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Social and Economic Considerations for Coastal and Watershed Restoration in the Puget Sound, Washington: A Literature Review

By Holly M. Stinchfield, Lynne Koontz, and Natalie R. Sexton

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Executive Summary

The purpose of this literature review is to summarize and synthesize the available information regarding the impacts of socioeconomic factors on coastal and watershed restoration in the Puget Sound, Wash. This review revealed that socioeconomic factors play an important role in determining the designation, process, and success of restoration projects. This review is divided into several sections, each addressing a different socioeconomic topic area related to restoration. Major findings from each of these topic areas are reported below.

Institutions and Restoration

Institutions include a wide range of legal, political, and administrative entities that determine public policy. Organizations such as government agencies and citizen groups are institutions, as are environmental laws and regulations. Institutions are significant in restoration processes because they involve both formal and informal processes of conflict resolution and guide the allocation of costs and benefits. The review of institutions and restoration led to two major findings:

- **The institutional situation regarding restoration in the Puget Sound is complex and scantily documented.** There are myriad institutions responsible for coastal and watershed management but it is unclear, in most cases, how those institutions interact with each other and how they affect restoration efforts.
- **Institutions can be barriers and facilitators to restoration.** There are many institutions that affect restoration in the Puget Sound and they may be conflicting, redundant, or congruent. Individuals may not trust organizations, particularly government agencies, or feel that these organizations make restoration activities more difficult than they need to be. Alternately, institutions can provide venues and incentives for restoration processes.

Beliefs, Behaviors, and Knowledge about Restoration and the Environment

As a whole, individual beliefs, behaviors and knowledge indicate the public's willingness to support restoration projects. With this information, conflicts and controversies surrounding restoration can be identified and promptly addressed or avoided. The review of beliefs, behaviors, and knowledge led to five major findings:

- **The Puget Sound itself is a valued place. There is concern about the environmental condition of the Sound among residents, but no real sense of urgency.** Concern about the health of the Sound also does not guarantee support for specific restoration activities. Each restoration project encounters resistance among some people and it is important to understand

as much as possible about the beliefs of those people regarding that specific project, as well as their more general beliefs about restoration and the environment.

- **Demographic characteristics are weakly related to individual beliefs about restoration and the environment.** In the Pacific Northwest, residents who are more educated, less wealthy, female, live in urban areas, and newcomers to the area are more likely to support restoration and be concerned about the environment than those who are less educated, more wealthy, male, live in rural areas, and have lived in the area for a long time. Those who work in extractive natural resources industries (agriculture, forestry, fisheries, and mining) are less likely to support restoration and environmental protection than those working in other sectors.
- **Knowledge about the environment and restoration is limited in the Puget Sound.** Additionally, the relationship between knowledge and beliefs is variable, but people who have more knowledge of environmental issues tend to behave in pro-environmental ways.
- **Knowledge can be a source of conflict during restoration.** Conflicts between local and scientific knowledge can impede restoration projects. Projects that include both types of knowledge often meet with less resistance.
- **Many people need a compelling reason to support and be involved in restoration.** Incentives of all sorts can encourage participation. People who are relatively economically secure may respond to financial incentives, but those who are not may need to see how ecological restoration can lead to community restoration (for example, in economically depressed areas) or to be reassured that restoration will not threaten their livelihoods and may, in fact, help them (for example, in agricultural communities).

Stakeholder Involvement

Stakeholders are individuals, groups, organizations, and institutions who have a stake in any particular issue, in this case, in restoration. Identifying and including stakeholders can be challenging, but it is important for reducing conflicts related to restoration projects. The review of stakeholder involvement led to two major findings:

- **Meaningful stakeholder involvement leads to successful restoration projects.** Meaningful involvement entails including stakeholders in every phase of the process, legitimizing all stakeholders' knowledge and beliefs, and ensuring that decisionmaking is transparent. Though intensive involvement inevitably slows down the process, it is critical to breaking down the socioeconomic barriers that prevent restoration.
- **Community-based restoration can engage local residents and create self-sustaining restoration programs.** This approach seems to work particularly well in economically depressed urban areas where restoration programs can be incorporated into broader revitalization attempts.

Communication of Restoration Issues

Environmental and restoration issues can be communicated through many different messages and mediums, and people respond to those messages and mediums in diverse ways. Communication is closely linked to education, so understanding how people respond to information about the environment can help to create more effective communication and education efforts concerning restoration. The review of communication of restoration issues led to one major finding:

- **Messages that focus on the responsibility of current residents to future generations are the most acceptable way to communicate environmental issues to residents of the Puget Sound.** Messages that stress the severity of the problem without resorting to scare tactics and provide avenues for people to affect the Sound in a positive manner are also effective. People gather information from many different forms of media, which can all be used to communicate the same message in various forms.

Economic Issues in Restoration

Economic issues in restoration range from market and non-market valuation of ecosystems and their services to the impacts of restoration on the economies of communities to individual willingness-to-pay for restoration. At all levels, careful estimation of the economic costs and benefits of restoration can show how restoration may benefit people, while identifying those who may be adversely affected and thus more likely to oppose restoration activities.

- **Though ecosystem services are very valuable in the Puget Sound, few studies attempt to measure them.** The benefits of ecosystem services are difficult to measure because of their complexity and non-market nature, but they have been recognized as important in determining the economic impacts of restoration.
- **Support and willingness to pay for protecting and restoring salmon is high in the Pacific Northwest.** However, there are some people who are not supportive or willing to pay. Part of this may stem from the fact that people are differentially affected by restoration efforts. Dam removal, for instance, may result in large overall benefits, but can deleteriously affect one segment of the population, such as farmers.

Though socioeconomic factors can either facilitate or obstruct restoration, few large-scale restoration projects in the United States emphasize them in either prioritization or monitoring procedures. The development of socioeconomic indicators that can be used in models and tools alongside ecological indicators would allow decisionmakers to better assess which restoration projects have a greater chance of succeeding. One useful conceptual model presents a trade-off scenario in which both ecological and socioeconomic factors are used to identify the most promising sites for restoration. For example, sites with high ecological potential and low socioeconomic constraints would be the best candidates for restoration, while those with low ecological potential and high socioeconomic constraints would be the lowest priority. The development of a tool that helps decisionmakers determine the appropriate socioeconomic analysis for their project would also be useful. Additionally, there are substantial gaps in the literature regarding restoration in the Puget Sound across all of the topics addressed in this review. Several topics have been addressed in only one study and others in none at all. The lack of research makes it difficult to provide a holistic view of the social and economic dimensions of restoration in the Sound but provides opportunity for future research. For instance, more research on modeling the relationships among behaviors, beliefs, and institutions related to restoration in the Puget Sound is needed.

Social and Economic Considerations for Coastal and Watershed Restoration in the Puget Sound, Washington: A Literature Review

By Holly M. Stinchfield,[1] Lynne Koontz, and Natalie R. Sexton

Introduction

The Puget Sound is a region of immense biological, social, and economic value. The Sound contains thousands of species and provides critical ecosystem services; it also offers shipping routes, recreation opportunities, economic commodities, and aesthetic benefits (Gelfenbaum and others, 2006). The Puget Sound region encompasses not only marine waters, but also the coastal areas that border the Sound and watersheds that drain into it. The region is home to four million people, who constitute 70 percent of the population of the state of Washington, and is expected to see an increase of 50,000 people a year (Gelfenbaum and others, 2006). This growing population has contributed to a number of serious environmental problems in the Sound. Several species, including some varieties of salmon and orca, are now listed under the Endangered Species Act (U.S. Fish and Wildlife Service, 2007). Losses of habitat, impaired water quality, eutrophication, and increases in invasive species have resulted from human activities such as shoreline armoring, urban development, and natural resource extraction (Gelfenbaum and others, 2006). There are a variety of coastal and watershed restoration projects being conducted in the Sound to remedy some of these problems.

The focus of coastal and watershed restoration projects is typically the improvement of biological and physical systems. However, not only does restoration impact socioeconomic systems, but socioeconomic factors can facilitate or impede restoration. Socioeconomic factors include both social issues, such as individual beliefs about restoration, institutions related to restoration, and stakeholder involvement in restoration, and economic issues, such as monetary costs and benefits. Regardless of the actual impacts of restoration in a particular area, affected people, such as special interest groups and local residents, may criticize and hamper restoration activities, especially if there are perceived negative socioeconomic impacts (for example, to the local economy or quality of life). The political and institutional will and capacity required to obtain funding and follow through on restoration plans may not exist. Therefore, restoration goals are determined, in part, by political, economic, institutional, and social demands. Choosing between these demands and balancing them with ecological goals is the challenge of restoration.

Decisionmakers may not realize how important it is to understand and incorporate socioeconomic factors affecting restoration activities along with the physical and biological factors until after a restoration project has ground to a halt due to opposition. Developing a successful ecosystem restoration project requires integrating the complexities of the physical and biological systems with the rules and constraints of the underlying socioeconomic systems. Values and attitudes of stakeholders towards possible restoration outcomes must be considered and incorporated at the beginning of a project, as must the economic costs and benefits, community

[1] Human Dimensions of Natural Resources Department, Colorado State University, Fort Collins, Colo.

goals, and institutional constraints related to those outcomes. As a former King County, Washington, councilmember noted regarding salmon restoration, "…you wouldn't get anywhere without the citizens with you" (Shared Strategy for Puget Sound, 2007, p. 357).

The impacts of social and economic factors on restoration have received increasing recognition in the literature (for example, Connelly and others, 2002; Higgs, 2005; Rhoads and others, 1999; Van Cleve and others, 2004; Vigmostad and others, 2005; Whalen and others, 2002). Wyant and others (1995) argue that both socioeconomic and ecological knowledge is necessary for successful ecological restoration. The purpose of this report is to provide a literature review of the socioeconomic factors that impact restoration activities in the Puget Sound and to explore conceptual frameworks that incorporate these factors into restoration decisionmaking. The review attempts to address the Puget Sound Nearshore Partnership's goal of "understand[ing] the effects of social, cultural, and economic values on restoration and protection of the nearshore" (Gelfenbaum and others, 2006, p. 18). Eight specific restoration objectives related to socioeconomic factors guided the development of this review of coastal and watershed restoration literature (table 1). Not all of the objectives are addressed (two, six, and seven are not discussed) and the review is organized in a different way, but it is intended to help achieve some of these objectives. The review and the annotated bibliography concentrate mainly on literature that addresses the social factors that impact restoration. Economic factors related to restoration have been widely studied and summarized elsewhere (for example, Kreiger, 2001; Ledoux and Turner, 2002; Leschine and others, 1997; Niemi and others, 1999), so they are addressed minimally in this review.

Table 1. Research objectives for determining socioeconomic impacts on restoration activities[1].

	Research Objectives
1	Determine how human governance, institutions, and social/political processes affect important nearshore ecosystem attributes such as habitats or biotic components.
2	Determine how human use patterns directly or indirectly affect and are affected by nearshore ecosystem attributes.
3	Determine how human attitudes, perceptions, and beliefs directly or indirectly affect and are affected by nearshore ecosystem attributes.
4	Determine how economic and demographic trends affect nearshore ecosystem attributes and human values.
5	Determine how communities (geographic and stakeholder) associated with nearshore marine areas in Puget Sound affect ecosystems attributes including how these communities relate to the use and conservation of these attributes.
6	Characterize and provide the science needed to protect cultural heritage and resources (historical and traditional artifacts) of the Puget Sound nearshore ecosystem.
7	Understand the role of the Puget Sound nearshore ecosystem in both historic and contemporary cultural heritage of Native American and non-Native American communities.
8	Understand ways to improve communication of scientific information regarding nearshore restoration, and ways the community attitudes, perceptions, and beliefs can shape and inform restoration science.

[1]From Gelfenbaum and others (2006, p. 18).

Social Science Considerations and Methods

Addressing social and economic issues is an essential part of evaluating the effects of restoration actions; however, there are many challenges to incorporating this information into the decision process. Limited planning budgets and timeframes often constrain the scope of socioeconomic analyses (if conducted at all), requiring the identification and prioritization of the most pressing socioeconomic issues that must be addressed within the restoration project (for example, sensitive or controversial management issues or when major changes are anticipated). Furthermore, many natural resource decisionmakers have an educational background in the biological or physical sciences with little training in the social sciences (Brinson and Benson, 2002). Social scientists have a variety of approaches available to measure the socioeconomic factors related to natural resource and environmental systems. A brief discussion of these approaches follows.

Social Considerations and Methods

There are a variety of social factors to consider when examining restoration. These may be measured at several different levels, ranging from the individual to the community to the institution. At the individual level, it is important to understand why people do what they do. What is the process that moves an individual from thought to an action? While it is not imperative that managers and decisionmakers fully understand the theories and models in the social science literature that explain these connections (see Fulton and others, 1996; Rokeach, 1973), it is important to understand that they exist. A person's core *values* are central to one's identity and are difficult to change. They develop early in life and tend to be relatively few in number, compared to other types of cognitions. These values directly affect people's *attitudes,* or evaluations, about a specific object or situation. These are played out in their preferences, opinions, and perceptions. These attitudes directly influence human behavior. For instance, people who are more concerned about the condition of the environment are more likely to engage in environmentally responsible behaviors, such as recycling (Barr, 2007) and home energy-saving measures (Poortinga and others, 2004). Though there are important differences among concepts like values and attitudes, many studies do not specify what is being measured. Because it is unclear what is being measured in most studies, the following literature review refers to beliefs in general, although the word may refer to a wide range of thoughts. Additionally, a person's knowledge about a subject may affect their attitude (and subsequent behavior). However, many social science studies have shown (and reality confirms) that increased knowledge does not always result in environmentally positive attitudes or behavior (for example, Jacobson and Marynowski, 1997; Zinn and Andelt, 1999). Through surveys and observation, values, attitudes, behaviors (or likely behaviors), and knowledge can be quantified and comparisons can be made based on a myriad of factors such as demographics (for example, age, income, and education).

At the community and institutional level, there are many social factors that can be examined, such as the extent and composition of social networks, the financial and technical capacity of communities or institutions to conduct restoration projects, and the roles of stakeholders in restoration. It is important to attempt to understand the dynamics of communities and institutions through examining their internal and external relationships and their influences on a decision process, such as restoration. This type of information is usually gleaned through interviews or focus groups and is many times qualitative in nature, in that it describes rather than measures the phenomena of interest.

Economic Considerations and Methods

Coastal and watershed habitats provide many goods and services that contribute to economies of the local communities, including such benefits as recreational opportunities, commercial uses, ecosystem services, and subsistence. Since restoration actions can affect these economic components, the impacts of such actions can be analyzed to determine if the project benefits outweigh the costs. Economic impacts associated with restoration actions can include positive and negative changes in local production, income, and employment (for example, decreases from loss of agricultural production from lands converted to marsh lands or an increase in visitor spending in local communities near a restoration project) that can be easily expressed in market (dollar) prices. The challenge is that most environmental benefits of restoration activities (for example, benefits to recreational users, societal benefits from healthy ecosystem services and salmon populations, and clean water) are non-market in nature which means they cannot be bought or sold, but still have economic value. The fundamental economic principles apply similarly to market and nonmarket goods, but the lack of market transactions and prices for nonmarket goods poses an obstacle. Economists have devised valuation methods that measure these values, either through indirect market means, or measuring public willingness to pay for the goods and services of concern. Estimating the nonmarket value of the environment, including restoration, is challenging (Leschine and Petersen, 2007). There are many different methods that measure certain aspects of non-market value, but using more than one method can result in valuing the same things more than once, thus resulting in an inflated value. Conversely, using only one method tends to provide a low estimate of the value. Each method also comes with its own set of limitations and caveats. For example, contingent valuation, or willingness-to-pay, is hypothetical, so it does not necessarily reveal what people will *actually* pay for an environmental good or service. Benefits transfer (the extrapolation of the non-market values of one site to another site) is viewed by some to be "as much art as science" because of the difficulty in comparing disparate sites (Leschine and Petersen, 2007, p. 22). Still, while economic valuations of non-market impacts are complex, they can be valuable in determining the total value of a restoration program.

