CHAPTER 12

Port Orford Ocean Resources Team:

Partnering Local and Scientific Knowledge With GIS for Community-based Management in Southern Oregon

Victoria Wedell, David Revell, Laura Anderson, and Leesa Cobb

Abstract

The Port Orford Ocean Resource Team (POORT), a non-profit organization on the south coast of Oregon, combines scientific and local knowledge to address ocean resource and community management decisions. POORT is tackling community-based management on the scale of a small fishing community. The goal is to protect the long-term sustainability of the Port Orford fishery ecosystem and the economic and social systems dependant on it. To answer a series of scientific and management questions, POORT experimented with a process for documenting spatial information through local knowledge interviews (LKIs) with Port Orford community members. These interviews were conducted using acetate-covered base maps, which were then converted into digital GIS layers, aggregated, and incorporated into further GIS analysis. The LKI process and GIS analyses provided a needed biological and local economic baseline inventory, as well as valuable qualitative information on Port Orford's natural resource history and the changes occurring in this small-scale fishing community due to the changes in fisheries management on the West Coast of the United States. POORT is combining grassroots efforts and scientific

Victoria Wedell, Marine Resource Management Program, Oregon State University, OR 97331(now with NOAA Knauss Marine Policy Fellowship Program, National Sea Grant Office, Silver Spring, MD 20910)
Corresponding author: vicki.wedell@noaa.gov

David Revell, The Surfrider Foundation, Oregon Chapter (now at Earth Sciences Department, University of California, Santa Cruz, CA 95062)

Laura Anderson, Marine Resource Management Consultant, Newport, OR 97365

Leesa Cobb, Port Orford Ocean Resource Team, Port Orford, OR 97465

knowledge to demonstrate means to assess impacts to fishing communities at an appropriate scale, as is called for by the MagnusonStevens Fishery Conservation and Management Act and reiterated by the U.S. Commission on Ocean Policy.

Introduction

The Port Orford Ocean Resources Team (POORT) is using a geographic information system (GIS) as a tool to combine the best available science and local knowledge about the nearshore and coastal environment to support long-term planning for community-based resource management. POORT's overall goal is to engage the Port Orford fishermen and other community members in developing and implementing a strategic plan that enhances the sustainability of the Port Orford fishery ecosystem and social system dependant on it. Long-term planning objectives include: increased input into local fishery management decisions, diversification of economic opportunities, and ensuring that conservation strategies balance economic and ecological sustainability with social equity. Led by a community advisory board largely comprising commercial fishermen and supported by scientific advisors from agencies and academia, POORT developed a list of scientific, market, and management questions that are driving nearshore cooperative research and GIS development. A participatory GIS approach provided both the framework for capturing important information, and offered coastal citizens a process for active participation in management discussions about the marine environment.

This process provided a baseline inventory of the spatial ecology and economy experienced by Port Orford community members as well as an examination of the social and economic linkages important to this small-scale fishing community. Spatial questions generated by POORT included: "What are the abundance, distribution, and diversity of the flora and fauna of the Orford Reef area?" and "How are the recreational and commercial fishing effort and related socioeconomic value distributed?" Through semi-structured interviews with various community members, POORT documented the distribution and relative economic importance of areas targeted for commercial fishing activities as well as the distribution of recreational activities, ocean and coastal resources, and many species. The discussion was primarily limited to the area between Coos Bay and Gold Beach, Oregon, out to the edge of the continental slope. The Port Orford Ocean Resources Inventory validates a process for documenting local experiential knowledge and provides the first steps towards a more in-depth economic analysis to support community-based management in Port Orford.

An Isolated and Unique Place on the South Coast of Oregon

Physical Location

Located in Curry County, Port Orford is the most westerly incorporated city in the contiguous United States and is situated on an open bay, unlike most other Oregon ports, which are positioned along river channels (http://www.portorfordoregon.com/ relocate.html). Both by land and by sea, the town is physically and economically isolated compared to other Oregon ports. It is located about 50 mi. south of the nearest large population center of Coos Bay and 70 mi. north of the port of Brookings and the Oregon-California boarder (Fig. 12.1; see page XXX). Large sand bars outside the nearest ports of Bandon and Gold Beach, both about 25 mi. away, can impose transportation barriers to the small fishing vessels of Port Orford. The Port Orford Lifeboat Station provided rescue services to the southern Oregon coast until 1970, when it was decommissioned (www.portorfordlifeboatstation .org/). Currently, the fishermen here must depend upon each other when trouble arises out at sea, risking their own safety and liability for others. The relative isolation of Port Orford may contribute to the town's true sense of community.

Oceanographic and Weather Conditions

Cape Blanco, a prominent oceanographic feature in the California Current system located approximately 10 mi. northwest of Port Orford, separates two distinct oceanographic regions of the Northeast Pacific Ocean, as divided by the Global Ocean Ecosystem Project (Mackas et al., 2002). Generally, eastern boundary currents induce strong upwelling conditions in the nearshore and support diverse and abundant marine life, including fishes, invertebrates, marine birds, and marine mammals. The Orford and Blanco reefs together consist of about 7 mi. of rocky reef and bull kelp forest (*Nereocystis*) habitat. Several of these rocky islands breach the surface of the water, extending the three-mile limit of state jurisdiction to include most of the nearshore area.

Winds and rains are seasonal. Late fall, winter, and early spring account for 81% of the 72 in. of annual precipitation (http:// www.wrcc.dri.edu/cgi-bin/cliGCStP.pl?orporf). January brings winter storms and gale force winds out of the southwest, from which there are no safe anchorages. "The only time it's calm in Port Orford is when the wind is blowing the same from both directions," a local resident only halfway joked during our interview (Interview 447; interview references throughout refer to the POORT project "Port Orford Ocean Resources Inventory and Local Knowledge Interviews," conducted August-December 2003). As the spring rains decrease, winds switch directions and come from the northwest throughout most of the summer. Moderated by the Pacific Ocean, temperatures range from 45

to 61° F. through the entire year (http://www.wrcc.dri.edu/cgi-bin/cliRECtM.pl?orporf).

The Port of Port Orford

> *"Fifteen years ago, you could stand on this corner [Highway 101 and Harbor Drive, location of the POORT office] with your lunch pail, a pair of cork boots, and a pair of rubber boots and you could be certain to find work for the day. Port Orford used to be an easy place to work"* (Interview 007).

Established in 1851, Port Orford was the first European settlement on the Oregon coast and has depended on natural resource extraction throughout its history. Originally settled in hope of tapping into rich gold deposits, some pioneer families still own and execute mineral rights in nearby rivers (Interview 007). The original port dates back to 1856, with the port district being formed in 1911. Logging and milling supported the community for many years, with the timber industry peaking here during the 1930s, mainly with the shipment of Port Orford cedar. Shipping of lumber stopped shortly after the jetty was completed, in 1968, primarily due to market conditions and the decline of local timber (http://portorfordoregon.com/portofpo.html). Many current commercial fishermen were also loggers, or come from logging families. Port Orford also has a maritime history, with some families having third-generation fishermen with over 50 years of cumulative knowledge passed down through the generations.

