes "registration" for purposes of the MFCMA, legislative confirmation of the Oregon Attorney General's opinion that "registration" also includes possession of a certificate of number and certificate of title from the State Marine Board would strengthen Oregon's legal basis for regulating recreational fishing beyond three miles. The legislature also should remove a possible 50-mile limit on state fisheries regulation beyond the territorial sea by replacing ORS § 506.755 (declaring a state fisheries conservation zone 50 miles seaward of the coast). It should be replaced with a provision declaring the state's intent to exercise its MFCMA-derived fisheries management authority beyond the territorial sea to the fullest. Because the MFCMA asserts authority over U.S.-origin anadromous species wherever they may be, no maximum seaward limit of state authority should be stated in the revision of ORS § 506.755.

S.10.6.8. Interjurisdictional Fisheries Management

Interjurisdictional fish stocks and fisheries are those whose range extends to the waters of two or more states or both state and EEZ waters. Examples relevant to Oregon include groundfish and salmon for which the PFMC has developed FMPs, and commercial fisheries in the Columbia River managed by Oregon and Washington pursuant to the 1915 Columbia River Compact with federal court supervision of Indian treaty fishing aspects. The other existing institutional vehicle for interjurisdictional fisheries management is the Pacific Marine Fisheries Commission (PMFC) also created by Compact in 1947.

The shrimp fishery is one important Pacific Northwest interjurisdictional fishery for which there currently is no effective coordinated management regime. Most shrimp fishing occurs in the EEZ, and in some years, as much as 30 percent of Oregon shrimp landings come from beds off Washington, and California and Washington shrimpers frequently fish off Oregon. While Oregon has instituted limited entry management for the shrimp fishery, California and Washington have not followed suit. Thus shrimp fishermen from California and Washington not subject to limited entry rules can fish in EEZ waters off Oregon and land their catch in their home state or in Oregon under single delivery permits. A similar problem exists with respect to Californians catching thresher shark off Oregon and Washington.

The development of additional FMP's by the PFMC is not likely. Thus to improve interstate coordination in the management of the shrimp fishery, Oregon, or Oregon, Washington, and California combined, should consider applying for federal research funds under the new federal Interjurisdictional Fisheries Act of 1986, P.L. 99-659, 11 U.S. Code Cong. & Admin. News (1987). As an incentive for states to manage such interjurisdictional fisheries in a cooperative fashion, the act funds research projects

which support interjurisdictional management on a 75% federal, 25% state funds basis beginning with fiscal year 1987. The federal share could be increased to 90% if either the PFMC or the PMFC were to adopt a shrimp FMP. Such cooperative research could lead to coordinated management agreements, and limited entry in all three states if deemed appropriate. One enforcement option for any interjurisdictional fisheries management scheme that results from the above recommendation is the federal Lacey Act, 16 U.S.C. §§ 3371-78, violations of which are prosecuted by NOAA. Current NOAA Lacey Act enforcement policy gives high priority to prosecution of fisheries cases with interjurisdictional aspects.