Content and Structure of the Review

This review focuses on the Puget Sound region where possible, but examples from other areas of the United States are utilized where necessary. In some topic areas, very little or no research exists for the Sound, but has occurred in other locations. Caution is warranted in generalizing results from one study area to another. Not only are the biophysical restoration factors different from study to study, but the socioeconomic context is as well, across both space and time. For example, the results of a study in Seattle may have little applicability in more rural areas of the region or in Seattle in 10 years. The ability to generalize also depends on methodology and theory, which are not addressed in this review. Because of the volume of literature, each study was not critiqued extensively on methodology, under the assumption that peer review would have ensured scientifically acceptable methodologies in the majority of the literature. Studies were also not examined from a theoretical standpoint. For instance, each study is framed by the researchers in a certain way which can impact the results. Questions are asked and issues are raised within the theoretical frameworks, knowledge, and experiences of the researchers. Despite these caveats, when the results from several studies are examined, certain patterns can sometimes be observed. These patterns can give practitioners some ideas as to the issues they may face when conducting restoration in the Sound.

The literature reviewed consists primarily of peer reviewed journal articles and books as well as reports from governments, non-profit organizations, and private consulting firms.

Information from newspapers, magazines, and other popular media is not included. Social and economic issues are considered jointly when possible, although some issues, such as the value of salmon, are discussed in separate sections. Most of the review focuses on the socioeconomic issues that may hinder or facilitate restoration, but many of these factors can be used to monitor the impacts and success of a project as well. Four main areas are discussed: (1) institutions and restoration, (2) individual beliefs, behavior, and knowledge regarding restoration, including salmon restoration; (3) stakeholder involvement in restoration, and (4) communication of restoration issues. There is also a brief discussion of the economic issues surrounding ecosystem services and salmon restoration. The review concludes with an investigation of the application of socioeconomic information to restoration decisionmaking. The development of socioeconomic indicators is discussed, as are conceptual models that can incorporate both ecological and socioeconomic factors in prioritizing restoration projects. The review is not comprehensive in that it does not cover every single possible socioeconomic issue related to restoration in the Sound. For example, socioeconomic impacts on actual environmental conditions are not addressed, nor are the impacts of environmental change on socioeconomic issues. This linked relationship has been the focus of some studies that have included the Sound region (for example, Liu and others, 2007a; Liu and others, 2007b), but is outside the scope of this review. Additionally, though tribes play a large role in restoration in the Sound, tribal issues are not discussed extensively or separately, but are included in the institutional section. The ethnographic literature available about tribes in the Pacific Northwest is wide ranging, but an effort was made to focus on current restoration issues, rather than broader considerations.

Socioeconomic Factors Related to Restoration in the Puget Sound

Institutions and Restoration in the Puget Sound and the Pacific Northwest

Institutions encompass a wide variety of arrangements and procedures, both formal and informal. Formal institutions are, for the purposes of this paper, "legal, political and administrative structures and processes through which decisions are made with respect to public policy" (Ingram and others, 1984, p. 323). They are often conflated with organizations, which may be defined as structured groups of people working together to attain a common goal and are typically considered a type of institution (Shannon, 1998). Informal institutions include the social norms, practices, conventions, and accepted behaviors of a society (Young, 2002, p. 6). To fully understand the institutional context of Puget Sound restoration, institutional analyses are necessary, but are outside of the scope of this review. This section reviews some existing Puget Sound institutions and a few available institutional analyses that apply to the region. It also explores how individuals relate to and interact with those institutions.

The importance of understanding the role of institutions in natural resources management has been extensively addressed in the literature (for example, Dietz and others, 2003; Imperial, 1999; Ingram and others, 1984; Shannon, 1998). Institutions are significant because they involve both formal and informal processes of conflict resolution and guide the allocation of costs and benefits (Ingram and others, 1984). Furthermore, Shannon (1998, p. 529) notes that "science and policy are negotiated" within an institutional context, in that institutions create and influence the policy and science which determines where, when, and how restoration occurs. Institutional analyses can help identify the key institutions involved in restoration and determine how decisions are made and shaped by institutions.

Institutional barriers in natural resources planning and decisionmaking can be among the most difficult to overcome (Ingram and others, 1984) and there appear to be many jurisdictional

and political obstacles to coordinating restoration in the Sound. First, there are myriad organizations responsible for managing land and water in the Sound. One study of marine protected areas in the Sound found they were managed by 14 different organizations, including Federal, State, County, and municipal governments; a university; and environmental groups (Murray and Ferguson, 1998). Table 2 was created from a brief review of journal articles and websites related to natural resources management in the Puget Sound. Despite its length, it does not address specific institutions at the local level because of the sheer abundance of them. This institutional situation is not uncommon in large restoration programs. For example, there are over 160 agencies and organizations involved in managing the lower Columbia River, which has resulted in fragmented and uncoordinated management (Lower Columbia River Estuary Partnership, 1999).

Some institutional issues may also stem from the fact that coastal and watershed restoration in the Puget Sound, like much of the Pacific Northwest, frequently involves an interrelated and complicated trio of legal mandates: the Endangered Species Act (ESA), water rights, and tribal rights. One of the most important pieces of legislation currently affecting restoration is the ESA, under which several species of salmonids, as well as many other fish and wildlife species, are listed as endangered or threatened in Washington State (U.S. Fish and Wildlife Service, 2007). The ESA requires the conservation of these species through the development and implementation of recovery plans by the agencies that manage the species (either the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS)) (National Marine Fisheries Service, 2007). Given that almost all the rivers entering the Sound contain or historically contained salmonid habitat, the ESA guides much of the current restoration work. Restoration of habitat frequently includes restoring flows to streams and rivers which can present another challenge. Water rights in Washington are assigned via prior appropriation, as is the case in most of the western United States (Washington State Office of Attorney General, 2000). Simply stated, people who have the oldest claim on the water have the right to use their shares first, followed by those who have later claims. These water rights can come into conflict with the ESA if the use of water, such as for agriculture or drinking water, harms endangered or threatened species. The water rights can also conflict with tribal rights to have sufficient flows to support fish populations. The Washington Governor's Office of Indian Affairs (2007) lists 29 federally recognized tribes in the state, two-thirds of which reside in the Puget Sound region. Many tribes in the Pacific Northwest have retained fishing rights on non-tribal land, often trading tribal land for fishing rights (Pevar, 1992, p. 198). Tribes also often can claim water rights that pre-date those of other landowners (Pevar, 1992, p. 209-210). Additionally, based on a 1974 court case, commonly known as the Boldt decision, tribes in Washington have the right to harvest 50 percent of the allowable take of fish in the state (Boxberger, 1989). In order for tribes to exercise these rights, there must be both water and fish available for them, which often relates to restoration efforts.

There have been many efforts to connect current institutions and create new institutions to manage restoration and protection in the Sound. In 2008, a new state agency, the Puget Sound Partnership, replaced the Puget Sound Action Team and the Shared Strategy for Puget Sound (Puget Sound Partnership, 2007). Like the Shared Strategy before it, this new institution is working with Federal, tribal, State, and local governments, as well as businesses and citizen groups to coordinate restoration activities. Shared Strategy had success in working with many different groups in planning salmon recovery. In 2007, they submitted the Puget Sound Salmon Recovery Plan for Chinook salmon to the NMFS in compliance of the requirements of the ESA (Shared Strategy for Puget Sound, 2007). Each of 15 geographical areas was responsible for developing their own recovery plan, which resulted in the involvement of many different groups. Shared Strategy helped to coordinate those efforts and combine the results into a regional plan for the

Table 2. Examples of institutions related to coastal and watershed restoration in the Puget Sound region.

Institutions	Examples
Academic institutions	Evergreen State College University of Puget Sound University of Washington Western Washington University
Businesses and industry	Agriculture Development/Construction Commercial fishing Timber Utilities (hydropower)
Citizen organizations	People for Puget Sound Puget Soundkeeper Alliance Recreation organizations (angling, birding, snowmobiling, and so forth) The Nature Conservancy The Trust for Public Land Watershed councils/associations
County governments	11 counties in Puget Sound watersheds: Clallam, Jefferson, King, Kitsap, Mason, Pierce, San Juan Islands, Skagit, Snohomish, Thurston, Whatcom
Courts	County courts U.S. Ninth Circuit Court of Appeals U.S. Supreme Court U.S. Western Washington District Court Washington Court of Appeals Washington Supreme Court Washington tribal courts
Federal agencies	National Marine Fisheries Service National Park Service U.S. Army Corp of Engineers U.S. Bureau of Indian Affairs U.S. Fish and Wildlife Service U.S. Forest Service
Federal laws and legislation	Clean Water Act Endangered Species Act Magnuson-Stevens Fishery Conservation and Management Act National Environmental Policy Act Private property rights

Table 2. Examples of institutions related to coastal and watershed restoration in the Puget Sound region.—Continued.

Institutions	Examples
Municipalities	Bellingham Olympia Seattle Tacoma
Tribes and nations	19 federally recognized tribes and nations in Puget Sound region: Jamestown Klallam, Lower Elwha Klallam, Lummi, Makah, Muckleshoot, Nisqually, Nooksack, Port Gamble S'Klallam, Puyallup, Samish, Sauk-Suiattle, Skokomish, Snoqualmie, Squaxin, Stillaguamish, Suquamish, Swinomish, Tulalip, Upper Skagit
Tribal rights	Fishing rights Prior water use rights
Washington state agencies	Department of Ecology Department of Fish and Wildlife Department of Natural Resources Parks and Recreation Commission Puget Sound Partnership/Shared Strategy for Puget Sound
Washington state laws and legislation	Forest Practices Act Growth Management Act Salmon Recovery Act Shoreline Management Act Water Resources Act Water rights Watershed Planning Act

Sound. Most recently, the Partnership (2008) released the Puget Sound Action Agenda which outlines a comprehensive plan for restoring the Sound by 2020.

There have also been other efforts to work collaboratively in the region. The Puget Sound Nearshore Ecosystem Restoration Project (PSNERP)/Puget Sound Nearshore Partnership was started by the U.S. Corps of Engineers and the Washington Department of Fish Wildlife to study ecological degradation in the Sound nearshore and to recommend actions to improve the condition of the nearshore (Puget Sound Nearshore Partnership, 2007b). The Partnership now includes many different organizations, including other State and Federal agencies, tribes, industries, and environmental organizations. The U.S. Geological Survey (USGS) currently conducts research in conjunction with PSNERP through the Coastal Habitats in Puget Sound (CHIPS) project (Shipley and Haines, 2006). The Puget Sound Georgia Basin (PSGB) Ecosystem Conference is held every two years and includes scientists, managers, tribal and First Nations representatives, policy makers, community leaders, educators, and students from both the United States and Canada (Puget Sound Georgia Basin Ecosystem Conference, 2009). The conference focuses on the condition of the transboundary region, ecosystem stresses, and how to respond to new issues, with an emphasis on bringing people from both sides of the border together

Institutions are significant because they involve both formal and informal processes of conflict resolution and guide the allocation of costs and benefits.

to exchange knowledge. There are also other transboundary institutions, including the British Columbia/Washington Environmental Cooperation Council created by the Environmental Cooperation Agreement between the Province of British Columbia and the State of Washington, as well as the Canada-United States Joint Statement of Cooperation on the PSGB Ecosystem (Fraser and others, 2006).

Institutional Analyses of Restoration Issues

There are some institutional analyses that touch on restoration issues in the larger context of the Pacific Northwest and the state of Washington. Several authors have focused on the comanagement of salmon (which often includes some type of restoration) by tribes in the Pacific Northwest (for example, Boxberger, 1989; Ebbin, 2002; Singleton, 1998, 1999). Comanagement refers to "governance systems that combine state control with local, decentralized decisionmaking and accountability" (Singleton, 1998, p. 7). In the Pacific Northwest, tribal management of salmon is subject to Federal laws such as the ESA, but daily management of the resource is typically the responsibility of the tribes. Ebbin (2002) and Singleton (1998, 1999) conclude that, though there are shortcomings in management, tribes have been generally successful in managing salmon. Ebbin (2002) noted that tribes facilitated the acceptance of different types of knowledge and moved toward ecosystem management, rather than just fisheries management. Singleton (1999) observed that tribes were able to enforce fishing regulations through a combination of formal and informal sanctions made possible by the small sizes and strong integration of the communities. Both authors stressed the difficulty of any one entity, such as a tribal organization, managing a mobile and public resource such as salmon. Boxberger (1989) investigated the impacts of the Boldt decision on the Lummi tribe in the Puget Sound. He found that the increase in allowable take for fish resulted in shifts in power structures within the tribe. Some tribal members were able to take advantage of the increase by buying larger boats and harvesting more fish, while others were unable to do so. Some of the latter felt that the tribal council and fisheries commission were dominated by the more prosperous fishers, who made decisions which benefitted themselves rather than the whole tribe. The research for all of these studies occurred before the majority of the salmonid listings under the ESA, however, which means that these tribal institutions may now be different.

The ESA listings resulted in various policymaking endeavors, two of which are explored here. Ryan and Bidwell (2005) examined how Washington supported the development of collaborative watershed management institutions through the state Watershed Planning Act and the Salmon Recovery Act. Both acts facilitated local efforts toward watershed management and salmon restoration. For instance, groups that wanted to develop their own watershed management plans could receive funding to do so. As of 2004, there were 37 watershed groups operating under this program. Though these groups are required to include certain entities, including all the Counties, the largest city or town, and the largest water distributor in the watershed, they were not required to include tribes or other important groups. By not requiring that these groups be included in planning efforts, Ryan and Bidwell argue that the state may have made it more difficult for those efforts to succeed. Members of the watershed groups also complained that, though the State provided funding, they did not provide enough in the way of other assistance. The authors note that collaborative efforts require lots of time to build relationships between entities, which was not allowed for in the original legislation. Additionally, though plans were developed to address the listing of species under the ESA, there was no legal requirement that they be implemented by local or state entities, leaving doubt as to whether they would ever be enacted. The authors also raise concerns about planning at the watershed level, observing that there are many issues that are not under the control of local government, such as existing State and Federal laws. The financial,

technical, and organizational capacity of planning groups also varies greatly from watershed to watershed. They argue that both of these problems indicate that larger scale efforts could be more successful or, at the very least, that planning should be coordinated across all watershed groups. However, Ryan and Bidwell commend the state for attempting to build capacity to address watershed issues at the local level, since attempting only top-down management for these sorts of resource issues is rarely successful.