PORT INFRASTRUCTURE

Port Orford has minimal fishing infrastructure: a pier and jetty, two commercial hoists, and one sport crane. The two buying stations at the port, Hallmark Fisheries and NorCal Seafood, purchase almost all of the fleet's seafood products; however, NorCal only buys Dungeness crab and live rockfish (Interview 138); Pacific Premium Seafood, the other buying and processing plant, closed due in part to the decline in urchin harvesting and the increase in the live rockfish market. There is cold storage and ice for sale and the port sells fuel (Scholz, 2003). The other marine businesses on the dock include the Dock Tackle, a combination tackle and gift shop; Nautical Museum; seasonal fresh fish market; and Pac Nor West Charters, which run recreational scuba and fishing trips. Financial pressure on the port to get returns from the Premium Pacific Seafood building threatens the retention of valuable fishing infrastructure. Without a clear vision of the future of this port, precious space and infrastructure could be lost through shortsighted planning.

A floating dock for recreational fishing boats on the side of the pier can be drawn up in bad weather. Sport fishing is less prominent here due to the large distance from nearby population centers and major

airports, the adverse weather conditions, and the lack of nearby large rivers, although the Elk and Sixes rivers bring in some recreational anglers. Beachcombing, surfing and diving, kayaking, and whale and bird watching are other common recreational activities occurring in Port Orford.

THE PORT ORFORD FLEET

Port Orford vessels need to meet the weight and dimensional requirements of the commercial hoists that lift them in and out of the water every day, resulting in a homogeneous fleet as compared to other Oregon ports (Fig. 12.2). Vessels are restricted to a maximum length of 44 ft., maximum width of 15 ft. and no more than 44,000 lb. (http://discoverportorford.com/portofpo.php). Small vessel size restricts the range and duration of fishing activities, especially during adverse weather conditions, resulting in somewhat traditional fishing grounds. About 40 vessels homeport here, either secured to the dock on trailers or moored in the harbor during the summer.

The success of a small boat fleet depends upon the diversity of the fisheries they execute and the flexibility to move in and out of them as weather, ocean conditions, regulations, and market conditions permit. POORT interviewed people from approximately 50% of the vessels in the Port Orford fleet, with an average vessel length of 34 ft. Figure 12.3 (see page XXX) shows that 72% of the 22 commercial fishermen interviewed currently participate in between four to seven fisheries over one year of fishing activities. Currently, the Port Orford fleet primarily targets salmon (86% of interviewees), Dungeness crab (82%), live rockfish (*Sebastes*) (73%), and sablefish (68%). However, albacore tuna (55%) and Pacific halibut (50%) are also important fisheries, as well as hagfish (23%) and urchins (14%) to a lesser degree (Fig. 12.4).

In years past, the deep-water shelf rockfishes would have been among the top five executed by Port Orford fishermen (73% of interviewees). Due to recent management measures, it is no longer economically viable

Figure 12.2. The port of Port Orford Dock and hoists (photo: V. Wedell).

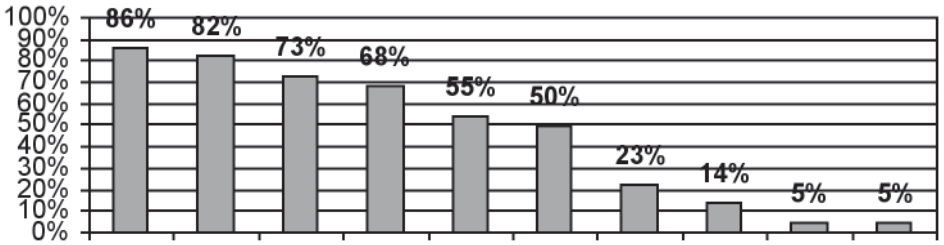


Figure 12.4. Percent of LKI participants targeting specific fisheries.

for Port Orford fishermen to target these species. Historically, there was also a booming local urchin fishery, which went through its bust cycle in the mid-1990s. When a fishery closes, the traditional response by Port Orford fishermen is to shift effort to a new fishery.

Although some did shift their effort to the nearshore live fish fishery, these were primarily the displaced small boat urchin fleet, which found new opportunity with high-value live fish. Fishermen target nearshore groundfish species in this fishery because of increased fish mortality when fishing in depths greater than 27 fath. (Interview 193). The longline fishermen were reluctant to move into the live fish fishery, recognizing their added pressure would overfish the slow-growing, late-maturing rockfishes. "We stayed out of it, that was those guys only fishery and we had crab, blackcod (sablefish), and some salmon fishing" (Interview 207). The live fish fishery did not replace the income lost by the longline fishing businesses from the lack of opportunity to fish the shelf groundfish.

The Port Orford Fishing Community

SOCIAL AND CULTURAL TIES TO COMMERCIAL FISHING

Whether we examined social and cultural linkages or economic indicators, Port Orford is a true fishing community supporting about 40 local fishing families (Andersion, 2001). The dock is the hub of social activity in the town. In addition to POORT, other industry-related organizations include the Port Orford Fishermen's Association and the Port Orford Women's Fishery Network. These fishing associations co-host the annual Salmon Bake and the men compete in the Dingy Race during the Port Orford Forth of July Jubilee, whose theme in 2003 was "Fishing the Wild Sea." The Blessing of the Fleet Ceremony, which takes place at the Fishermen's Memorial, honors those fishermen who have been lost at sea and prays for the continued safety of those who still make their living out on the ocean. The Port Orford Arts and Seafood Festival also celebrates Port Orford's fishing history. The cultural importance of the ocean and of commercial fishing is even evident in the many maritime murals and ocean-related names that adorn small businesses and schools in Port Orford.

DEMOGRAPHIC INDICATORS OF A FISHING COMMUNITY

Whereas other coastal towns are seeing much larger and more rapid increases in population, Port Orford almost refuses to grow. In 2000, the U.S. Census Bureau estimated 1,153 people currently living here, an increase of just over 11% in the last 30 years (http://bluebook.state.or.us/local/ populations/pop03.htm). In the next 15 years, the coastal zone is estimated to receive over half the nation's projected population growth, an additional 27 million people moving into coastal counties that cover only 17% of the land area of the United States (Beach, 2002). It is likely that Port Orford's population will grow at an increased rate. Common perceptions held by the community are that the immigrating people are predominately Californian retirees and that the limited living-wage jobs available in Port Orford are increasingly employing more of these people than local residents.

A relatively large proportion of the Port Orford population has jobs in the fishing industry. However, the estimates vary considerably, from as high as 30% to as low as 9%, as reported by Scholz (2003) and the U.S. Census (2000), respectively. Anderson (2001) reports that depending on the season, the community has between 100 and 150 people directly or indirectly involved in the day-to-day activities of commercial fishing, representing about 10-15% of the population. This relative proportion of fishing-related employment has statutory and management implications as set out by National Standard 8 of the 1996 reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act, renamed the Sustainable Fisheries Act.