Day (2005) explored the development and effectiveness of the Washington State "Forests and Fish Plan" (FFP) which was intended to fulfill the requirements of the ESA by protecting salmon. Day utilized the Institutional Analysis and Development (IAD) framework developed by Ostrom and her colleagues (for example, Crawford and Ostrom, 1995; Ostrom, 1990; Ostrom, Gardner, and Walker, 1994). The IAD framework focuses on the formal and informal rules that guide individual and institutional interactions (Imperial, 1999). The framework identifies institutional actors who make resource management decisions and then examines the interactions among those actors to evaluate institutional performance and policy outcomes. The actors who developed the FFP were the Washington Forest Protection Association (industrial forest landowners), Washington Farm Forestry Association (small family tree-farmers), Association of Washington Counties, State Departments of Ecology, Natural Resources, and Fish & Wildlife, tribes, USFWS, NMFS, and Environmental Protection Agency (Day, 2005). Though environmental groups were part of the coalition initially, they later withdrew and, along with commercial fishing groups, sued the state over the policy, which they believed catered to industry and governmental interests. However, Day argues that the plan had a high chance of achieving compliance because of the voluntary and collaborative nature of the development process. None of the actors wanted the Federal Government to intervene in salmon recovery so they ensured that the rules in the FFP meet ESA requirements. The timber industry wanted to avoid a repeat of the spotted owl controversy, in which whole tracts of forest were closed to logging. The State wanted to retain control over natural resources management as well as share the burden of recovery with other sectors. Day notes that this sort of voluntary self-regulation may only work under the threat of harsher penalties like those dictated by the ESA.

Summary of Institutions and Restoration in the Puget Sound and the Pacific Northwest

Institutions are among the most important aspects of restoration to understand because of their overarching roles in policy and decisionmaking. There are myriad institutions in the Sound that impact, guide, and create policy related to restoration. Among the most important legal mandates affecting restoration are the Endangered Species Act, tribal rights, and water rights. There also have been and continue to be attempts to connect current institutions and create new ones to better manage restoration efforts in the region, such as the Puget Sound Partnership and the Georgia Basin Puget Sound Research Conference. It remains to be seen whether the most recent institutions will be more successful than their predecessors.

Institutional analyses of salmon management by tribes during the 1990s show that tribal management was largely successful, though managing an itinerant and communal resource such as salmon can be difficult. Two other analyses address the way the Endangered Species Act has driven the development of other institutions in the region. They stress the importance of legal mandates, like the ESA, in encouraging individuals and organizations to work together on restoration. In both cases, there was a certain amount of voluntary effort that was relied upon, but the possibility of the Federal Government stepping in motivated policymakers to take action.

Institutions, Individuals, and Restoration

In the Puget Sound, individuals' perceptions of and experiences with institutions can be barriers to restoration. For instance, farmers may or may not trust the motives or actions of government agencies and other organizations. A survey of watershed partnerships in the United States revealed that, in some watersheds, farmers were working with the partnerships successfully, while in others, farmers did not want to be involved with certain government agencies (Duram and Brown, 1999). Farmers in Skagit County did not trust restoration efforts because they believed that restoration was part of a government plan to gain control of land and water, a way for environmentalists to get jobs and funding, or an attempt to restore the Skagit Valley to its pre-Columbian state (Breslow, 2001). In another part of the country, Paladino (1998) found that conservation easements were generally viewed with suspicion by farmers living near the Broad River in Georgia, mostly due to resistance to giving up property rights. In the Chesapeake Bay watershed, many landowners chose to participate in the Federal Government's Conservation Reserve Enhancement Program (CREP), but others did not feel comfortable working with the government or accepting government money (Street, 2001).

Other individuals may have issues with the requirements and demands of institutions. Owners of property on Lake Washington felt that one of the greatest barriers to naturalizing shorelines was the permitting process (Howell and others, 2007). Many respondents had to perform mitigation requiring a permit for shoreline modifications. However, it took a quarter of the owners surveyed more than a year to receive their permits and only half the projects were completed. In addition, it was no easier for owners who wanted to naturalize their shorelines to get a permit than it was for owners who were hardening their shorelines (for example, building bulkheads). In Oregon, the Watershed Enhancement Board found that most of their grant recipients were willing to monitor the socioeconomic impacts of their restoration projects to get funding, but were frustrated about having to submit yet another report to the Board (Bonner and Hibbard 2002). People may also be displeased when institutions do not solicit their input. A survey of Oregon coastal community leaders and residents revealed that many respondents were upset because they believed that the Oregon Department of Fish and Wildlife (ODFW) changed the Salmon Trout Enhancement Program (STEP) without gaining support from the public (Smith and others, 1997). STEP had been focused on hatchery boxes maintained by volunteers but when ODFW changed the focus to wild fish and ecosystem management without public input, it created hostile feelings toward the agency.

Summary of Institutions, Individuals, and Restoration

Many times, individuals perceive institutions, particularly governmental entities, as barriers to restoration by private property owners. Many private property owners lack trust in their government institutions, resulting in resistance to restoration efforts. Private property owners who encounter institutional obstacles to restoration are less likely to undertake such projects. Additionally, institutions that do not listen to their constituents when creating policy can face opposition to implementing their plans.

Individual Beliefs and Behavior Concerning the Puget Sound

Literature exploring individuals' beliefs about restoration in the Puget Sound area is scarce. However, several studies have evaluated residents' perceptions of the Puget Sound in general. Because general attitudes about the Sound influence specific attitudes toward restoration of the Sound, these studies are helpful in understanding what residents may believe about restoration.

The review of these studies of beliefs and behaviors is limited to those conducted with residents of the Sound.

Residents of the Puget Sound region value the Sound for many different reasons. The Sound and surrounding areas provide a variety of benefits for residents, including economic, lifestyle, emotional, spiritual, cultural, historic, moral, and legacy (for future generations) benefits (Cocker Fennessy, 2006c). For example, residents of Olympia, Washington, identified several attributes of the Deschutes River Basin that were important to them, including: outdoor recreation, tourism, aesthetics and spirituality, ecosystem functions; cultural, civic, and historical pride; and marine commerce (CLAMP and WDFW, 2006). In a 2003 study, about half of respondents living in the Sound region chose the natural environment and beauty as the features they liked the most about the area (Moore Information, 2006b). Focus groups of residents thought of the Sound as a place, not just a body of water, that they were proud of and valued greatly (Cocker Fennessy, 2006a). Interviews with civic and community leaders in the Puget Sound revealed that they valued living near and seeing the Sound, but thought that most people take it for granted (Cocker Fennessy, 2006b). The Sound was also deemed the most important body of water to consider when addressing environmental problems in the region (Moore Information, 2006b).

However, in general, residents of the Puget Sound region appear to be much more concerned with issues such as transportation, taxes, and jobs/economy than with the health of the Sound (Moore Information, 2006a, 2006b). This may be because some studies showed that most residents thought the Sound was in average to excellent condition, in better shape than other bodies of water, and in better health today than in the past (Cocker Fennessy, 2006a, 2006b; Moore Information, 2006a). On the other hand, one survey of residents found that over 80 percent believed that the health of the Sound was not so good or poor and more than half thought that the health of the Sound was worse now than in the past (Cocker Fennessy, 2006c). Another study of property owners and people involved in the management of the Cedar River watershed in Washington revealed that the majority of respondents believed that the health of the river has declined in the past 50 years (Montgomery, 2003).

While there is not uniform concern about the health of the Sound, residents do appear to be concerned about the environmental issues surrounding the Sound. When asked directly about environmental issues regarding the Sound, the top ecological concerns were population growth and development, water quality, and pollution (Cocker Fennessy, 2006a, 2006c; Moore Information, 2006a, 2006b). People were also concerned about the lack of enforcement of environmental laws, improving the education of the public about the Sound, acquiring more funding to protect and restore the Sound, and the loss of habitat and natural areas (Cocker Fennessy, 2006c; Moore Information, 2006a). Similar findings were revealed in a study of residents of five coastal communities in Washington and Oregon. More than 39 percent of respondents ranked habitat loss, contamination from oil spills, and shoreline development as serious threats to the bays in their communities (Huppert and others, 2003). Puget Sound residents believed that restricting development, restoring degraded ecosystems, and reducing toxic chemical discharges into water were the most important actions for restoring the health of the Sound (Cocker Fennessy, 2006c). A healthy and clean Sound was considered to be one where fish and wildlife thrive, the water is clean, growth and development are controlled, and non-point source pollution is decreased (Cocker Fennessy, 2006a, 2006c).

Along with valuing the Sound and being concerned about the condition of the Sound, residents in the region are supportive of protection and restoration activities as a way to improve the health of the Sound and are willing to contribute financially to the process. For instance, in 2005, a majority of voters supported a sales tax increase to fund protection, conservation, and restoration activities in Washington (Moore Information, 2006b). Additionally, most residents

were willing to pay more for sewage treatment if it prevented sewage from entering the Sound. Residents also thought that progress was being achieved in preventing oil spills, educating the public about environmental problems, and cleaning up land contaminated by chemicals (Cocker Fennessy, 2006c). Many people had a realistic view of restoration, recognizing that restoring the Sound is a lengthy process that might not ever end (Cocker Fennessy, 2006a).

There is also interest among Puget Sound residents in being personally involved in restoration efforts. A survey of Skagit County, Washington, residents revealed that over 80 percent of respondents were willing to support or take an active part in each of six different restoration activities, including planting vegetation along river banks, restoring salmon runs, and removing invasive plants (Elway Research, Inc., 2005). Similar results from a survey of Oregon coastal community leaders and residents reported that almost half of the respondents would volunteer half of a day or more a month to help restore salmon (Smith and others, 1997).

However, the relationship between beliefs and behavior is not always direct. In the Puget Sound region, residents tend to say that a healthy environment is important, but their actions do not always reflect these beliefs. For instance, even though many individuals living on streams that drain into the Puget Sound stated that the health of the environment was the most important consideration in landscaping their private residences, they did little to restore or maintain the ecological condition of the streams running through their yards (Booth and others, 2004). A survey of owners of private shoreline properties on Lake Washington revealed that over 85 percent of the owners had hardened or partially hardened shorelines, even though a majority of respondents recognized the ecological importance of a natural shoreline (Howell and others, 2007). Furthermore, one-third had attempted shoreline modifications in the past year, with the most common alterations being building or repairing a dock and repairing or replacing an existing bulkhead.

Summary of Beliefs and Behavior

The Puget Sound is valued highly by residents of the region, but there is mixed opinion as to the health of the Sound. Some residents believe the Sound is in good ecological condition, while others believe it is in poor health. The top ecological concerns among Puget Sound residents are population growth and development, water quality, and pollution. Residents in the Sound region tend to be generally supportive of protection and restoration activities. They are willing to contribute financially to the process and many express an interest in being personally involved in restoration efforts. However, though residents tend to say that a healthy environment is important, they do not necessarily behave in ways deemed environmentally friendly.

The Puget Sound is valued highly by residents of the region, but there is mixed opinion as to the health of the Sound.

Demographic Differences in Beliefs and Behavior

Differences in demographic characteristics, such as age, income, education, occupation, and place of residence, can correspond with individual differences in beliefs and behavior regarding the environment (Jones and Dunlap, 1992; Olofsson and Öhman, 2006, Van Liere and Dunlap, 1980). However, demographics have been shown repeatedly to be relatively weak predictors of individual environmental attitudes and behaviors, even where consistent relationships exist (Dietz, Stern, and Guagnano, 1998; Jones and Dunlap, 1992; Mertig and Dunlap, 2001). Other factors, such as values, tend to have a much stronger relationship with attitudes and behaviors than demographics (for example, see Teel and others, 2005). Still, on a societal level, some research shows that as

nations become more urbanized, more educated, and wealthier, citizens become more concerned about the environment (Inglehart, 1990, 1997; Inglehart and Baker, 2000). For instance, within the United States, states in the West with higher average levels of urbanization, education, and income tend to have higher percentages of people who believe wildlife should not be utilized solely for human needs, but should have rights similar to humans (Manfredo and others, 2003; Teel and others, 2005). These results indicate that some demographic trends could be used to help predict how residents in general in an area may feel about restoration, once relationships between demographic characteristics and beliefs about restoration for that region have been determined. It is also important to keep in mind that, even though each demographic measure is discussed separately below, typically a suite of factors predicts better than any single one. A few studies were found that focus on the Puget Sound, but most reviewed below apply to the Pacific Northwest or to other areas of the United States due to the lack of information from the Sound.

Age

Age has been shown to be one of the stronger and more constant demographic predictors of environmental concern in the United States (Jones and Dunlap, 1992; Olofsson and Öhman, 2006, Van Liere and Dunlap, 1980). Generally, as age increases among people in the United States, concern for the environment decreases. However, the relationship between age and environmental concern appears mixed in the Pacific Northwest. One study revealed that the younger the person in the Pacific Northwest, the more likely they were to support salmon protection (Smith and Steel, 1997). Yet, another study of residents in Washington and Oregon found that the older the person, the more likely they were to have moved to their community due to environmental characteristics (such as views and scenery, being near the ocean, and clean water in the bays). Younger residents were more likely to have been motivated to move by economic considerations, such as the low cost of living and job opportunities (Huppert and others, 2003).

Education

Education has also consistently been a good predictor of environmental concern (Jones and Dunlap, 1992; Olofsson and Öhman, 2006, Van Liere and Dunlap, 1980). More education tends to be related to increased concern about the environment in the United States, a finding that is supported in the Pacific Northwest. For instance, Oregon and Washington residents with higher levels of education were more motivated by environmental characteristics to move to their area than less educated residents (Huppert and others, 2003).

Gender

Gender has rarely been found to be a strong predictor of environmental concern in the United States, though when differences exist, women tend to be more concerned about the environment than men (Jones and Dunlap, 1992; Olofsson and Öhman, 2006, Van Liere and Dunlap, 1980). In concord with those findings, studies in the Pacific Northwest have found that women were significantly more supportive of greater protection for salmon and fish and wildlife habitat than men (Smith and Steel, 1997).

Income

Though previous research would suggest that income is not a consistent predictor of environmental concern in the United States (Jones and Dunlap, 1992; Van Liere and Dunlap, 1980), this is not necessarily the case in the Pacific Northwest. Wealthier residents seem to be less

concerned about the environment than less wealthy residents. For example, a survey of Skagit County residents revealed that wealthier residents were more likely to believe that the health of the Skagit River was improving than less wealthy residents (Elway Research, Inc., 2005). Additionally, Huppert and others (2003) found that wealthier residents in five coastal communities in Washington and Oregon were more likely to have moved there because of economic considerations, as opposed to environmental characteristics.

Occupation

Occupation has generally been found to be weakly related to environmental concern in the United States (Olofsson and Öhman, 2006, Van Liere and Dunlap, 1980), but there is some evidence that people engaged in extractive natural resources industries (such as agriculture, forestry, mining, and fisheries) are less likely to be concerned about the environment than those in other occupations (Jones and Dunlap, 1992). Many residents of the Pacific Northwest engage in extractive activities for their economic survival, some of which may be conducted on public land and water and all of which can be directly impacted by restoration activities. Legislation such as the Endangered Species Act can affect those in natural resources industries more than others, as was demonstrated by the spotted owl controversy in the 1990s. These occupations are also frequently considered a way of life, as opposed to simply a job, so restoration and the environment may have different meanings to those engaged in such occupations than to those in other types of occupations. Because of these factors, occupation may be useful in examining differences in environmental beliefs in the Pacific Northwest.

Several studies have found that those working in extractive natural resource industries in the Pacific Northwest are less likely to be concerned about the environment and to support restoration. For instance, a survey of residents of Skagit County found that those with ties to agriculture were more likely to think the river's health was improving and that trends related to forested land were headed in the right direction, while "white collar" workers (for example, those in business/professional services, wholesale or retail trade) were more likely to believe that the health of the Skagit River was declining and that trends related to forested land were headed in the wrong direction (Elway Research, Inc., 2005). Farmers in Skagit County also were resistant toward restoration activities (in this case, stream buffers) promoted through the Conservation Reserve Enhancement Program (CREP) because they felt it would result in the loss of their land and farms, reduce their control over their livelihoods, and reduce available sources of food for the public (Breslow, 2001). Similarly, local residents in the Tillamook Bay area in Oregon were supportive of restoring wetlands in general, but limiting livestock access to riparian areas was very controversial (Gregory and Wellman, 2001). In a study of residents of five coastal communities in Washington and Oregon, people who worked in extractive industries were more likely to prioritize economic considerations, while those who worked at home or in white-collar jobs were more likely to favor protecting the environment (Huppert and others, 2003). In the Pacific Northwest in general, people involved in the timber and ranching industries were less likely to support protection for salmon than those in other occupations (Smith and Steel, 1997). This division is also evident in a survey conducted by the State of Washington to help set sediment management standards for the Puget Sound (Leschine and others, 2003). Employees of State and Federal natural resource agencies (for example, Washington Department of Ecology, Environmental Protection Agency) and university scientists tended to consider environmental problems, such as habitat loss, water quality, and toxic waste, more threatening to the quality of life in the Puget Sound than did employees of waterfront industries and environmental consultants. The latter were more concerned with social and economic threats like crime, poor public schools, and excessive environmental regulation.

There can also be differences in beliefs held by managers or leaders actively engaged with the resource and the beliefs held by the general public. In the Cedar River watershed in Washington, people engaged in watershed management (those on the mailing list of the Cedar River Council and members of the Water Resource Inventory Area 8 Steering Committee) were more likely to choose loss of channel width and complexity as the most important environmental threat to the river while property owners were more likely to choose decline of fish in the river (Montgomery, 2003). People engaged in watershed management were also more likely to choose pollution of the river as the least important threat as compared to property owners. In five coastal communities in Washington and Oregon, estuary managers also had different views than residents regarding environmental threats (Leschine and others, 2003). In particular, residents in Coos Bay, Oregon, did not believe that there were any environmental threats to their estuary, while managers in the area believed that oil spills, industrial pollution, channel dredging, and city runoff were serious threats. Another study comparing community leaders and local residents' views regarding ecosystem restoration on the Hudson River in New York revealed that differences in beliefs may not exist, but differences in perceptions of those beliefs can occur (Connelly and Knuth, 2002). The survey asked respondents to rate the importance of various environmental actions that could be taken on the river. Community leaders consistently underrated how important the environmental actions would be to residents and they overrated the importance of economic development and access to residents. In reality, community leaders and residents rated most of the actions very similarly.

Residence

Beliefs about the environment have been shown to be related to where people live and how long they have lived there. In general, people who live in urban areas tend to be more concerned about the environment than those in rural areas in the United States (Jones and Dunlap, 1992; Olofsson and Öhman, 2006, Van Liere and Dunlap, 1980). How long a person has lived in an area has also been linked to beliefs about the environment. For instance, Manfredo and his colleagues (Manfredo and others, 2003; Teel and others, 2005) found that the longer people had lived in an area in the western U.S., the more likely they were to believe that wildlife should be utilized to fulfill humans needs and should not have rights like humans.

Place of residence

There are few studies related to restoration in the Puget Sound that address the environmental beliefs of urban and rural residents. The studies of farmers reviewed above in the occupation section indicate that at least some rural residents are not supportive of restoration efforts (Breslow, 2001; Elway Research, Inc., 2005). Another study showed that urban residents in the Pacific Northwest were more likely than rural residents to support protecting salmon (Smith and Steel, 1997). Though there is little literature that addresses the beliefs of urban Sound residents about the environment, as well as restoration, understanding the beliefs of urbanites concerning restoration and the environment is important, given population growth trends around the Sound. The Sound watershed is home to around four million people and is growing at the rate of about 50,000 people a year (Gelfenbaum and others, 2006). It contains 10 of the 15 biggest cities in Washington with a current population of almost 1.5 million (Washington State Office of Financial Management, 2007). This sort of population growth and distribution not only translates into more human impact on the environment, but also raises the probability that restoration will be taking place more frequently in urban areas in the future.

Length of residence

In the Pacific Northwest, Huppert and others (2003) found that Oregon and Washington residents who had lived in the area for fewer years favored protecting the environment more than residents who had lived there longer. However, in a survey of Florida residents, respondents who had lived in Florida for more than five years were more likely to be concerned about coastal habitats than those who had lived there for less time (Milon and others, 1998). These disparate results may be tied to the reasons people move to a certain region. For instance, Huppert and others (2003) concluded that many people who recently moved to Washington and Oregon were more motivated to move by environmental characteristics than by economic considerations, resulting in greater support for protecting the environment by residents who had more recently moved to the area.

Summary of Demographic Differences in Beliefs and Behavior

People's beliefs and behavior related to restoration and the environment tend to be related to demographic characteristics, but the consistency and strength of these relationships varies. The relationship between age and environmental beliefs is not consistent among residents of the Pacific Northwest. However, other demographic characteristics such as education, income, occupation, and residency are more consistent. Residents who are more educated, less wealthy, or female appear to be more likely to be concerned about the environment and support restoration. Urban residents are also more likely to support environmental protection than rural residents, though there is little information about the beliefs of urbanites in the Pacific Northwest. Additionally, newcomers in the Pacific Northwest appear to favor protecting the environment more than longer term residents. Conversely, those involved in extractive natural resources industries are less likely to support restoration and environmental protection than those working in other sectors.

Individual Beliefs and Behavior Concerning Salmon Restoration

Declining salmon populations due to fishing demands and habitat loss have been a concern since the late 1800s in the Pacific Northwest (Huppert, 2001). During the twentieth century, many dams were built on the region's rivers which further decreased populations. To offset these declines, hatcheries to supplement salmon stocks and institutions to manage salmon fishing were established, but these actions did not reverse the downward trend (Huppert, 2001). There are currently 26 evolutionary significant units of salmonids listed as threatened or endangered by the National Marine Fisheries Service (2005). Given the lack of success of hatcheries, restoration and protection of salmon habitat have become critical to salmon recovery (Huppert, 2001). Because of their status as threatened or endangered species, salmonids have been driving restoration efforts in the Pacific Northwest for several years. Restoring salmon populations has been a primarily technical endeavor in the past, focused on enabling fish to bypass dams, mimicking more natural water flows and improving hatchery practices. However, more recently the idea of restoring the entire ecosystem in which salmon live has become more prevalent, broadening restoration efforts in the Pacific Northwest.

Salmon recovery is a controversial restoration issue, both within the Puget Sound region and the Pacific Northwest as a whole. This may stem partially from the various meanings (or values) that people attach to salmon recovery. Huppert (2001) categorizes these meanings into three broad views:

- The *romantic/religious* view is based on respect for salmon and entails restoring ecosystems to their "natural" state. Salmon are seen as one part of a larger goal to restore ecosystems.

- The *economic/utilitarian* view regards salmon as a commodity and focuses on a balance between salmon fisheries and other industries (for example, forestry, agriculture, hydropower, and urban development) in a river system.
- The *biodiversity preservation* view centers on the consequences of allowing salmon to go extinct and seeks quick action to prevent this from happening. There is little consideration of larger scale restoration with the primary objective being preservation of genetic diversity.

These ideas are frequently intermixed, though some people hold relatively pure forms of them.

Any of these three views could result in support for protecting and restoring salmon, which may explain why support is generally high in the Pacific Northwest. Studies conducted in the early 1990s in the Pacific Northwest found widespread support for protecting fish like salmon and their habitats (Smith and Steel, 1997). A survey of Oregon coastal community leaders and residents showed that a majority of respondents believed that salmon should be protected regardless of cost (Smith and others, 1997). California residents in another study chose salmon run restoration as the most important use of water in the Trinity River (Taylor and Douglas, 1999). However, people who hold an economic/utilitarian view may be less likely to support salmon restoration. For instance, a study found that Oregon residents who favored growing the economy over protecting the environment were more likely to support changing the endangered species laws and protecting the rights of landowners with regards to salmon restoration (Smith and others, 1997). Those who favored protecting the environment were more likely to be concerned about restoring and protecting wetlands and salmon as well as to be willing to pay or volunteer to restore salmon.

People also have different ideas on how salmon restoration will or should be accomplished. In a survey of residents of Skagit County, over 80 percent of respondents agreed that salmon habitat restoration could occur without impacting farmland or forest, but over half also felt that the loss of farmland, forests, and fish and wildlife species was inevitable (Elway Research, Inc. 2005). A study of Oregon residents revealed that around half of the respondents believed that reducing the numbers of predators of salmon, improving forest management, restoring wetlands, and increasing citizen participation were quite or very important for restoring salmon (Smith and others, 1997). Additionally, most respondents did not believe it was important to decrease hatchery production and many thought that even more hatchery salmon were needed to boost the population.

People also do not necessarily agree on who should pay for salmon restoration. A survey of Oregon residents found that most thought that everyone was somewhat responsible for declines in salmon populations but had different opinions on who should pay or be paid for restoration (Smith and others, 1997). Over half agreed that private landowners should be paid for protecting salmon, though 16 percent disagreed. Some felt that landowners who cause environmental damage should have to pay to correct it, but others believed that landowners should be compensated for restoration and protection activities regardless of their past actions.

Summary of Beliefs and Behavior Concerning Salmon Restoration

In general, support for protecting and restoring salmon is high in the Pacific Northwest, though there are some differences in level of support among the public. Though everyone is seen as culpable in the decline of salmon, there is disagreement as to who should pay for restoration. Some people believe landowners who have damaged habitat should pay for restoration; others feel landowners should be paid for restoration and protection, regardless of past actions. There is support for many ecosystem restoration activities that will help salmon, with a general belief that even more hatchery fish should be raised to supplement wild stocks.

Incentives for Restoration—Motivating Changes in Behavior

While there are many individuals who are very involved with restoration issues, there are others, such as private property owners, who may need incentives to become active. Frequently, institutions are the source of such incentives. Economic incentives for restoration are commonly suggested as a way to encourage involvement by local residents and communities. In a study of private property owners along Lake Washington and employees of nearby municipalities, respondents felt the most effective incentives for naturalizing shorelines were tax breaks, matching funding, streamlined permitting, waiving permitting fees, awarding grants, and increases in property value (Howell and others, 2007). However, in the lower Cedar River area, both property owners and people interested in watershed management believed that financial incentive programs were not the most effective way to restore the river (Montgomery, 2003). Though incentive programs were chosen by these respondents as the least effective method of restoration, they were also chosen as the action that would gain the most public support. Almost half of the respondents chose publicly funded projects over financial incentive programs for private land owners as the best way to achieve restoration goals, with only a sixth believing private lands incentives were best.

Huppert (2001) points out that there are currently few economic incentives provided by institutions to change individual behavior regarding coastal and watershed restoration in the Pacific Northwest. For instance, none of the municipalities that border Lake Washington give incentives to property owners for naturalizing shorelines, even though King County has a program in which all the municipalities could participate that provides tax breaks to landowners for preserving or creating natural shorelines (Howell and others, 2007). Where incentives are used, they have been shown to be effective. For example, the Bear Creek watershed that feeds into Lake Washington has been successfully protected via a mix of tax breaks, money for easements, and regulations from city and county governments (Ryan and Jensen, 2003).

Financial incentives may not be effective in all cases, however. People who live in economically depressed urban areas may require different incentives to encourage their participation in restoration. Casagrande (1997) stresses the importance of community control of restoration projects in poor urban areas. He indicates local participation that develops a sense of ownership can be very effective. Urban residents often feel they have little control over what happens in their neighborhoods so facilitating a restoration project that is developed and directed by residents can create pride and a sense of responsibility to the environment. Many neighborhoods have a deteriorated social structure that can be rebuilt through community projects, including restoration, and successful demonstration projects can lead to interest in further restoration. Community-based restoration activities have occurred at the Presidio in San Francisco (Holloran, 1996). Community groups are encouraged to direct restoration projects and student internships that pay a competitive wage have been created so that youth from all socioeconomic backgrounds can participate in restoration. In New Haven, Connecticut, residents living near the West River included restoration projects in their community economic development plan after recognizing the social, economic, and ecological benefits (Casagrande, 1997). Additionally, they have plans to create an environmental education school in their community that uses the restoration of the West River as a learning tool.

Summary of Incentives for Restoration—Motivating Changes in Behavior

There are a variety of incentives that may be employed to encourage private property owners and communities to become involved in restoration. Economic incentives from institutions are favored by some property owners and can be effective, but there are few programs in the Puget Sound that provide them. In economically depressed urban areas, coupling restoration projects

with community revitalization programs can provide incentive for residents to become involved. Additionally, the more control a community has over a project, the more likely residents are to participate.

Knowledge of Restoration and the Environment

Types of Environmental Knowledge

It is generally recognized among scholars that there are two types of knowledge about the environment: scientific knowledge and local knowledge (also referred to as traditional ecological knowledge) (Higgs, 2005). Scientific and local knowledge often differ temporally and spatially. Scientific knowledge is frequently developed over short periods of time within large geographic areas, while local knowledge tends to be accumulated over long periods of time spent in small areas (Ebbin, 2002). Higgs (2005) argues that both types of knowledge are critical to successful restoration projects. He goes so far as to say, "I cannot think of a single successful project that has thrived on scientific knowledge alone, independent of local knowledge…" (p. 162). However, knowledge itself can be a contentious issue. There is often a divide between those who hold scientific knowledge and those who hold local knowledge. Scientific knowledge is critical in making decisions about restoration but it is sometimes viewed by non-scientists with suspicion and doubt. Local knowledge can be a source of valuable information but is sometimes dismissed by scientists because it is based on life experience rather than methodical research. Rhoads and his colleagues (1999) point out that scientific and local knowledge develop within different social and cultural contexts. This can result in conflicts between the holders of that knowledge. For example, farmers in Skagit County contested the science used to justify stream buffers in their area (Breslow, 2001). They believed that the science was not conducted with rigor, that it did not apply to agricultural land, and that studies that showed the buffers were not useful were ignored. These sorts of knowledge conflicts can hamper restoration efforts unless the validity of different types of knowledge is accepted by stakeholders.

Increasing the acceptance of local knowledge by scientists and scientific knowledge by non-scientists can be achieved in different ways. The development of personal relationships among scientists and non-scientists often facilitates this process. In Illinois, district drainage commissioners on the upper Embarras River initially resisted working with scientists to develop a watershed plan because the commissioners had already created a plan based on their own knowledge of the river and the needs of the community (Rhoads and others, 1999). However, personal relationships were eventually formed between the commissioners and the scientists through extensive interaction, resulting in the development of trust which led to the acceptance of scientific knowledge by the commissioners. The scientists in the project also recognized the importance of understanding the watershed from the perspective of the commissioners, which led to a watershed plan which was both ecologically and socially sound.

Another way to incorporate both scientific and local knowledge is to create models based on both types of information. In the Willamette River Basin in Oregon, local stakeholder input was used to develop three sets of possible future land and water use policies for the basin (Baker and others, 2004; Hulse and others, 2004). The landscape of the basin was then mapped based on the different sets of policies, resulting in three maps of what the basin might look like in the year 2050 if certain policies are followed. A primarily citizen-driven approach was used, though experts were also involved several times in the process. Local stakeholders had access to, and were somewhat restricted by, the available scientific data but also relied on their own knowledge and beliefs to guide the process. The Sacramento River Project in California included local landowners and

stakeholders in hydraulic modeling of flood impacts and geomorphic modeling of meander migration, both as sources of information for and as reviewers of the models (Golet and others, 2006). This led to greater acceptance of the results, which indicated that moving the levee back from the river and revegetating the landscape with native plants would both reduce flooding impacts and improve ecosystem health.