National Standard 8

National Standard 8 of the 1996 Sustainable Fishing Act demonstrates the need for stronger emphasis on socioeconomic concerns in fisheries management, particularly a need for increased focus on communities. Specifically, it states that: "Conservation and management measures shall, consistent with the conservation requirements of this Act take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities" (National Marine Fisheries, Service, 2002).

Although Standard 8 requires that the impacts of fishing regulations to fishing communities be analyzed, it does not state how the boundaries of that place are drawn or its dependency measured. New incentives are needed to help groundfish management make the transition to new goals and objectives, such as National Standard 8 (Hanna, 2000).

Defining Fishing Communities and Fishing Dependency

Current research into the definition and practical application of the terms "fishing community" and "fishing dependency" intends to help management agencies determine what the differential economic impacts from fishing regulations and management measures are for communities. The Sustainable Fishing Act defines a fishing community as: "… a community which is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and United States fish processors that are based in such a community" (Hall-Arber et al., 2002).

Fishery management councils interpret the legislation to imply a place-based definition of a fishing community. Current research into identifying fishing-dependent communities determined that 15% fishing employment would qualify fishing-dependence, although the percentage is an arbitrary number (Jacob et al., 2001). However, limitations with this measurement include: the gross scale of census data (i.e., county-level), the severe under-estimation of fishing employment using census methods (Jacob et al., 2002). Apparent dilution of dependency occurs with increases in the non-fishing proportion of populations, as with immigrating California retirees to Port Orford, or with the reduction in fishing employment, such as those retrained in the Groundfish Disaster Outreach Program.

Assessing Impacts to Fishing Communities

To better manage fisheries, you need to know the fishermen and the industry from their perspective and how perceptions, rationalities, and behavior change as a consequence to fisheries management (Jentoft, 1999). Socioeconomicimpacts among communities vary considerably and depend on fleet composition, infrastructure, specialization, social institutions and gentrification trends. The National Academy of Public Administration concludes that Fishery Management Plans do not have adequate social and economic goals and that social and economic data collected by NOAA Fisheries are inadequate for understanding the effects of past management on fishing communities or for predicting outcomes to these communities of management alternatives (Gade et al., 2002). The scale of economic data collection and the burden of turning that into useful information are insufficient to successfully assess impacts to specific communities.

Hall-Arber et al. (2002) not only looked at measures of fishing-related employment, but also traditional economic analysis, complexity of fishing infrastructure and degree of gentrification, and the port-profile approach, which looks at patterns of contracts, characteristics of community culture and institutions, and the local residents' views about

their way of life and fisheries management. Because of the inherent complexity, a comprehensive analysis of the social and economic impacts of fishing regulations is impossible without new tools. The Groundfish Fleet Restructuring Information and Analysis Project is one such tool trying to resolve the gross scale of fish-ticket information through spatial GIS analysis to assess the impacts to ports of capacity reduction scenarios and area closures (Scholz, 2003).

Port Orford and the West Coast Groundfish Crisis

The National Marine Fisheries Service (NMFS) has responsibility to manage the nation's living marine resources within the exclusive economic zone. On the West Coast, the Pacific Fisheries Management Council (PFMC) has regional authority over the federally managed marine species in Washington, Idaho, Oregon, and California. PFMC is responsible for conservation and management of marine fish stocks, habitat, and fisheries in a sustainable manner while trying to equitably balance a variety of related human needs. However, the Council has taken on important fisheries problems on an individual issue basis: "The [PFMC] has responded to [economic hardship, uncertainty, polarization, low landing limits, over capacity] by trying to deal with individual issues on an ad-hoc basis. This short-term approach has been increasingly characterized by crisis management" (Pacific Fisheries Management Council, 2000).

The West Coast groundfish crisis is characterized by overfished groundfish species and reduced fishing opportunities occurring after a period of expansion and growth (Hanna, 2000). A 50% capacity reduction of the groundfish fleet (Pacific Fisheries Management Council, 2000). and subsequent depth-related shelf closure between 100 and 250 fath. in place since 2002 has impacted many fishing communities along the coast.

Port Orford has a long-established dependency on the groundfish fishery, with local longline vessels targeting lingcod, canary, yelloweye, and yellowtail. These deep-water shelf groundfishes were a valuable fishery for this small-scale fleet, as abundant fishing grounds are nearby. Quota reductions were placed on the fishery when it became evident to fishery managers that the trawl fleet was overfishing and discarding these species at a high rate. The restrictions were coast-wide and encompassed all gear types, effectively shutting down Port Orford's longline groundfish fishery. Many local fishermen lost a significant portion of their income, as much as 90% in one year for some fishermen (Interview 899).

Port Orford and The Groundfish Disaster Outreach Program

Port Orford fishermen received more than $800,000 in direct payments from the Groundfish Disaster Outreach Program (GDOP) to aid in transitioning people into new careers. Started in April 2000, with federal appropriation funds, the GDOP works with the Oregon Employment Department, which administers the Groundfish Transition Income, and the coastal Workforce Investment Agencies, which provides the actual training for new careers. In Port Orford, the target recipients for the transition income are: boat owners and their spouses, deckhands, and shore-side baiters and processor employees from Premium Pacific Seafood.

Unique to the Port Orford area are the displaced shore-side baiters. Traditionally, a longline vessel's crew does baiting of gear on the boat. However, Port Orford vessels have no room on board to do this. The shore-side baiting crews, who are often family members of fishermen, baited tubs seasonally from March through August until the groundfish cuts put them out of work, with no other employment opportunities available in Port Orford. Although, not everyone was successful in training for a new career, it is significant when examining the hurdles and challenges of stopping fishing and going on to another life. Barriers to career transition identified by the GDOP include: unwillingness to relocate, no GED or high school diploma, no driver's license, and drugs and alcohol. Of the 49 applicants, 29 have completed their transition successfully.

Communication in the Fisheries Management Process

The current fisheries management process does not allow for the meaningful participation of small-scale fishing representatives in management decisions. A documented communication problem already exists between the fishing industry and fisheries managers, characterized by blame, distrust, and stereotyping (Conway et al., 2002). Although the council process is designed to encourage and enable public participation, and to tailor management to local needs, customs, and interests, one problem often cited by Oregon's fishing communities is the industry's superficial involvement in the council process.

Potentially, the public can be involved at several levels of the council process: serving as council members, serving on advisory bodies, and providing public testimony at council meetings. However, fishery management and its regulatory process are complex, often contentious, and confusing to most people. For example, NMFS lists at least 61 different steps to develop and adopt fishery management plans and actions (Gade et al., 2002). The commercial fishing industry is distanced from NMFS and PFMC because of the lack of day-to-day communication and because they are often unsure when or to whom to approach with concerns. PFMC meetings are the primary venues for NMFS to interact

with its constituents and partners, however the venue is often a considerable distance from the fishermen's homeport, making attendance difficult and expensive. For example, a PFMC meeting in Portland, Oregon, is about a six-hour drive from Port Orford.