Environmental Knowledge, Beliefs, and Behavior

Studies have found that people's level of knowledge about the environment is related to beliefs about the environment, but that the relationship is not always consistent. Sometimes, people who hold more knowledge about an environmental issue are more likely to support environmentally sound natural resource management. For instance, several studies have shown that more knowledge about fire leads to increased tolerance using fire as a management tool (Cortner and others, 1984; Gardner and others, 1985; Manfredo and others, 1990; McCool and Stankey, 1986; Zwolinski and others, 1983). However, increased knowledge does not always translate into increased support. For example, one study found that hunters in Florida were among the most knowledgeable about ecosystem management practices, but had the most negative attitude toward its implementation (Jacobson and Marynowski, 1997). Research has shown that knowledge is one of a variety of important factors in determining environmental behavior (Hines and others, 1986/1987; Hungerford and Volk, 1990; Kollmuss and Agyeman, 2002). People who hold more knowledge about an environmental issue do tend to be more likely to engage in pro-environmental behavior. Hines and others (1986/1987) note that the development of environmental knowledge and skills is an important part of facilitating responsible environmental behavior, which indicates that environmental education may be a good way to increase support for and participation in restoration activities.

In general, knowledge about restoration, ecological processes, and environmental problems in the Pacific Northwest is limited. Though logging practices, shoreline development, fish passage obstructions, and spill events are considered to be the main causes of stream and coastal degradation (Restore America's Estuaries, 2002), some farmers in Skagit County, Washington, cited over-fishing as the major problem (Breslow, 2001). However, others correctly noted that logging and development were primary causes. Additionally, interviews with residents near the Broad River in Georgia found that farmers were, in general, much more knowledgeable about watersheds and river ecosystems than other interviewees (Paladino, 1998). A majority of property owners on Lake Washington believed that providing habitat for fish and wildlife and preventing erosion are desirable functions of the lake's shoreline (Howell and others 2007). However, over half also thought that providing bass habitat was a desirable function, even though bass are an invasive species. A survey of Oregon and Washington residents found that, when given a list of 11 ocean-related terms, more than half the respondents said they knew six of them but less than a third recognized the other five (Steel and others, 2005). On an ocean knowledge quiz in the same survey, over half the respondents answered two of the questions correctly but less than 40 percent answered the other three questions correctly.

Many Puget Sound residents believe that a public that is more knowledgeable about the problems of the Sound would be more likely to think and behave in ways that helped the Sound (Cocker Fennessy, 2006b). This has been shown to be the case in the Pacific Northwest. In Oregon, a survey of coastal community leaders and residents found that those with greater knowledge about environmental and salmon-related issues were more willing to volunteer to restore salmon than those with less knowledge (Smith and others, 1997). Oregon and Washington

residents who were familiar with more ocean-related terms and scored higher on an ocean quiz were more likely to believe that ocean fisheries were in decline (Steel and others, 2005).

Similar findings have been revealed on the East Coast. Among residents of the Hudson River estuary, knowledge was positively related to the perceived importance of actions related to cleaning up, protecting, and conserving the river (Connelly and others, 2002). High school students in New Jersey who had taken a marine biology class were more likely to support dune and vegetation restoration than those who had taken more generalized science classes (Nordstrom and Mitteager, 2001). Research on attitudes toward marine life on the East Coast has shown that more knowledgeable people are less likely to have a negative view of sharks (Thompson and Mintzes, 2002) and to engage in harmful behaviors regarding dolphins (Barney and others, 2005).

In general, knowledge about restoration, ecological processes, and environmental problems in the Pacific Northwest is limited. Conflicts between different types of knowledge can impede restoration programs.

Summary of Knowledge of Restoration and the Environment

Conflicts between different types of knowledge can impede restoration programs. Scientific knowledge can be viewed by some people as taking precedence over local knowledge, sometimes creating divisions among stakeholders. The inclusion of local knowledge in decisionmaking processes can help alleviate disagreements and facilitate restoration planning. The development of personal relationships between scientists and non-scientists and the creation of models incorporating both scientific and local knowledge have been effective in reducing conflicts on some restoration projects.

Increased knowledge has been linked to positive beliefs about and behavior regarding the environment. However, knowledge about restoration, ecological processes, and environmental problems in the Pacific Northwest tends to be limited. Those individuals who do have greater knowledge are more likely to believe restoration is important and to be willing to volunteer or otherwise contribute to restoration activities.

Stakeholder Involvement in Restoration

Involving a wide variety of people in developing restoration programs has become common in the United States, partly because of the public involvement requirements of Federal legislation such as the National Environmental Policy Act (Office of NEPA Policy and Compliance, 2007). Much of the time, the people included in such decisionmaking are key individuals or groups who have a stake in the issue. Formally defined, *stakeholders* are individuals, groups, organizations, and institutions "…who share a common interest or stake in a particular issue or system; they can be at any level or position in society, from global, national, and regional concerns down to the level of household…" (Grimble and Wellard, 1997, p. 175). Stakeholders in coastal and watershed restoration may include local property owners, farmers, small business owners, and resource users; city, County, State, and Federal Government and natural resources agencies; natural resource industries, including hydropower and logging companies; tribes; and environmental and citizens organizations. Often stakeholder involvement is referred to as public involvement, but public involvement is only one type of stakeholder involvement. There may be many stakeholders within the public, such as concerned individuals or citizens groups, and there are also stakeholders that are not part of the public, such as government agencies. However, many articles simply refer to public participation or involvement, making it difficult to identify stakeholders within that broader group.

The terminology used in the original papers has been retained here, even though it may not be consistent with other literature.

One of the first challenges of involving stakeholders is in identifying them. In any given area, there may be numerous potential stakeholders. For instance, as part of this study, a cursory stakeholder assessment was conducted to identify the stakeholders in natural resources management in the Skagit Valley in Washington State and found over 60 stakeholders. They included every level of government from the local watershed council to the U.S. Fish and Wildlife Service, along with tribes, utility companies, local citizens groups, national environmental organizations, and others. In addition to the sheer number of possible stakeholders in a region, people often have different ideas about who should be considered a stakeholder in restoration, particularly when it comes to decisionmaking. Puget Sound residents hold varying beliefs about which entities are responsible for and should make decisions regarding restoration. In one study, many believed that everyone was responsible for restoring the Sound and thought that a diverse group of stakeholders should lead the effort (Cocker Fennessy, 2006a). A survey of Skagit County residents found that more than two-thirds believed that local governments, people like them, farmers/landowners, State government, environmental organizations, local Indian tribes, and local businesses all bear at least some responsibility to determine the environmental future of the county (Elway Research, Inc., 2005). More than 85 percent of respondents agreed that all these stakeholders must work together on environmental issues; however, 71 percent also believed that this cooperation would never occur. Just under 30 percent of residents surveyed in the lower Cedar River watershed believed that multi-government/citizen panels should make decisions regarding river restoration and a similar percentage believed that local government alone should make those decisions (Leschine and Montgomery, 2003; Montgomery, 2003). These diverse results are similar to those found in a survey of Oregon residents by Smith and his colleagues (1997). Half of the respondents wanted the State to lead salmon restoration efforts, but another group of respondents did not want the government involved at all.

After stakeholders have been identified, bringing them together can have many benefits for restoration programs. Meaningful stakeholder participation in natural resources management facilitates information sharing, creates inventive management approaches, increases support of management decisions, and guarantees that those decisions take the public's values into account (Dalton, 2006). In a survey of watershed partnerships across the country, at least 75 percent of the partnerships solicited public participation during various phases of their project (Duram and Brown, 1999). The majority of partnerships felt public participation positively affected the ability for the groups to reach consensus on plan goals and on the final plan, on the legitimacy of the final plan, and on the organizing capacity of local communities. Many respondents noted that their efforts had increased awareness and cooperation, but others had been less successful and felt there was a long way to go. Despite the occasional difficulty of the participation process, Duram and Brown (1999) conclude that public participation should be an important part of watershed planning initiatives because it increases the chances of long-term success, recognizes that watersheds do not follow political boundaries, and provides a coordinated framework of stakeholders to manage resources.

Restoration programs in the Puget Sound and the Pacific Northwest have generally included stakeholders, though the extent of participation by various stakeholders has varied. During exploration of the restoration of Capitol Lake in Olympia, Washington, both public meetings and focus groups were held to involve stakeholders (CLAMP and WDFW, 2006). Focus groups were deemed more productive because they were more structured than the public meetings. This conclusion is consistent with the results from Duram and Brown's (1999) survey of watershed partnerships which found that over 40 percent of the respondents felt that public meetings were not

effective in encouraging public participation. Participants in marine and coastal resource management processes in the northeastern United States believed that public meetings were a good way to disseminate information but that smaller working or focus groups were also necessary to effectively make progress (Dalton, 2006). The Padilla Bay National Estuarine Research Reserve in Washington took a more intensive approach and set up a demonstration farm managed in collaboration with local farmers to address the effects of agriculture on the health of the estuary ecosystem (DePhelps, 1996). Local community members were involved as decisionmakers and managers in the hopes that the research and education program would be more successful. However, DePhelps notes that involving the community at this level can make the process more difficult and scientists and academics may feel uncomfortable dealing with the informal nature of information exchange and research among community members.

Other restoration programs have tried a mix of bottom-up and top-down approaches. The Puget Sound Salmon Recovery Plan, a Federally directed effort, was written by 15 watershed recovery planning groups (Shared Strategy for Puget Sound, 2007). Each group created their own plan for salmon recovery that was then incorporated into the larger plan for the Sound. However, the recovery plans are subject to approval and modification by the Federal Government because salmon are a Federally endangered species (National Marine Fisheries Service, 2006b). Though the NMFS recognizes the importance of involving other stakeholders, they also must ensure that every plan meets certain requirements. The mixed approach for this program most likely resulted in greater inclusion of local stakeholders across the Puget Sound region than would have a program dictated by the Federal Government. Still, the effort has been criticized by some for not ensuring public input (National Marine Fisheries Service, 2006a). Because there were no guidelines for stakeholder involvement, some groups included a wide variety of stakeholders in the planning process, while others did not. For instance, the Skagit River watershed plan was created by two tribes and the Washington Department of Fish and Wildlife and the lack of public input in the plan was the focus of several public comments received on the plan (National Marine Fisheries Service, 2006a).

Summary of Stakeholder Involvement in Restoration

Stakeholder involvement begins with identifying stakeholders, which may result in a variety of interested parties. Involving stakeholders can range from public meetings to completely collaborative decisionmaking groups, depending on the restoration situation. Projects in which intensive stakeholder involvement has been achieved are frequently successful, though they may take much longer to plan and implement. Stakeholder involvement in Puget Sound restoration has varied from very intensive to very little, though the general trend toward greater stakeholder involvement in natural resource management issues across the county will most likely occur in the Sound as well.

Projects in which intensive stakeholder involvement has been achieved are frequently successful, though they may take much longer to plan and implement.

Communicating Restoration Issues

Framing environmental problems effectively to gain public support for solving them is essential to successful restoration efforts. Communication about environmental issues can be viewed by some people as biased because they believe the communicators have an agenda (Eisenhauer and Nicholson, 2005). Understanding the perspectives of the various sectors of the public on restoration issues can help to identify an effective message. Among Puget Sound residents, the most important reason identified for restoring the Sound is for the benefit of future

generations (Cocker Fennessy, 2006a, 2006b, 2006c; Moore Information, 2006a). In one study, almost all of the respondents (97 percent) agreed that cleaning up the Sound should be done for future generations (Moore Information, 2006a). Reducing dangers to human health, improving quality of life, and creating healthy fish and wildlife habitat have also been given as significant reasons for restoration. Civic and community leaders in the Puget Sound region have also recommended that communications should be based on science and focused on making the issues personal, stressing stewardship, connecting the Sound to the economy, avoiding hyperbole or threats, and highlighting the benefits for individuals and communities (Cocker Fennessy, 2006b). The effective communication of scientific data to other stakeholders and the general public is also critical. Scientific data from a project in the Willamette River region in Oregon was made available to the public via publications and presentations (Baker and others, 2004; Hulse and Gregory, 2004). Data visualizations, such as time-lapse graphics, were used to facilitate the communication of scientific findings.

Not only is the content of communication important, but the means of communication are as well. People get information about environmental issues from a variety of sources. For instance, most private property owners on Lake Washington used city newspapers or newsletters, neighbors and friends, and local mailings as their primary sources of information about their neighborhoods. They believed that local mailings and city newspapers or newsletters would be the most effective manner to receive information related to their shorelines (Howell and others, 2007). A survey of Oregon coastal community leaders and residents revealed that the most cited sources of information about salmon restoration were word of mouth, television and radio, and newspapers (Smith and others, 1997). The internet can also be a useful and cost effective way of disseminating information to a large number of people. In 1998, the National Ocean Service of the National Oceanic and Atmospheric Administration (NOAA) created a website as a forum to discuss coastal issues on a national level (Bookman, 2000). The website had more than 7,000 visitors over a six month period and over 1,500 people downloaded information. The source of information can be related to the level of knowledge among the public. Oregon and Washington residents who received information concerning ocean issues via television tended to be less knowledgeable about the issues, while those who received information via the internet or newspapers tended to be more knowledgeable (Steel and others, 2005). It is unclear as to whether the certain sources provide more or less information and thus lead to more or less knowledge or whether people with more knowledge seek out different sources of information than people with less knowledge.

Summary of Communicating Restoration Issues

People in the Puget Sound respond most favorably to messages about environmental issues that stress current residents' responsibility to future generations. They are also responsive to messages about threats to human and fish and wildlife health, but leaders in the region believe that messages should avoid hyperbole or threats and focus on positive actions. Residents receive environmental information about the Sound from a variety of sources and the source of the information is related to the level of knowledge among the public.

Economics and Restoration in the Pacific Northwest

Economic Value of Ecosystem Services in the Pacific Northwest

Healthy ecosystems are ecological life-support systems. Goods and services provided by ecosystems are the basic building blocks of human welfare, providing the food we eat, the water we drink, the clothes that keep us warm, materials we use to build shelter, fuel for warmth, and

inspiration and experiences that enrich our lives (Krieger, 2001). Ecosystem services are benefits from these natural assets, such as storm and flood protection, recreation, nutrient recycling, biodiversity, aesthetic value and more (Batker and others, 2005). The benefits of ecosystem services reveal themselves in the market in a variety of ways. Wetlands recharge ground water, stabilize sediment, control water quality and transport biomass (Kazmierczak, 2001; Scodari, 1990; Woodward and Wui, 2001). Each of these functions can benefit surrounding and downstream producers. Healthy ecosystems also function to control damage from natural disasters including floods and severe storms (Leschine and others, 1997; Scodari, 1990; Woodward and Wui, 2001). The associated savings in damage control can serve as a proxy for the value of providing flood protection. Ecosystem services can also enhance the value of private property adjacent to the resource (Scodari, 1990; Woodward and Wui, 2001). This includes increases in property values associated with residing near clean water and exposure to scenic views (Scodari, 1990; Woodward and Wui, 2001). Ecosystem services, especially for the provision of water resources, can have significant impacts on recreation (Scodari, 1990). Altering water levels can directly impact the quality of recreation experiences such as fishing or white water rafting, including number of trips taken to an area. While there has been increased acknowledgement that the valuation of natural systems and environmental quality is appropriate and important (Rivers, Trails and Conservation Assistance, 1995), the values of ecosystem services are often still overlooked and not evaluated through traditional cost benefit analyses due to the complex and non-market nature of these attributes (Whitelaw and Macmullan, 2002).