PFMC meetings consist of a presentation of management options by the various committees followed by a public comment period, where citizens can either speak at a microphone or provide written comments. This communication process does not lend itself to the careful deliberation of citizen input and, consequently, experiential knowledge of long-time industry members is never considered in the decision process, often labeled as anecdotal and biased. Therefore, fishermen often perceive a lack of respect from scientists and managers. The formal nature of providing testimony in a public meeting is very different from the culture of fishing communities, where in-person, informal exchanges is preferred (Conway et al., 2002). Given the current process, the nearshore fishing industry is powerless to affect management decisions. In fact, most fishermen feel the decision has already been made before the meeting ever begins (Conway et al., 2002). Dissatisfaction with current fisheries governance is evident by the increasing number of lawsuits challenging NMFS in federal courts. Since the mid-1990s, litigation against NMFS has grown 10-fold, an order of magnitude greater than in previous times and its record of defending management actions has dropped to less than 50% (Gade et al., 2002). Challenges come from both industry members and environmental organizations. This is a symptom of the management system's inability to reconcile its objectives of conserving fishery resources and maintaining optimum yields. Our fisheries management system has been slow to adopt its plans to accommodate the new national standards and the changes imposed by the 1996 Sustainable Fisheries Act.

Gade et al. (2002) report that, despite the frustrations, commercial fishermen believe that both sides could learn from each other and could successfully work on joint projects together. The respondents in this survey reflected that they would have a greater sense of ownership if they were involved in the design, implementation, and follow-through of research projects, beginning with collaboration in the design phase. Cooperative programs, with proper design and development, have achieved mutually agreed upon objectives between NMFS and the fishing industry. Some fishermen want a real voice in the decision-making because they have lost faith in the ability of the government's ability to solve management problems.

Cooperative and Community-based Fisheries Management as an Alternative

Community-based management provides an open framework for improving communication in fisheries management and encourages collaborative and innovative management strategies to address the

unique environmental, economic, and social conditions at a manageable geographic scale. Fishing communities like Port Orford are looking for avenues to provide pertinent information to fisheries decision-makers in a way that is seen as valid and worthy of careful deliberation. Using GIS and rapid appraisal techniques provide an opportunity to collect local knowledge important to fisheries management at appropriate scales (Scholz et al., 2004). Mapping local knowledge is a process that also supports community-based fisheries management functions, which include: data gathering and analysis, logistical harvest decisions, habitat and water quality protection, and long-term planning (Pinkerton, 1989). It also allows the community to identify economic alternatives.

The Port Orford Ocean Resources Team

As a reaction to current management concerns, a non-profit organization has been formed to address science and management questions at the scale of a single fishing community. However, POORT realizes the importance of partners and has some at national, regional, and state levels and from academia, government, and conservation perspectives. POORT's Communications Coordinator is the gatekeeper of this whole project. POORT is seeking a balance that can maintain traditional fishing opportunities while diversifying its economic base.

Participatory GIS to Support Marine and Coastal Resource Management

Applying GIS science in a participatory setting for marine and coastal areas is an innovative approach for community-based management. Improvements in technology and increased availability of relevant data layers allow for a growing number of marine applications in a traditionally land-centric science. Over the last 40 years, increasing use of GIS by grassroots community organizations and participation in its use by ordinary citizens is possible because of the decreasing cost of hardware, improved user interfaces, and a trend towards a more human-centric vision of GIS (Craig et al., 2002). GIS offers communities a process for developing consensus about their environment and for engaging in long-term planning, and potentially, increased input into local management decisions. The state and federal agencies may be willing to share more power with groups they perceive as credible partners (Craig et al., 2002).

The methodology of the Port Orford Ocean Resources Inventory drew on the expertise of current research, including projects occurring in California (Scholz et al., 2004), and the Channel Islands National Marine Sanctuary Ethnographic Survey and in Canada (Macnab, 2002). Communities have combined fishermen's knowledge with GIS for marine protected area planning and for local area management.

Participatory GIS improves the communication of local knowledge about complex marine and coastal environments through using a

common frame of reference, such as nautical charts, fath. contours, and local place names. Better information will help develop appropriate responses to management questions through spatial analyses. Participants in such processes may see opportunities to achieve individual goals through collective action, and also become empowered to do so. In this respect, participatory GIS may help bridge the competitive nature of fishing with collaborative learning approaches in community-based management.

Port Orford Community GIS Research Design and Methods

Introducing GIS: The First Step

POORT introduced GIS to the Port Orford community through two planning meetings in 2003. At the first meeting, the basic concepts of computer mapping and GIS were introduced, resulting in a valuable discussion of the different types of spatial data, and the uses and limitations of GIS. The proposed method of conducting local knowledge interviews was also introduced and a local commercial fisherman volunteered to participate in a pilot interview. At the second planning meeting, the full interview process and derived information layers were presented to the local advisory board. To further demonstrate how local knowledge is translated into a GIS layer, we also conducted a group exercise to document the navigation routes in and out of the dock. After some deliberation, general consensus was reached that for the community to have input into local fisheries management decisions, relevant information had to be collected and put into a format that would ultimately be digestible to managers. From that point forward, local knowledge interviews and GIS development became a priority project for POORT.

Developing the GIS Framework

Through ongoing POORT meetings, the local advisory board and the science advisory committee generated research and management questions. Listed here are some of the questions with a spatial component:

– What are the distribution, abundance and diversity of species near Port Orford?
– Are some species residents? What are their movement patterns?
– What are the distributions of recreational and commercial effort and related socioeconomic value?
– What is the catch per unit effort of different fishing gear types?
– What is the correlation between habitat and species distribution, abundance, and diversity?
– Are spatial management strategies appropriate for Port Orford? What kind and where might they be located?

From these questions, we developed our GIS framework, in which we determined what data is needed to answer some of the questions. We also established the database format to facilitate data storage, retrieval, and analysis. We then prioritized data for acquisition and creation (Table 12.1).

Conducting the Port Orford Ocean Resources Inventory

The overarching goals of the Port Orford Ocean Resources Inventory were: (1) to develop a foundation for local knowledge data collection and storage; and (2) to support the mission of the POORT charter of "using the best available science and local knowledge for the community to make local fishery management decisions." POORT agreed that GIS is a good tool to combine and analyze experiential and scientific information because focusing on location allows people to develop a common perspective of a shared marine environment. The POORT local advisory board determines information storage, access and use through a consensus process. Through an iterative participatory process with Port Orford community members, we documented the local knowledge of the distribution of human uses and relative economic importance of areas targeted for commercial use, as well as the distribution of species and resources (Fig. 12.5).

IDENTIFYING THE STUDY AREA

Laminated base maps were the platform over which the interview took place. The smallest-scale base map (i.e., the one that covers the largest area) was 1:120,000 and displays the south coast of Oregon from Bandon in the north to Gold Beach in the south. However, through interviews, it was discovered that these maps did not show the complete extent of the Port Orford fleet's fishing activity. For logistical purposes, it was necessary to end somewhere and Bandon and Gold Beach were chosen because they are the nearest commercial fishing communities. Two of the base maps were larger scale, representing the marine area closer to the port of Port Orford, from north of Cape Blanco to Sisters Rock at Frankport, Oregon. The base maps displayed the relevant National Oceanic and Atmospheric Administration nautical charts, the latest bathymetric data from the Oregon State University (OSU) Active

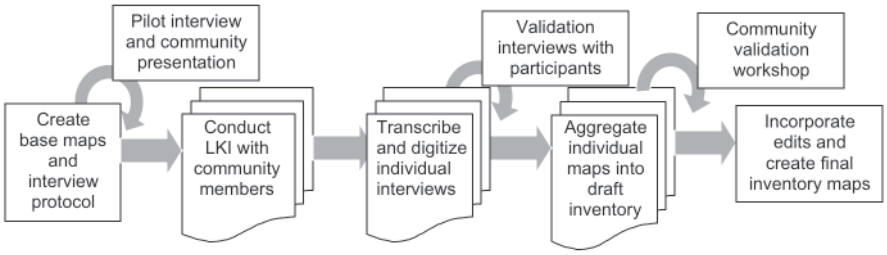


Figure 12.5. Flow chart of LKI process and GIS analyses.

Table 12.1. Spatial data list.

Data Layers	*Creator*	*Location*
NOAA Nautical Charts	NOAA Office of the Coast Survey	Valley Library, OSU
Side scan sonar of Orford Reef	Marine Program, ODFW	Hatfield Marine Science Center, Newport, OR
Urchin Surveys	Marine Program, ODFW	Hatfield Marine Science Center, Newport, OR
Fish Surveys	Marine Program, ODFW	Hatfield Marine Science Center, Newport, OR
Multi Beam Bathymetry off Oregon	Dr. Chris Goldfinger	Active Techtonics Lab, OSU
Geologic Substrate	Dr. Chris Goldfinger	Active Techtonics Lab, OSU
Oregon Shoreline	OR ORMTF	Oregon Coastal Atlas
Three-mile State Jurisdictional Boundary	OR ORMTF	Oregon Coastal Atlas
Digital Orthophotos Quarter Quadrangles	USGS	Oregon Coastal Atlas
Oregon State Boundary	BLM	Oregon Geospatial Data Clearinghouse
Oregon Counties	BLM	Oregon Geospatial Data Clearinghouse
Oregon Highways	ODOT	Oregon Geospatial Data Clearinghouse
Commercial Activities Distribution	POORT	POORT Office
Recreational Activities Distribution	POORT	POORT Office
Species and Resource Distributions	POORT	POORT Office
Economic Importance of areas targeted for commercial fishing	POORT	POORT Office

BLM = Bureau of Land Management; ODFW = Oregon Department of Fish and Wildlife; ODOT = Oregon Department of Transportation; ORMTF = Ocean Resources Management Task Force; OSU = Oregon State University; USGS = U.S. Geological Survey

Tectonics and Seafloor Mapping Laboratory displayed as depth contours in fath. and some local place names. Using these maps to collect and display local knowledge was a natural outflow from the fishermen's experience in using nautical charts for navigation.

INTERVIEW PARTICIPANTS AND RECRUITMENT

The interview participants were not restricted by any gender or ethnic basis. The 33 interviews included 36 individuals from the Port Orford community who utilize the Port Orford marine environment for their occupation or leisure activities. Several people are not adequately represented by one category alone (Table 12.2). The 22 fishermen interviewed had a combined 524 years experience on the ocean and averaged 24 years of experience in commercial fishing. They work a combined total of over 2,000 days/year, averaging over 120 days/year out at sea (includes the four recently retired fishermen). Six out of 22 were second-generation fishermen, and one was third generation. Three representatives from the buying sector of the fishing industry participated. Although some of their knowledge is not direct at-sea observations, they possess a "common knowledge" of fishing locations and have great insights into the overall picture of the economic activities of this port.

A snowball sampling strategy started with volunteers from the local advisory board and identified potential participants through suggestions made by interviewees. This sampling method involved interview volunteers making unsolicited suggestions about other community members who are knowledgeable and might be interested in participating in the interview process. POORT recruited some

Table 12.2. Local knowledge interview participants.

Number of People	*Participant Category*
24	Port Orford commercial fishermen (owners, captains, and deckhands)
3	Recreational fishermen
6	Recreational users (divers, surfers, kayakers, whale/bird watchers, beachcombers)
3	Local fish buyers
1	Port of Port Orford staff
2	Oregon Department of Fish and Wildlife scientists
33 LKIs with 36 Port Orford Community Members	
Average age	51 years
Average experience	20+ years
Number of Men	31
Number of Women	5

participants at community meetings, through a flyer posted at the Port Orford dock and in the *Port Orford Today*! and informally through day-to-day communication. Volunteers contacted the POORT communications coordinator who then followed up to schedule a date and time for the interview.

CONFIDENTIALITY

Issues of access, representation, privacy, and confidentiality should not to be overlooked, as they contribute to the relative success or failure of participatory GIS processes. Interviewees signed a confidentiality agreement and informed consent document at the onset of the interview process to protect anonymity and the proprietary nature of information to the extent practicable under law. Contact information is taken only so that the interviewees could be contacted for the follow-up interview. A random identification number references an individual's local knowledge, appearing on the acetate overlays, interview notes, and in the computer records. Individual data were securely stored and were not be accessible to any person other than the interviewer and the people who input the information into the computer. After all information was collected and verified from all interviews, the acetate maps and written information were either returned to the participant or destroyed.

LOCAL KNOWLEDGE INTERVIEW MATERIALS AND METHODS

Trained POORT consultants and a graduate student conducted two- to three-hour, semi-structured interviews with commercial fishermen, recreational users, and other community members at the POORT office. The following materials were used.

- Confidentiality Agreement and Informed Consent Document
- Interview questions
- Checklist of activities/species/resources
- Interview response spreadsheet
- Approximately 36" x 36" base maps
  - 1:120,000 "Coos Bay to Gold Beach"
  - 1:40,000 "Port Orford Nautical Chart"
  - 1:24,000 "North of Port"
  - 1:24,000 "South of Port"
- Acetate overlays, scissors, and masking tape
- Colored wax pencils
- Tissue eraser
- Identification guides

Interviewees delineated areas of personal and observed human uses and locations of specific fish, invertebrate and plant communities on acetate-covered GIS base maps. Two interviewers provided a crosscheck for when transcribing the descriptive information into a database. The interviewers took handwritten notes on a standard response sheet.

Participants verified the accuracy of the interview transcription and subsequent digitization during a one-hour follow-up interview. The only data used for community-based management purposes are the aggregate maps created from compiling individual information.

The interview process occurred mainly in five steps. First, demographic and vessel information was asked, then the locations of the interviewee's primary ocean-related activity. If the primary activity was commercial fishing, the participant was asked to assign a value to the relative economic importance of their areas targeted for particular fisheries. Referring to a list of human activities and species, including plants, invertebrates, marine birds and mammals, and fishes, the interviewers asked them to describe their personal observations of those species and activities in the Port Orford study area. The interviewees drew the location of their observations with wax pencils on clear plastic acetate overlaid on base maps. Some attribute information included: how the location was derived, the scale of base map (if applicable), trends over time as they relate to climate and weather, and habitat and/or depth associations. Identification guides were on-hand for reference. Lastly, the interviewee talked about anything else important to them about the ecology, or the economic and social conditions. This "open microphone" time helped identify the common themes of important issues to the community to help guide community-based management efforts.