Many studies have been conducted regarding ecosystem goods and services associated with restoring riparian areas. Topics include: public willingness to pay for the protection of river ecosystems (Garber-Yonts and others, 2004; Holmes and others, 2004; Loomis and others, 2000; Sanders and other, 1990); the benefits of instream flow for river recreation including paddling, angling and hiking (Berrens and others, 1996; Bowker and others, 1996; Daubert and Young, 1981; Loomis, 1998); public values for removing dams to restore fish habitat (Loomis, 1996, 1999, 2002); the value of recreational and commercial fishing (Anderson, 1989; Gregory and Wellman, 2001; Loomis, 1989, 1999; Quigley and Arbelbide, 1997; Washington Department of Fish and Wildlife, 2002); the value of agricultural buffers for riparian habitat restoration (Palone and Todd, 1998; Prato, 1998; Qui and Prato, 2001); increased property values from urban stream restoration projects (Kulshreshtha and Gillies, 1993; Streiner and Loomis, 1995); and public values for instream flows and wetlands (Leschine and others, 1997). These studies identify a high level of public support and willingness to pay for ecosystem services provided by river resources.

There are several handbooks that frame the economic issues associated with restoration, and guide policy in essential restoration activities. A handbook titled, “Salmon and the Economy,” prepared by ECONorthwest (1999) focuses on habitat restoration in Washington and Oregon. The handbook is designed to aid decisionmakers throughout the Pacific Northwest to better understand the economic issues and facts associated with the costs and benefits of salmon and salmon restoration. Another handbook written during the widespread Chesapeake Bay restoration project reports on a specific type of restoration policy associated with bringing back habitat to riparian areas (Palone and Todd, 1998). The Chesapeake Bay handbook’s purpose is to provide professional land managers and planners with the latest information on the functions, design, establishment and management of riparian forest buffers. Another guide, entitled “Using Economics as a River Conservation Tool,” explains the benefits of determining the economic value of river resources (Anderson and others, 1995). This guide outlines five approaches to river conservation that have been viewed as successful. A final guide based on river recreation describes methodology for collecting trip expenditure information and to estimate economic value through modeling (Tillinghast and others, 1998).

Specific social and economic studies in the Puget Sound have estimated the value of an entire watershed and the value of restoring an estuary. The most comprehensive study was part of the management plan designed to protect and restore salmon habitat in the Green/Duwamish and Central Puget Sound Watershed, entitled the "Water Resource Area 9 (WRIA 9) Habitat Plan" (Batker and others, 2005). Batker and others (2005) attempted to arrive at a value for all ecosystem services within the watershed annually, ultimately estimating the annual value to be between $1.7-6.3 billion.

Measuring the value of ecosystem services can be a complex task, but provides important information about the benefits of the environment. One study in the Puget Sound valued a single watershed in the billions of dollars.

Summary of Economic Value of Ecosystem Services in the Pacific Northwest

The economic benefits of ecosystem services are expressed in many different ways, ranging from flood protection and water quality to recreational opportunities and increased property values. These benefits are difficult to measure because they are complex and non-market in nature. However, it has been recognized that it is important to include ecosystem service benefits in economic valuations when attempting to calculate the value of the environment. In the Puget Sound, little work has been done in estimating the benefits of ecosystem services, but one study did estimate the annual value of a single watershed to be in the billions of dollars.

Economic Valuation of Salmon in the Pacific Northwest

A large body of literature assesses the value of healthy fish populations and includes such topics as: the value of fish habitat and angler values (Holmes and others, 2004; Loomis and others, 2000; Streiner and Loomis, 1995), the impacts of fish habitat restoration programs on farmers (Adams and Gallo, 2001), the impacts of logging and road construction on fish populations (Loomis, 1989), and the value of instream flows associated with recreational fishing (Daubert and Young, 1981). Many studies specifically address the value of salmon in the Pacific Northwest. One review of studies found that the value of each additional salmon ranged from $7.82 to $230 in the Pacific Northwest (Cascade Economics and others, 2007). A survey of residents of Skagit County found that more than 65 percent were willing to pay a dollar or two a month to protect fish and wildlife (Elway Research, Inc. 2005). Olsen and others (1991) found that households throughout the region were willing to pay between $26 and $74 per year to double the size of salmon and steelhead runs in the Columbia River. A survey of Oregon residents found that they were willing to pay an average of seven dollars a month to restore salmon and more than a third would pay over $10 a month (Smith and others, 1997). Loomis (1996) found people were willing to pay $60 to $70 to create salmon habitat by removing the Elwha Dam on the Olympic peninsula ($59 per household in Clallam County, $73 per household for the rest of Washington, and $68 per household across the United States). Another study focusing on estuarine function in Tillamook Bay, Oregon, estimated that residents value each additional acre of salmon habitat at around $5,000 (Gregory and Wellman, 2001). A study of Oregon residents found that they were willing to pay $144 annually to increase protection of salmon habitat (Garber-Yonts and others, 2004).

Dam removal is becoming one of more commonly suggested ways to restore salmon populations, but it is very controversial. For instance, the proposed removal of four dams on the lower Snake River led Washington Senator Slade Gordon to declare that the removal "would be an unmitigated disaster and an economic nightmare" (Whitelaw, 2000). However, dam removal results in both economic costs and benefits that can be measured. A group of 78 economists

created six principles (table 3) to analyze when considering dam removal (Whitelaw and MacMullan, 2002). The six principles encompass the full consideration of the costs and benefits associated with restoration practices, as well as the social and economic consequences of restoration decisions. There have been some studies addressing the economic benefits of small dam removal. A report by Trout Unlimited estimated the costs of removing small dams and determined that in many cases the costs of removal were much lower than repair (Trout Unlimited, 2001). Loomis and Feldman (1995) also suggest that the Federal Energy Regulatory Commission (FERC) consider non-market valuation techniques to ensure environmental values are given equal consideration when dam relicensing which impacts salmon habitats occurs.

The overall benefits of dam removal have been quantified in several studies. For instance, Loomis (1996) calculated that the aggregate benefits of removing the Elwha Dam were $138 million over 10 years. The removal of four dams on the Lower Snake River was estimated to result in benefits ranging from $206 million to over $2 billion, depending on the number of visitor days (Loomis 1999). Niemi and Martin (2001) identify some of the tradeoffs associated with producing affordable hydroelectricity and maintaining healthy salmon runs. They suggest electric and water conservation via technical and financial support (incentives), leasing water rights from farmers who are not making a profit, and technologies that manage business and household energy during peak periods as ways to ameliorate the negative impacts on salmon habitats.

Table 3. Six guiding principles for analysis of the economic consequences of salmon recovery in the Puget Sound[1].

Primary Analytical Principles		
1	Benefits as well as costs	Undergoing restoration or not undergoing restoration would generate economic benefits as well as economic costs. Consider them both to understand the full effect on the value of goods and services derived from streams, forests, and other resources.
2	Positive as well as negative impacts on jobs	Dealing with a restoration project would have both positive and negative effects on job opportunities. Consider them both to understand the full effect on workers, their families, and their communities.
Secondary Analytical Principles		
3	Distribution of consequences and fairness	Those who enjoy the benefits or jobs created by the restoration project would not necessarily be the same as those who would bear the costs or job losses. Consider the full range of economic consequences to understand who wins, who loses, and the fairness of distribution.
4	Rights and responsibilities	With any restoration project decision, property owners and resource users behave differently than they otherwise would. Consider whether these changes represent infringement of their rights or enforcement of their responsibilities.
5	Uncertainty and sustainability	Any decision on a restoration project would rely unavoidably on information insufficient to guarantee any outcome. Fully consider the potentially high costs from decisions yielding undesirable outcomes that are irreversible or extremely difficult to alter once in place.
6	More than just salmon conservation	Undergoing or withholding from a restoration project would have a variety of ecological and economic effects, such as changes in the quality of stream water or recreation which may seem peripheral, but consider all of the effects.

[1]From Whitelaw and Macmullan, 2002.

Restoring salmon populations can be beneficial to society overall, but can be deleterious to certain groups. For instance, in Butte County, California, the restoration of anadromous fish in Butte Creek was estimated to increase the county's output by almost $1.7 million and create over 44 new jobs (Adams and Gallo, 2001). However, it would cost the county almost $1.4 million, with over a million dollars of the cost borne by agricultural interests. Additionally, more than 16 jobs would be lost, two-thirds of them from the agricultural sector. This study points out that the burden of costs and receipt of benefits of restoring salmon may not be distributed evenly.

Summary of Economic Valuation of Salmon

In the Pacific Northwest, salmon and their habitat are valued highly and many residents are willing to pay substantial sums to protect salmon. Dam removal, though controversial, often results in large benefits estimates. However, the costs and benefits of salmon restoration may not be felt equally by all affected parties, which must be considered in any estimation.

Major Findings from Review of Socioeconomic Factors

This review uncovered many important socioeconomic factors in the Puget Sound that could impact restoration activities. Institutions, stakeholder involvement, communication, economic issues, and individual beliefs, behavior, and knowledge may all have an effect on restoration. Some key points of this review are highlighted below.

- **The institutional situation regarding restoration in the Puget Sound is complex and scantily documented.** There are myriad institutions responsible for coastal and watershed management but it is unclear, in most cases, how those institutions interact with each other and how they affect restoration efforts.
- **Institutions can be barriers and facilitators to restoration.** There are many institutions that affect restoration in the Puget Sound and they may be conflicting, redundant, or congruent. Individuals may not trust organizations, particularly government agencies, or feel that these organizations make restoration activities more difficult than they need to be. Alternately, institutions can provide venues and incentives for restoration processes.
- **The Sound itself is a valued place and there is concern about the environmental condition of the Sound among residents, however there is no real sense of urgency.** Concern about the health of the Sound also does not guarantee support for specific restoration activities. Each restoration project encounters resistance among some stakeholders and it is important to understand as much as possible about the beliefs of those stakeholders regarding that specific project, as well as their more general beliefs about restoration and the environment.
- **Knowledge about the environment and restoration is limited in the Puget Sound.** The relationship between knowledge and beliefs is variable, but people who have more knowledge of environmental issues tend to behave in pro-environmental ways.
- **Knowledge can be a source of conflict during restoration.** Conflicts between local and scientific knowledge can impede restoration projects. Projects that include both types of knowledge often meet with less resistance.
- **Meaningful stakeholder involvement leads to successful restoration projects.** Meaningful involvement entails including stakeholders in every phase of the process, giving all stakeholders' knowledge and beliefs equal legitimacy when creating restoration plans, and

ensuring that decisionmaking is transparent. Though intensive involvement inevitably slows down the process, it is critical to breaking down the barriers that prevent restoration. Grimble and Wellard (1997) note that the biggest difference between stakeholders is typically between those that make the decisions and those that are affected by those decisions. Comprehensive stakeholder involvement ensures that those who are affected by the decisions have some say in the process.

- **Many people need a compelling reason to support and be involved in restoration.** Incentives of all sorts, not just economic, can encourage participation. People who are relatively economically secure may respond to financial incentives (see Howell and others, 2007), but those who are not may need to see how ecological restoration can lead to community restoration (for example, in economically depressed areas) or to be reassured that restoration will not threaten their livelihoods and may, in fact, help them (for example, in agricultural communities).
- **Community-based restoration can engage local residents and create self-sustaining restoration programs.** This approach seems to work particularly well in economically depressed urban areas where restoration programs can be incorporated into broader revitalization attempts.
- **Focusing on the responsibility of current residents to future generations may improve the effectiveness of communication of the environmental problems and possible solutions in the Puget Sound.** Messages that stress the severity of the problem without resorting to scare tactics and provide avenues for people to affect the Sound in a positive manner are also effective. People gather information from many different forms of media, which can all be used to communicate the same message in various forms.
- **Though ecosystem services are very valuable in the Puget Sound, few studies attempt to measure them.** The benefits of ecosystem services are difficult to measure because of their complexity and non-market nature, but they have been recognized as important in determining the economic impacts of restoration.
- **Support and willingness to pay for protecting and restoring salmon is high in the Pacific Northwest.** However, there are some people who are not supportive and willing to pay. Part of this may stem from the fact that people are differentially affected by restoration efforts. Dam removal, for instance, may result in large overall benefits, but can deleteriously affect some segments of the population, such as farmers.
- **There are substantial gaps in the literature regarding restoration in the Puget Sound across all of the topics addressed in this review.** Several topics have been addressed in only one study and others in none at all. The lack of research makes it difficult to provide a holistic view of the social and economic dimensions of restoration in the Sound but provides opportunities for future research.

Incorporating Socioeconomic Factors into Restoration Decisionmaking

Socioeconomic information, like that reviewed above, can be very helpful to decisionmakers in the restoration arena. As one report put it, "it is time to recognize that some projects cannot be done because of social considerations and stakeholder interests and some can be done more easily for the same reasons and that **these considerations need to be taken into account very early on**" (Gramling and others, 2007, p. 57, original emphasis). Typically,

restoration projects are prioritized primarily on their ecological potential, with less consideration given to the way socioeconomic factors may impede or facilitate restoration efforts. To fully integrate socioeconomic factors into restoration prioritization, it is important to identify appropriate socioeconomic indicators. Ecological indicators have been criticized by scientists in restoration programs for their narrowness and tendency to obscure the broad picture (Van Cleve and others, 2004). This criticism is also valid for socioeconomic indicators, which, by their nature, simplify the socioeconomic context. However, the judicious use of carefully chosen indicators can ease the prioritization process in restoration. Indicators can aid decisionmakers unfamiliar with socioeconomic theories and analyses in incorporating these factors into their restoration prioritization process. Indicators also allow ecological and socioeconomic factors to be more easily compared within the same model, as is demonstrated later in this section.

Prioritizing Restoration Projects Using Socioeconomic Factors

In large geographic regions like the Puget Sound, deciding where to begin restoration can be difficult because there are multiple degraded areas and varied socioeconomic and ecological barriers to restoration success. Increasingly, the importance of social and economic factors in prioritization is being recognized by those involved in restoration in the Sound. For instance, the recent action agenda from the Puget Sound Partnership (2008) lists human well-being as one of six major ecosystem recovery goals. This goal includes preserving aesthetic values, providing for tribal needs, supporting economic activities, and tracking socioeconomic variables. To help meet this goal, they are developing an indicator which will measure human prosperity, though the report notes that it has been challenging to develop indicators of human well-being. The action agenda also lists communication, outreach, and education as priorities. A recent future scenario building project by the Puget Sound Nearshore Partnership and the Urban Ecology Research Laboratory at the University of Washington chose human behaviors and perceptions as one of the most important driving factors which will shape the environmental future of the Sound region (Urban Ecology Research Laboratory, 2009). Additionally, the 2007 criteria for funding prioritization of projects in the Estuary and Salmon Restoration Program in the Puget Sound contained some socioeconomic focus areas, including probability of success, readiness, and public support (Puget Sound Nearshore Partnership, 2007a). The exact indicators for probability of success are not listed, but it does say that a wide variety of factors that may affect the project should be considered. Readiness primarily refers to the capacity of the funding applicants to complete the project, which touches on institutional and stakeholder issues. Public support focuses on public education opportunities, communication with the public, and the extent of stakeholder involvement in the project. Another report from the Puget Sound Nearshore Partnership stresses the importance of including "social, cultural, and economic values at multiple scales of times and space" in restoration planning (Goetz and others, 2004, p. 7), indicating the importance of these factors, even if they are not explicitly used as prioritization criteria.