INTERVIEW CONVERSION AND DATA AGGREGATION

The graduate student coded the acetate overlays and transcribed interview data into standardized Microsoft Excel databases, which would eventually become the polygon attribute tables. Location information was given to the interviewers in one of four ways: (1) directly drawn on the maps in wax pencils; (2) verbally referenced using a local place name; (3) using depth or distance associations; or (4) using another species association. Early in the process it was necessary to develop standardized polygons for those areas verbally referenced by a local place name. During an ad-hoc focus group with several fishermen, an OSU graduate student delineated the spatial extent of the local places referenced during interviews. Each polygon and otherwise-referenced area was given a unique identifier and its own record in the database. Attributes were populated from both interviewers' notes.

A team of consultants and the graduate student then digitized polygons from the individual interviews and joined them with the Excel databases to create individual digital map layers comprising all polygons assigned to the activity or species. Each interview generated anywhere from 10 to 50 data layers. One-hour follow-up interviews verified the content integrity following the conversion process. Participants specified any necessary edits to the polygons and associated attributes, which were then incorporated into the GIS databases.

POORT chose to aggregate all recreational activities, which included surfing, kayaking, diving, wind surfing, recreational fishing, shore fishing, whale watching, bird watching, and beachcombing, to produce a composite aggregate map of the intensity of recreational use in general. For commercially targeted areas, the spatial distribution and intensity of use of areas targeted for salmon, Dungeness crab, halibut, and sablefish (i.e., black cod) provided a good variety of economically important species, and were a less controversial subset of the whole Port Orford fishing portfolio.

Under contract with POORT, the non-profit environmental organization Ecotrust aggregated themes to create six draft inventory maps. Vector data was converted into 98-ft. grids. Each grid cell was assigned a value of 1 for poly presence and 0 for its absence. Then, cumulative totals for each grid cell were generated using an Arc Macro Language (AML) script. Nearest neighbor analysis with a 6-cell focal mean smoothed the data. The data were then classified using an equal area distribution of 7 classes and re-categorized in low, medium, and high usage. POORT then took the draft aggregation maps to a community workshop to solicit edits to further refine the community inventory (see Port Orford maps on the Web site accompanying this book).

COMMUNITY INVENTORY VALIDATION WORKSHOP

Conducted in January 2004, a community workshop provided validation of the process and resultant information and allowed the interview participants to suggest improvements to the aggregated map. This workshop provided forums for participants to propose edits in writing, individually, or in small groups. Propositions were then revised with the larger group and voted on. Suggestions for edits that were different between participants were dealt with by keeping it "as is." Votes of abstention were just as important as agreement and disagreement. The community concluded that the maps accurately represented the spatial extent and intensity of use of the study area. Few further edits will need to be incorporated.

Database Banking, Access and Immediate Use

Storage and accessibility of proprietary information concerned many fishermen and community members. The POORT office in Port Orford, Oregon, and disk space in the OSU Terra Cognita Spatial Analysis Laboratory, provided short-term secure storage for the data. Options for long-term storage of the GIS data include: the POORT office, the Oregon Coastal Atlas (a Web-based portal jointly managed by the Oregon Ocean-Coastal Management Program, OSU, and Ecotrust; Haddad et al., this volume), or Ecotrust's Inforain Server. A permanent solution for secure data storage will be decided through a series of community meetings, the first of which outlined the above options.

Recommendations from the validation workshop suggest that Oregon Coastal Atlas would be the preferred alternative, although this must be voted on by the POORT local advisory board before adoption. Workshop participants also recommended immediate uses for the inventory.

Results

The community group achieved consensus on distribution of areas targeted by Port Orford for commercial and recreational activities in the draft maps. Through the local knowledge interviews, we have begun to directly answer some of the primary management questions that are guiding the POORT project. We are collectively gaining insight into the distribution and diversity of plants, fishes, and invertebrates around Port Orford, including some of the seasonality associated with each species and activity. The community is also beginning to relate the economic values of both recreational and commercial activities with the distribution of effort.

The spatial extent of effort for crabbing is determined by the movement of crabs in and offshore with the season and by competition with larger vessels that move in from other ports. For Dungeness crab, two areas of highest intensity are evident. Accessibility to these grounds is the primary reason for their higher level of use. However, north of Cape Blanco, weather can limit utilization of these grounds, as traveling above the Cape can be difficult.

Primary areas for targeting salmon are determined by the movement of forage species, oceanographic, and climatic conditions. The high-intensity area nearshore between Port Orford and Cape Blanco represents the North Beach season, a very important fishery because it is the only troll-caught salmon on the Oregon coast during part of the year. The area is very important economically due to its proximity and accessibility of the Port Orford fleet.

The halibut target area is primarily a large off-shore bank known locally as the High Spot. This highly utilized area is determined mainly by fisheries management, which sets a halibut opener (reduced from 72 to 10 hours in recent years). Although fishermen know halibut are located in other areas, when there are only 10 hours to fish, they go to the money spot. The community workshop did not suggest any changes be made to this draft map.

Rogue River canyon and the edge of the High Spot are the primary areas targeted for black cod. The large area extending from the edge of the High Spot represents areas accessible to trap gear, although not to longline gear. In the validation workshop, one small area off of the port of Bandon was determined to be an error and will be removed from the final map. The main suggestion for improvement was making high intensity use continuous from 100 to 300 fath. on the edge of the High Spot. This was the same suggested improvement for the draft map showing relative economic importance of black cod.

Discussion and Conclusions

To meet the requirements of the 1996 Sustainable Fisheries Act's National Standard 8, fisheries management must address issues at the community level, which means at a finer scale of data collection. For Port Orford, 450 ft. is appropriate. The process worked, as evidenced by so few changes being suggested at the validation workshop. A community-based GIS process, combined with scientific and local knowledge focused on a local area, allowed researchers for POORT the opportunity to collect this resolution of data.

Local knowledge interviews are a successful tool to understand a fishing community, its resources, and dependence on various areas. The open microphone time provided the participants an opportunity to drive the process and communicate in a more customary manner. Topics arose that shed light on potential market opportunities, rockfish spawning cycles, habitat-species associations, perceptions on and potential locations of marine parks, and the ecological changes and perceived drivers of these changes in the local area. Applicability to other communities depends on the relative homogeneity of the port and the degree of trust between those conducting the interviews and the industry participants.

Coupling scientific and local knowledge in GIS is an effective way to support community-based management objectives. Rapid rural appraisal techniques provide baseline information at a relevant scale and provide insight into the ecological nuances of a local area. Using the base maps provide a common frame of reference to improve communication about a shared marine and coastal environment. Using a consensus building-process to learn collaboratively, POORT is building social capacity for long-term planning and input into management decisions

Spatial representation of human uses, economic importance, and species distribution can guide area-based management strategies, including local area management and the selection of less impactful areas for marine protected areas. Addressing the community management question—"Is there an area in Port Orford suitable for marine protected areas?"—remains a significant challenge.

Developing a trust between industry, scientists, and managers is often difficult in community-based management approaches. Although many safeguards are in place to protect confidentiality, anonymity, and data access and use, some fishermen still worry that the data collected through these programs may be used against them in the end. This relates to the perception that fisheries managers place the most stringent regulations on the sectors that have the most scientific data collected about them. Therefore, a positive experience with cooperative research, such as participatory GIS, can be the first step towards an improved relationship of mutual ocean stewardship.

Future Work

This interview process did not answer each scientific, market, or management question; so additional data has been prioritized for acquisition. POORT received an $110,000 cooperative research grant from NMFS to help answer some of these questions. Potential next steps include examining linkages between the geologic substrate data provided by benthic habitat maps of the OSU Active Tectonics and Seafloor Mapping Laboratory, and species distributions as supplied by the collective experience of local fisherman and other local experts. Three separate biological projects will be undertaken in 2004 in addition to the GIS work: fish biological sampling, visual ecological surveys using a remotely-operated vehicle (ROV), and project design for a subsequent fish tagging and gear selectivity study. POORT will also conduct more in-depth economic surveys and spatial analysis. With the information and resources provided through the GIS and the cooperative research, POORT's long-term goal is to make management recommendations to state and federal regulatory entities charged with management of the marine and nearshore environment.

Acknowledgements

Special thanks to Charles Steinback of Ecotrust for assistance with GIS analysis and map preparation. For the lead author, this project constituted part of a Master of Science program in Marine Resource Management at Oregon State University (OSU), under the direction of Professors Jim Good and Dawn Wright of OSU, and Dr. Astrid Scholz of Ecotrust.

References

Anderson, L., 2001. *Fisheries Management and Marine Reserves in Oregon: A Question of Scale*, Oakland, CA, Environmental Defense, 17 pp.

Beach, D., 2002. *Coastal Sprawl: The Effects of Urban Design on Aquatic Ecosystems in the United States*. Arlington, VA, Pew Oceans Commission, 33 pp.

Conway, F. D. L., Gilden, J., et al., 2002. Changing communication and roles: Innovations in Oregon's fishing families, communities, and management, *Fisheries*, 27(10): 20-29.

Craig, W. J., Harris, T. M., and Weiner, D. (eds.), 2002. *Community Participation and Geographic Information Systems*, New York, Taylor and Francis. 370pp.

Gade, M. A., Garcia, T. D., Howes, J. B., Schad, T. M., and Shipman, S., 2002. *Courts, Congress, and Constituencies: Managing Fisheries by Default*, Washington, D.C., National Academy of Public Administration, 160 pp.

Haddad, T., Wright, D. J., Dailey, M., Klarin, P., Dana, R., Marra, J., and Revell, D., Klarin, P., Dana, R., Marra, J., and Revell, D., this volume. The tools of the Oregon Coastal Atlas, in Wright, D. J., and Scholz, A. J. (eds.), *Place Matters: Geospatial Tools for Marine Science, Conservation, and Management in the Pacific Northwest*, Corvallis, OR, Oregon State University Press.

Hall-Arber, M., Dyer, C., Poggle, J., McNally, J., and Gagne, R., 2002. *New England's Fishing Communities*, Cambridge, MA, Massachusetts Institute of Technology Sea Grant College Program, 417 pp.

Hanna, S., 2000. *Setting the Fisheries Management Stage: Evolution of the West Coast Groundfish Management*, Corvallis, OR, International Institute of Fisheries Economics and Trade.

Jacob, S., Farmer, F. L., Jepson, M., and Adams, C., 2001. Landing a definition of fishing dependent communities: Potential social science contributions to meeting National Standard 8, *Fisheries*, 26(10): 16-22.

Jacob, S., Jepson, M., Pomerory, C., Mulkey, D., Adams, C., and Smith, S., 2002. *Identifying Fishing Dependent Communities: Development and Confirmation of a Protocol*, MARFIN Project and Report to NMFS Southeast Fisheries Science Center, 214 pp.

Jentoft, S., 1999. Healthy fishing communities: An important component of healthy fish stocks, *Fisheries*, 24(5): 28-29.

Mackas, D., Strub, P. T., and Hunter, J., 2002. Eastern Boundary Current-California Current System Working Group Reports, Leonardtown, MD, U.S. Global Ocean Ecosytem Dynamics, http://www.usglobec.org/reports/ebcccs/ebcccs.contents.html. Last accessed August 30, 2004.

Macnab, P., 2002. There must be a catch: Participatory GIS in a Newfoundland fishing community, in Craig, W., T. Harris, and D. Weiner (eds.), *Community Participation and Geographic Information Systems*, New York, Taylor and Francis: 173-91.

National Marine Fisheries Service, 2002. Community Impact Analysis, http://www.st.nmfs.gov/st1/econ/impact.html. Last accessed March 7, 2004.

Pacific Fisheries Management Council, 2000. *Groundfish Fishery Strategic Plan: Transition to Sustainability*, Portland, OR, 66 pp.

Pinkerton, E., 1989. *Cooperative Management of Local Fisheries: New Directions for Improved Management and Community Development*, Vancouver, Canada, University of British Columbia Press.

Scholz, A., 2003. *Groundfish Fleet Restructuring Information and Analysis: Final Report and Technical Documentation*, San Francisco, CA, Pacific Marine Conservation Council and Ecotrust, 63 pp.

Scholz, A., Bonzon, K., Fujita, R., Benjamin, N., Woodling, N., Black, P., and Steinback, C., 2004. Participatory socioeconomic analysis: drawing on fishermen's knowledge for marine protected area planning in California, *Marine Policy*, 28(4): 335-49.

Related Web Sites

City Populations (by rank), No. 91-137. Oregon Blue Book. http://bluebook.state.or.us/local/populations/pop03.htm. Last accessed Jan. 15, 2004

Port of Port Orford. Copyright 2003. Port Orford Area Chamber of Commerce, http://discoverportorford.com/portofpo.php. Last accessed Feb. 26, 2004

Port of Port Orford: Circa 1856. Copyright 2003. http://portorfordoregon.com/portofpo.html. Last accessed Feb. 15, 2004

Port Orford Life Boat Station. Copyright 2000-2003. Point Orford Heritage Society. http://www.portorfordlifeboatstation.org/. Last accessed Feb. 26, 2004.

Port Orford Oregon: Gateway to America's Wild Rivers Coast. Copyright 2003-2004. http://www.portorfordoregon.com/relocate.html. Last accessed Feb. 15, 2004.

Port Orford 2, Oregon: Period of Record General Climate Summary - Precipitation. Western Regional Climate Center - Desert Research Institute. http://www.wrcc.dri.edu/cgi-bin/cliGCStP.pl?orporf. Last accessed Feb. 26, 2004.
Port Orford 2, Oregon (356784): Period of Record Monthly Climate Summary. Western Regional Climate Center - Desert Research Institute. http://www.wrcc.dri.edu/cgi-bin/cliRECtM.pl?orporf. Last accessed Feb. 26, 2004.