Other large-scale restoration projects also place importance on social and economic factors, though few have specific indicators for prioritization efforts. Many of them emphasize public involvement and outreach as goals of the program, rather than as means for prioritization (for example, Chesapeake Bay Program, 2000, Lower Columbia River Estuary Partnership, 1999). Some programs, like the CALFED Bay-Delta Program and the Comprehensive Everglades Restoration Plan, have developed environmental justice guidelines to facilitate the involvement of marginalized groups in restoration projects (CALFED Bay-Delta Program, 2007, South Florida Water Management District and U.S. Army Corps of Engineers, 2002). Most programs do not have a readily available list of indicators for prioritizing projects, though a few do provide them.

For instance, of eight prioritization measures used by the Louisiana Coastal Wetlands Conservation and Restoration program, only one–implementability–addresses any social or economic concerns (Louisiana Coastal Wetlands Conservation and Restoration Task Force, 2003). However, a recent report commissioned by the Task Force strongly stresses the importance of social and economic factors in prioritizing projects (Gramling and others, 2007). "Well-being" indicators for the Great Lakes restoration program have been proposed, including the value of the Great Lakes to residents, sense of place among Indian tribes, recreational access to the Great Lakes, and population and income distribution (Great Lakes Regional Collaboration, 2005). It is unclear whether those indicators were put into use, however.

While the actual development of socioeconomic indicators for restoration will require further research, critical socioeconomic focus areas are identified in table 4. These focus areas were developed based on the review of literature, as well as the guidelines of other large-scale

Table 4. Potential focus areas to prioritize coastal and watershed restoration projects in the Puget Sound region.

Level of Measurement	General Focus Areas
Individual	Behaviors related to restoration and the environment • Current involvement in restoration activities (for example, volunteer work) • Behaviors that help or harm the environment • Use of area to be restored (recreational, commercial, cultural, and so forth) Beliefs about restoration and the environment • Values • General attitudes toward environment and restoration • Specific attitudes toward proposed restoration project Demographics (age, education, residence, occupation, income, and so forth) Economic reliance on environment/natural resources Knowledge of environmental processes, threats, and restoration • Level of local or traditional knowledge • Conflicts between local and scientific knowledge
Communities/ Stakeholder Groups	Capacity of communities and stakeholder groups (cultural, technical, financial, and so forth) to influence, facilitate, constrain, and carry out restoration activities Cultures of communities and stakeholder groups Conflicts and power relations within and between communities and stakeholder groups (both historical and current) Economic impact of natural resource industries and recreation on communities and stakeholder groups Economic impact of proposed restoration project on communities and stakeholder groups
Institutional	Identification of existing restoration institutions Legal and traditional rights of groups and individuals Relationships among existing restoration institutions (for example, power relations, gaps and overlaps in policies and programs) Institutional culture and how it facilitates and/or obstructs restoration efforts Institutional capacity (cultural, technical, financial, and so forth) to carry out restoration activities Interactions between individuals and institutions

restoration programs in the United States. They can provide the basis for developing specific indicators to be used in prioritizing restoration projects in the Puget Sound. The focus areas are organized according to the level of measurement at which information is gathered. The socioeconomic factors are divided into individual, community/stakeholder group, and institutional levels. Each level of measurement has different methods that may be applied and thus different expenditures of time and money are required to gather this information. For instance, at the individual level, surveys often work well, while at the community/stakeholder or institutional levels, more in-depth methods, such as interviews and focus groups may be required.

Conceptual Frameworks for Restoration Prioritization

The development of indicators allows for their use, alongside ecological indicators, in models and tools that prioritize restoration projects. Hulse and Gregory (2005) provide a simple but useful conceptual model (fig. 1) that combines ecological and socioeconomic factors in prioritizing restoration projects. Their approach links the potential for ecological benefits from restoration with the socioeconomic likelihood of restoration success. Essentially, the highest priority sites would be those with high ecological potential and low socioeconomic constraints. The lowest priority sites would be those with low ecological potential and high socioeconomic constraints. As Hulse and Gregory point out, those sites with both high potential and high constraints must be evaluated on a case by case basis to determine if they are worth pursuing. As the conceptual model implies, there is always a careful balance to be considered between the ecological and socioeconomic factors of a given restoration project. The model can assist decisionmakers in identifying projects with the highest probability of success, while clarifying socioeconomic and ecological issues that may prove problematic.

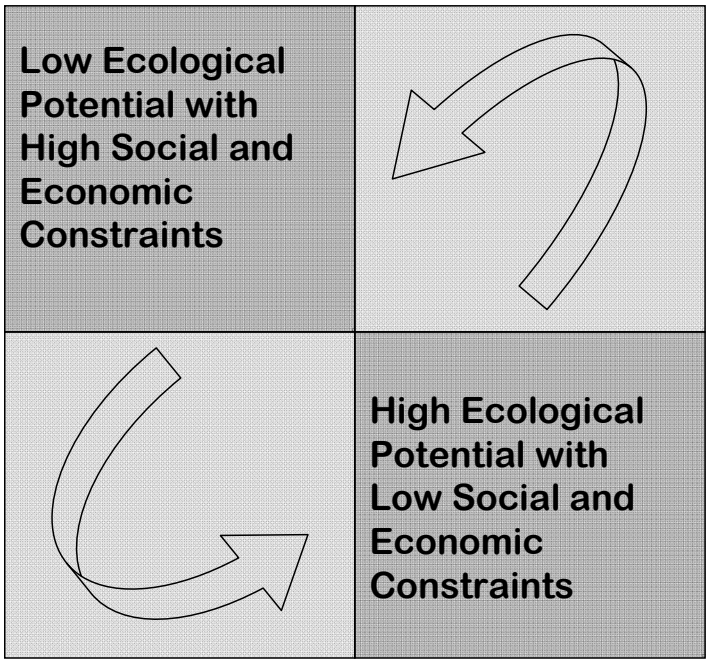

Figure 1. Conceptual model for prioritizing restoration projects (from Hulse and Gregory, 2005).

A wide range of indicators can be utilized within the framework of this model. For instance, in their analysis of the restoration potential of land in the Willamette River valley, Hulse and Gregory used indicators of channel complexity, floodplain forest, human systems, and economic patterns, but many different indicators could be included. Any indicators developed from the focus areas from table 4 could also be utilized. For example, the beliefs of local residents about the ecological and economic impacts of a project, assessments of the influence of stakeholder and community groups, and examinations of local institutional constraints could be used to identify areas where there is local support and capacity for a restoration project. Choosing which indicators to use in this model (or any model) often depends on the resources available to the restoration program. Some programs may be able to conduct extensive socioeconomic analyses of their projects, while others may be limited by time, money, or expertise.

The feasibility study covering planned restoration activities in the Deschutes Estuary provides another framework for assessing the social and economic impacts of a restoration project. The main steps include: (1) establishing the geographic extent and(or) scale of the restoration project, (2) identifying the status-quo social and economic conditions of the project, (3) determining the expected physical changes from the proposed restoration activities, and (4) assessing the social, economic, and institutional effects of the physical changes, either quantitatively or qualitatively (Cascade Economics LLC, Northern Economics, Inc., and Spatial Informatics Group LLC, 2007).

Research Needs

This review provides a basis for future research by generating some new questions about the impacts of socioeconomic factors on coastal and watershed restoration. More information on these issues can help managers and decisionmakers better understand how socioeconomic factors may hinder or facilitate restoration projects. Through this review, two main areas of future research needs were identified. First, there are many information gaps on the socioeconomic impacts on coastal and watershed restoration, not only for the Puget Sound region, but in the United States in general. There are three main areas where information is lacking:

- **Modeling the relationships of people's beliefs about the environment, restoration, and institutions.** Most of the existing research focuses on the demographics (for example, age, income, education) of stakeholders and the public, which have been shown repeatedly to be relatively weak predictors of environmental attitudes and behaviors (Dietz, Stern, and Guagnano, 1998; Jones and Dunlap, 1992; Mertig and Dunlap, 2001). Research has shown that values are better predictors of attitudes than demographics (for example, Teel and others, 2005), which indicates that understanding values, attitudes, and behaviors is more useful than tallying demographics. Very few existing studies on restoration consider or attempt to model these relationships.
- **Understanding actual behaviors of people regarding restoration.** People do not always do what they say they do or will do and more study is needed of the environmental behavior of Puget Sound residents. Furthermore, linking behaviors to values and beliefs is critical in determining where to focus communication and education efforts.
- **Evaluating institutions in the restoration arena.** Though institutions have a preeminent role in restoration efforts, few studies explore institutional culture in the Puget Sound or the way institutions interact with each other and with individuals. An analysis of the institutions involved in restoration in the Sound would be useful in understanding how these institutions guide and create restoration policies. Institutional analyses of other large-scale restoration

projects, like the Great Lakes (for example, Hartig and Law, 1994; Sproule-Jones, 1999), could be helpful in guiding an analysis of restoration institutions in the Sound.

Second, there is also a need for research that can assist managers and decisionmakers in incorporating socioeconomic considerations into restoration programs. Ecological factors are routinely included in restoration assessments; research on tools and methods to help managers and decisionmakers include socioeconomic factors just as easily is essential. Two main research developments would be helpful:

- Socioeconomic focus areas were identified in this review (table 4) that can act as the basis for developing specific indicators. These indicators can then be ranked as to their importance and integrated with ecological indicators to prioritize restoration projects.
- Every restoration program will differ in available resources. Many managers and decisionmakers are not familiar with socioeconomic analyses; this hinders the application of such analyses to management problems. Developing a tool that bridges the gap between socioeconomic analyses and practical application of those analyses would be valuable. Additionally, a tool that aids managers and decisionmakers in choosing the level and extent of socioeconomic analysis will allow the most efficient use of time and money while providing the greatest amount of relevant information.

Conclusion

The Puget Sound is considered a region of beauty and value by its inhabitants. However, many of them are not aware of the ecological problems in the Sound. There is widespread support for restoration efforts among the public, but each restoration project faces a different socioeconomic situation. The individuals and institutions involved in each project are unique, as are the relationships between those entities. The review of literature in this report demonstrated the importance of considering social and economic factors in restoration programs. Socioeconomic factors may constrain or facilitate restoration projects. The context of each project is distinct and requires individual analysis, though much can be learned from the experience of others. The information provided here can assist in decisionmaking by identifying the possible socioeconomic conflicts and consequences of restoration.

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Annotated Bibliography

Baker, J.P., Hulse, D.W., Gregory, S.V., White, D., Van Sickle, J., Berger, P.A., Dole, D., and Schumaker, N.H., 2004, Alternative futures for the Willamette River Basin, Oregon: Ecological Applications, v. 14, p. 313–324.

The Pacific Northwest Ecosystem Research Consortium (PNW-ERC) was established to do research regarding community-based decisionmaking in Oregon and Washington. In the Willamette River Basin in Oregon, they conducted an alternatives futures analysis using local stakeholder input. The analysis has three steps (1) establish the current and historical landscapes as well as the trajectory of landscape changes, (2) create two or more future scenarios based on stakeholder input, and (3) assess the impacts of the scenarios on valued social and economic indicators. In the Willamette Basin, three future scenarios were developed. The first, Plan Trend 2050, assumed that all land and water use policies remained the same and that current trends continued. The second, Development 2050, assumed that future policies were less restrictive than current policies and that free market forces were more powerful. The third, Conservation 2050, assumed greater concern with ecosystem restoration and protection. Four general endpoints were examined to explore the effects of each scenario: water availability, ecological condition of the Willamette River, ecological condition of streams, and terrestrial wildlife. Plan Trend 2050 would result in a doubling of population density with urban growth boundaries (UGB), a minimal amount of lost farmland, minor changes in land use and cover with the exception of a 19 percent decrease in forest cover, small overall effects on aquatic and terrestrial wildlife with larger effects in some specific areas and for some species, and large changes in water use and availability. Consumption would rise by 57 percent and stream flows would severely decline in the basin. However, there was some dispute over whether Plan Trend 2050 really reflected what was going on in the basin since many policies were not being followed exactly. Development 2050 would result in a 55 percent increase in population density in the UGBs, a loss of a quarter of the farmland, a 22 percent reduction in forest cover, negative impacts on terrestrial and aquatic wildlife, and large changes in water use and availability. Consumption would rise by 58 percent and stream flows would be severely affected, though not to the extent as under Plan Trend 2050. Conservation 2050 would result in a similar UGB population density as under Plan Trend 2050 though with less rural land impacted by development, a 15 percent decrease in farmland with most of the loss due to a return to natural vegetation, a 17 percent increase in forest cover, positive impacts on terrestrial and aquatic wildlife, and a 43 percent increase in water consumption but a positive impact on stream flows. The results of the alternatives future analysis were conveyed to the public and decisionmakers through presentations and publications, and were used as the basis for further analyses by other groups. The authors note that future scenarios designed by stakeholders tend to be conservative, while those created by experts may be more extreme. They recommend that both types of scenarios be taken into account when conducting this analysis. They also point out that the project team chose the endpoints and indicators without much input from stakeholders and suggest it is important to give the stakeholders more say as to what endpoints are actually valued. For instance, social and economic endpoints were not priorities in this analysis but they may be for stakeholders. The authors conclude that futures analyses are valuable because they are conducted at the landscape level and that they should be implemented routinely by decisionmakers.

Batker, D., Barclay, E., Bowmans, R., and Hathaway, T., 2004, Ecosystem services enhanced by salmon habitat conservation in the Green/Duwamish and Central Puget Sound watershed (Draft): Seattle, Wash., Asia Pacific Environmental Exchange.

The report identifies the sources of socioeconomic value in the Green/Duwamish and Central Puget Sound watershed. It addresses natural, human, human-built, and social capital and calculates the monetary worth of each type of capital in the watershed. Natural capital includes natural resources (for example, timber) and ecosystem services (for example, water purification) which are provided for free by the environment. Both the type of land cover and the health of the ecosystems within the watershed were considered in calculating the value of natural capital. The authors point out that the value of ecosystem services is always underestimated because things such as aesthetic value cannot be measured in dollars. They estimate that the ecosystem services of the watershed are worth from $24 million to $3.38 billion annually. Wetland and coastal ecosystem services are not included in this estimate. Human capital includes the people who live in the watershed and their skills and training. Population, education, and employment can be used as indicators of human capital. Income is used as an indicator in this report but no dollar estimate is provided. Human-built capital comprises products, tools, and technology produced by humans. Houses, buildings, and infrastructure can be used as indicators of human-built capital. Tax revenue is used as an indicator for this analysis and totals over $187 million a year. Social capital refers to the benefits which social networks can provide, such as safety, friendship, and identification with a community. Indicators of social capital could include crime rate and memberships in various civic organizations but the value of social capital is not calculated in this report.

Bonner, K., and Hibbard, M., 2002, Issues in monitoring the socio-economic effects of the Oregon Watershed Enhancement Board grant program: Salem, Oreg., Oregon Watershed Enhancement Board, 4 p. Accessed on July 14, 2008, at *http://www.pacificwatersheds.net/economics/OWEBissues.pdf*.

The Oregon Watershed Enhancement Board (OWEB) commissioned a study to determine how watershed enhancement activities funded by the board contribute to local economies. In this paper, the authors report the results of 20 telephone interviews of people from watershed councils, soil and water conservation districts, and state agencies regarding their views about monitoring the socioeconomic effects of restoration projects. Most respondents believed that monitoring could be a valuable tool in improving relationships between local restoration groups and the legislature and in encouraging people to spend their restoration money on local purchases and hires. Many of the respondents were willing to participate in monitoring activities but wanted a system which was simple and easy to track, that defined local and non-local clearly, and that allowed plenty of time for integration into existing systems. One respondent did not want to be required to monitor socioeconomic impacts of his organization's projects, despite the fact that his organization already kept track of those impacts. Many other respondents stated that they were willing to monitor to get funding, but did not want another thing to report to the OWEB. One respondent offered alternatives to monitoring every expenditure: having people define local when reporting their expenditures, only reporting in total what was spent locally and non-locally, and explaining non-local purchases. Another respondent thought that having close-ended questions in the final report would make it easier for people to report local and non-local spending. In summary, most respondents did, in fact, purchase and hire locally when they could and were willing to monitor their local and non-local spending for OWEB grants.