APPENDIX 12.1.
Local Knowledge Interview Recruitment Flyer

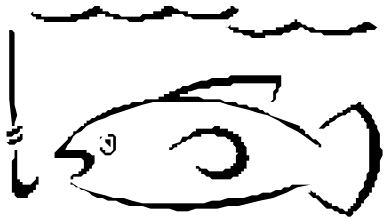
Port Orford Ocean Resource Team

POORT is engaged in a community-based management effort and is conducting a local inventory of the ocean region important to the Port Orford community.

We want to talk to commercial and recreational fishermen, recreationalists (divers, kayakers, surfers, etc.), and other citizens who have personal knowledge about the resources, species, and human activities that occur in the Port Orford ocean area.

Local knowledge interviews will be conducted in the POORT office:

351 W 6th St



Get involved! We want to talk to YOU!!!
Sign-up in the POORT office or call us to be a part of this unique opportunity!

APPENDIX 12.2.

POORT Confidentiality Agreement

Individual data will not be accessible by any person other than the Interviewer and the person who will input the data into the computer using geographic information system (GIS) software. Raw interview data will be securely stored until such time that all data are entered and verified. At that time, the information will be returned to the Interviewee, destroyed, or stored at said location with the Interviewee's permission.

Interview information will be aggregated with data from other interviews to produce compilation maps, which will NOT display any one individual's information. Furthermore, the POORT will NEVER share any one person's information without express written consent of the Interviewee.

The unique identification number below will be used to identify this interview in the computer database. The only place where your name and ID number will appear together is on this form, which will be securely stored indefinitely. By signing here you agree to the conditions of this confidentiality agreement.

Date: _____

POORT Interviewers:

_____ _____

Interviewee:
Identification number: _____
Name (please print and
sign):_____

Address: _____
_____

Phone: _____

APPENDIX 12.3

Institutional Review Board Informed Consent Document

PROJECT TITLE:	**PORT ORFORD OCEAN RESOURCES INVENTORY**
PRINCIPAL INVESTIGATOR:	**JIM GOOD, MARINE RESOURCES MANAGEMENT PROGRAM**
RESEARCH STAFF:	**VICKI WEDELL, LAURA ANDERSON, LEESA COBB, DAVE REVELL**

Purpose

The purpose of this research study is to conduct an inventory of the local knowledge of species, resources, and activities that occur in the marine environment important to the community of Port Orford. Computer mapping is used to document and display the information shared in the interview process. The purpose of this consent form is to give you the information needed to help you decide whether to be in the study or not.

We are inviting you to participate in this research study because you utilize the Port Orford marine environment for your occupation or recreational activities. A snowball sampling approach will be used to get an estimated 40 people in this interview process. Volunteers from POORT Advisory Board will be recruited first, while other willing participants will be identified through suggestions made by interviewees or other POORT members.

Procedures

If you agree to participate, your involvement in the interview process will last for three hours total. A two-hour interview will be followed a few weeks later by a one-hour consultation to verify the accuracy of the maps created. A community workshop will allow another opportunity to make modifications to the composite community map.

The following procedures are involved in this study. At least two interviewers are present for each interview. A random identification number will be used to reference your local knowledge maps. Confidentiality agreements are offered and signed at the onset of the interview. Then, you refer to a list of potential species and human uses and describe your personal observations of those that occur in the Port Orford study area. Identification guides are on-hand for reference, if needed. You use wax pencils to draw the areas of your observations on clear plastic mylar, which is overlaid on base maps having fathom contours and the relevant nautical chart displayed. Information shared

at the interview process is taken back and digitally documented in map form. The maps are brought back to you after a few weeks for a 1-hour consultation where any necessary modifications are identified and corrected. After all consultations are completed for all participants, species and use maps will be aggregated and presented as the Port Orford Ocean Resources Inventory.

Risks

There are no foreseeable risks associated with participating in this research project. Sensitive information is protected through random identification numbers.

Benefits

There may be no direct personal benefit for participating in this study. However, society may benefit from this study by learning about a participatory process for computer mapping of local ecological knowledge.

Costs and Compensation

You will not have any costs for participating in this research project. You will be compensated with a rockfish poster even if you withdraw early.

Confidentiality

Records of participation in this research project will be kept confidential to the extent permitted by law. Individual data is not accessible to any person other than the interviewer and the person who will input the information into the computer. Raw interview data is securely stored until such time that all the data are entered and verified. Then the data is returned to the interviewee or destroyed. Information is aggregated with data from other interviews and compilation maps generated for exclusive use by POORT. Maps and information are not shared with outside groups without express written consent of the POORT Advisory Board members.

Voluntary Participation

Taking part in this research study is voluntary. You may choose not to take part at all. If you agree to participate in this study, you may stop participating at any time. You are also free to skip any question in the interview that you prefer not to answer.

Questions

Questions are encouraged. If you have any questions about this research project, please contact: Vicki Wedell at 541-619-4699 or vwedell@coas.oregonstate.edu or Jim Good at 541-737-1339 or

good@coas.oregonstate.edu. If you have questions about your rights as a participant, please contact the OSU Institutional Review Board (IRB) Human Protections Administrator, at (541) 737-3437 or by e-mail at IRB@oregonstate.edu.

Your signature indicates that this research study has been explained to you, that your questions have been answered, and that you agree to take part in this study. You will receive a copy of this form.

Participant's Name (printed):

_____

_____

(Signature of Participant)
(Date) _____

RESEARCHER STATEMENT

I have discussed the above points with the participant. It is my opinion that the participant understands the risks, benefits, and procedures involved with participation in this research study.

_____

(Signature of Researcher)

Appendix 12.4

Local Knowledge Interview Questions

INTERVIEW QUESTIONS:

1. User profile
   a. Identification number
   b. Age
   c. Sex
   d. Profession/activity (owner, captain, deckhand)
   e. Duration
      1. Start/end year
      2. Number of days/year in area
      3. How many years have you maintained this level of activity?
   f. What generation fisherman are you?
   g. What vessel(s) do you fish from?
   1. What are its length and size of engine?
2. Where are your primary (fishing) zones?
   a. What are the primary fisheries in each zone?
   b. What are the primary gears in each zone?
   c. Rank each zone on a scale of 1-5 for:
      1. The amount of effort you spend there
      2. Its economic importance

Effort (% of time fishing for a year)

1 = (0-20%) 2 = (21-40%) 3 = (41-60%) 4 = (61-80%) 5 = (81-100%)

Economic importance (% of yearly income)

1 = (0-20%) 2 = (21-40%) 3 = (41-60%) 4 = (61-80%) 5 = (81-100%)

3. What "resources" do you use or have you observed in the study area? **(Use list)**
   a. Where do you use/observe resource X?
   b. What is the current status of the resource in the study area? (abundance)
   c. Has the location or status of this resource changed since you have been involved in your activity in the study area? If so, how and why?
   d. What are the seasonal changes of this resource in the study area? (spawning locations, nursery grounds)
   e. What other changes have occurred with respect to this resource? When and why did they occur?
4. Is there anything else about the ecology of this area that you want to tell us?
5. Are there any other economic, social, or cultural factors to consider?
6. Anything else?