Bookman, C.A., 2000, Town meeting on America's coastal future—Using the internet to promote coastal stewardship: Ocean and Coastal Management, v. 43, p. 937–951.

During 1998, the International Year of the Ocean, the National Ocean Service (NOS) of NOAA began facilitating discussions among stakeholders in coastal issues. The National Dialogues, as they were called, produced a set of vision statements which were then disseminated to the public and discussed by the public via an internet town meeting. The town meeting was a web site with surveys and discussions about coastal issues. To engage people in the town meeting, initial communications included exhibits at professional and regional meetings, articles in publications and links on other web sites, and mailings to specific coastal stakeholders. After six weeks, the responses of the town meeting participants were considered. Many felt the meeting was a good way to reach a broad audience and that the information was useful for educators and grassroots participants. However, it took time to participate in the discussions and experts felt the information was too general for them. There was also no incentive for participating, the web site sometimes loaded slowly, and some participants felt there was a bias in the National Dialogues' vision statements toward planning based on sound science and toward community and environmental values. As a result of these comments, efforts were aimed more toward educators and students. A CD was created with all of the web site content on it, making the information easier to download, though it was no longer interactive. Visitation to the web site increased dramatically after focusing on educators, with more than 7,000 visitors over a six month period. Most of the visitors were students, teachers, or people affiliated with government agencies, but others participated in environmental groups or lived near the coast. Around 8 percent of visitors either filled out the survey or wrote a comment and over 1,500 people downloaded information. The survey allowed participants to respond to one or more coastal issues, but they did not have to respond to all the issues. The most popular issues were population and development, coastal hazards (possibly due to hurricanes on the East Coast), and environmental quality. The least popular issues were responding to change, food supply, and water-dependent commerce. The written comments showed that people were concerned about preserving cultural heritage, willing to restrict recreation to protect the environment, supportive of more active management of growth and development, and interested in removing incentives for unsuitable development. Several lessons were learned from the internet town meeting. Many people used the web site to download documents indicating that this is a good vehicle for disseminating information. The use of lots of graphics slowed down the web site for many participants and made it more difficult for them to include it in curriculum, for instance. Future web sites should at least offer a simpler version of the screens and downloads for those with slow internet connections. Web sites should also be targeted toward specific audiences. Professionals were not interested in this web site, but educators were. Participants should always have the opportunity to write down comments, even though this data is harder to analyze and interpret than quantitative data. Given the effort put into the web site, the authors feel that that the results were worth it.

Breslow, S.J., 2001, Farmers' perceptions of salmon habitat restoration measures—Loss and contestation: San Jose, Calif., Environmental Anthropology Project, Society for Applied Anthropology, 52 p. Accessed on May 14, 2008, at *http://www.sfaa.net/eap/breslow/breslow.pdf*.

Breslow investigated Skagit County, Wash., farmers' perceptions of the voluntary Conservation Reserve Enhancement Program (CREP) using in depth interviews. She found that the main point of contention was the width of buffers along streams and rivers. Even though CREP compensated farmers very well for lost productivity due to buffers, farmers still did not want to participate in the

program. Opposition to the buffers stemmed from farmers' perceptions of loss and contestation. They believed that they would lose land, their farms, control, and food. Most were concerned about losing their livelihoods and identities as farmers, not about losing money. Farmers also strongly contested the buffers. Most believed agriculture was not to blame for the decline in the salmon population, citing over-fishing, logging, and development as the main culprits. Many argued that the buffers would not have the predicted effects on the salmon and would, in fact, have negative effects on the salmon and on themselves. Farmers also contested the science used to justify the buffers. They believed that the science was not done well, that it did not apply to agricultural land, and that studies showing buffers were not useful were ignored. Many interviewees suggested other ways to conserve salmon populations, such as paying anglers to not fish, removing obstacles from fish passages, and monitoring farms for run-off. Many farmers believed that buffers were not about salmon conservation and were in fact a government plan to gain control of land and water, a way for environmentalists to get jobs and funding, or a plan to restore the entire Skagit Valley to its pre-Columbian state. Breslow also interviewed three landowners who were participating in CREP. They were positive about their restoration projects and the crews which had worked on them, but were disappointed in the complicated nature of CREP as well as some of the criteria of the program. Further, the one participating farmer who was interviewed thought salmon conservation was not worthwhile, while the other two landowners believed it was a good thing.

Burger, J., 2003, Assessing perceptions about ecosystem health and restoration options in three East Coast estuaries: Environmental Monitoring and Assessment, v. 83, p. 145–162.

The author examined attitudes and perceptions of New Jersey residents residing in coastal areas concerning environmental problems, land and resource uses, and the importance of habitat restoration. Interviews of residents took place in the Newark Bay Complex, a highly urbanized and industrialized area, and in Manasquan Inlet/Shark River and Barneget, both less populated and industrialized. A convenience sample of people on the shore resulted in 240 completed interviews. Over 90 percent of respondents said pollution was one of the most important environmental problems in New Jersey. Two-thirds of respondents said coastal or estuarine habitats were important to them for outdoor sports. A fifth said that recreation and nature were also important and others listed relaxation, family, and exercise. When rating estuarine uses, communing with nature, walking, provision of open space, and fishing were rated highest. Collecting plants and herbs, swimming, jogging, and birdwatching were rated lowest. A quarter of respondents said that pollution prevention should be undertaken to improve habitat, while a fifth mentioned other remediation activities (stopping dumping and controlling development) and biological improvements. When rating the importance of various remediation and restoration options, removing pollution and cleaning up garbage were rated highest. More security and police officers and building boardwalks were rated lowest. In general, habitat improvements were rated about the same as recreational improvements. When comparing the three estuaries, respondents from Barnegat Bay rated all the uses higher than respondents from the other two areas. Respondents from Newark rated the importance of all the improvements lower than respondents from the other two areas, while those from Manasquan Inlet rated almost all of the improvements higher than the other respondents.

CLAMP and WDFW, 2006, Deschutes Estuary Feasibility Study net benefits analysis—Stakeholder involvement report: Olympia, Wash., Capitol Lake Adaptive Management Plan

Steering Committee, 14 p., Accessed on April 3, 2008, at *http://www.ga.wa.gov/CLAMP/NBA_Stakeholder_Involvement_ Report.pdf*.

The report outlines the stakeholder involvement process for the Deschutes Estuary Feasibility Study, which investigated the possibility of restoring Capitol Lake in Olympia, Wash., to an estuary. A net benefits analysis (NBA) which addressed how the social, economic, and environmental values of the Deschutes Basin might change due to restoration was part of the study which required stakeholder input. The process was intended to get stakeholders to do three things: (1) "identify attributes related to the Deschutes Basin that should be analyzed in the NBA," (2) "recommend whether the identified attributes should be analyzed quantitatively or qualitatively," and (3) "suggest ways for the community to be involved in making a final decision about the long-term management of Capitol Lake." A focus group of stakeholders was assembled, including members of environmental groups, local businesses, an educational organization, neighborhood and historical groups, and a local tribe, as well as individual citizens. The focus group met twice and completed the three objectives above. They identified over 50 attributes which were divided into eight categories: sustainable future (focused on a balance of social, environmental, and economic values), healthy economy, everybody's basin (unique cultural amenity that everyone can use), web of life (habitat close to urban area), come play outside (outdoor activities/recreation for families and others), it's the water (aesthetics of water), from here to there (physical links in the Basin), and spiritual connections. They recommended a mix of quantitative and qualitative analysis for the attributes in each category and provided details on how those analyses should be carried out for 46 attributes. A public meeting was then held where some focus group members presented their results and the general public was able to add to the attributes list, as well as offer suggestions as to how the public could be involved in decisionmaking. Several additional attributes were suggested, some of which had not been identified in the focus group meetings. Between the focus group and the public meeting, over 135 suggestions for public involvement in the project were generated. The results of these meetings were "translated" by the project staff into eight categories of attributes: outdoor recreation, tourism, aesthetics and spirituality, ecosystem functions; cultural, civic, and historical pride; education, marine commerce, and infrastructure. Overall, the stakeholder involvement process was a success, with all of the objectives being achieved and many people participating in the process. However, the public meeting format was not as structured, and thus not as successful, as the focus group format and the authors recommended this format be used more extensively in future research.

Casagrande, D.G., 1996, A value based policy approach—The case of an urban salt marsh restoration: Coastal Management, v. 24, p. 327–337.

The salt marsh in West River Memorial Park in New Haven, Conn., was being considered for restoration by the state. The marsh was composed of tall, dense common reed, but if tidal flushing were reintroduced, a more ecologically appropriate mix of other shorter grasses would grow instead. City officials were concerned about the lack of use of the park and were focused on increasing recreational opportunities and facilities. They were not interested in restoration of the marsh at this time. The author conducted a door-to-door survey of 67 households within a tenth of a mile from the river in New Haven to determine the values and perceptions residents hold about the river, as well as how they use it. Respondents felt that cleaning up garbage and pollution in the river was the most important activity, followed by reducing crime near the river and improving habitat. Over half the respondents used the river for escaping and relaxing, walking and jogging, enjoying views, or watching wildlife. A fifth of respondents used it for fishing, and less than 15 percent used it for picnicking, boating, or swimming. Three-quarters of respondents agreed that the

river is polluted. Trash and garbage were mentioned by the most people as the type of pollution they associated with the river. Nonpoint sources of pollution, sewage discharges, and heavy metal contamination are more damaging than trash but the visual nature of garbage probably makes it more apparent to respondents. Three-quarters of respondents thought the river has been altered by humans, not only by pollution but by development near the river as well. Slightly less than half agreed that the river is dangerous because of crime. People who were concerned about crime in general were not necessarily concerned about crime near the river, which indicates that use of the river may not be dictated by perceptions of crime. The author concludes that aesthetics and improving habitat are more important to residents than increasing recreational opportunities. Restoring the salt marsh seems to be compatible with the values of local residents and will probably need to be pursued by community groups if it is to be accomplished.

Casagrande, D.G., 1997, The human component of urban wetland restoration *in* Casagrande, D.G., ed., Restoration of an urban salt marsh—An interdisciplinary approach: New Haven, Conn., Yale School of Forestry and Environmental Studies, p. 254-269, 270 p.

Casagrande views the ecological restoration of the salt marsh in the West River Memorial Park in New Haven, Conn., as a fairly simple matter which could be accomplished by opening one or two tide gates and allowing the natural process of succession to establish more appropriate vegetation. He also argues that restoration should also benefit people but residents living near the river are currently disconnected from the marsh, though they are concerned about its health. Urban residents in general have been found to be concerned about environmental issues and want to participate in nature-related activities. However, there are many barriers to participation: lack of money, lack of outdoor recreation opportunities, cultural norms, and so forth. Casagrande outlines six complementary approaches which have been used to connect urban residents with their environment. First, local participation which develops a sense of ownership is very effective. Urban residents often feel they have no control over what happens in their neighborhood so introducing a restoration project which is developed and directed by residents can create pride and a sense of responsibility to the environment. Second, community-based approaches have been successful in some cities. Similar to local participation, empowering community groups by providing funding while letting the groups decide how the money will be spent creates pride and ownership in projects. Many neighborhoods have a deteriorated social structure which can be rebuilt through community projects, including restoration. The West River Neighborhood Association has been successful in securing over one million dollars in grant money to improve their community, including establishing an environmental education school that will use the marsh restoration as part of its curriculum. Third, facilitators can ease the process of restoration by communicating among all stakeholders if they are respected by all the parties involved. For instance, the Center for Coastal and Watershed Systems is acting as a facilitator between the State, city, and neighborhood association for the New Haven salt marsh restoration. Fourth, environmental education both in communities and in schools can result in more interest in restoration projects. Fifth, successful demonstration projects can lead to more interest in further restoration. Sixth, evaluation of the benefits of restoration projects for urban residents must be conducted to demonstrate what can be gained from the projects. There are several ways that the human component of ecological restoration can be explored and measured: behavior, knowledge, values and perceptions, personal efficacy, time and money, and community structure. All of these indicators both affect restoration and are affected by it. Casagrande provides a hypothetical example of how to integrate people into restoration which includes collaborating with local residents to develop restoration plans, participation of community in restoration and monitoring,

and educational programs for the community about restoration. He concludes that urban restoration can be used to study how the social and biophysical components of restoration interact.

Cocker Fennessy, 2006a, Opinion research and outreach synopsis (prepared for Puget Sound Partnership): Seattle, Wash., Cocker Fennessy, 8 p. Accessed on March 25, 2008, at *http://www.pugetsoundpartnership.org/our_work/charge_2/ResearchSynopsis final.pdf.*

This report gives an overview of the research done by Cocker Fennessy and Moore Information for the Puget Sound Partnership. The research consisted of 825 telephone surveys, 32 interviews of opinion leaders, 10 focus groups, and 296 online surveys, along with outreach consisting of six public forums. The telephone surveys (Moore Information, 2006a), opinion leader interviews (Cocker Fennessy, 2006b), and public forums and online surveys (Cocker Fennessy, 2006c) are summarized elsewhere in this bibliography so only the results of the focus groups will be reported here. The focus groups consisted of a representative mix of people not already involved in Puget Sound issues. To the participants, the Sound was a place, not just a body of water, which they were proud of and valued highly. Most thought the Sound was in good or average condition, was in better shape than other bodies of water, and was in better health today than in the past. Many could not define the boundaries of the Sound, resulting in many different conceptualizations of the region. A healthy and clean Sound was considered to be one where fish and wildlife thrive, the water is clean, and the beaches are open. The major threats to the Sound were population growth, loss of habitat, stormwater runoff, and toxic pollution. Most participants were not familiar with terms such as nutrients, pathogens and ecosystems, but they did use natural areas frequently to describe National Parks or open space. Many believed that everyone was responsible for restoring the Sound and thought that a diverse group of stakeholders should lead the effort. It was expected that restoring the Sound would be a lengthy process and might not ever end. The most important reasons for restoring the Sound were for future generations, for a high quality of life, and for human health.

Cocker Fennessy, 2006b, Opinion leader interviews—Summary report (prepared for Puget Sound Partnership): Seattle, Wash., Cocker Fennessy, 45 p. Accessed on March 25, 2008, at *http://www.pugetsoundpartnership.org/our_work/charge_2/Opinion%20 leader% 20report%20final.pdf.*

As part of a larger project for the Puget Sound Partnership, Cocker Fennessy interviewed 32 opinion leaders in the Puget Sound area. Interviewees were positive about the economy, but worried about population growth, transportation, education, and housing. They valued living near and seeing the Sound but thought that most people take it for granted. Some believed that improving the health of the Sound was a high priority, while others placed it at the bottom of the list. This may be because many interviewees thought that the environmental condition of the Sound was average or good, the health of the Sound was not a crisis situation, and the Sound was in better condition today than in the past. Others thought that the Sound could go either way and get better or worse in the near future. Protecting and preserving the Sound meant different things to different people. There were many suggestions as to what was causing environmental problems in the Sound: stormwater runoff, septic tanks, runoff from roads, unchecked growth, and so forth. Hood Canal was perceived as experiencing serious environmental problems and interviewees recognized efforts to address those problems. The Sound was seen as part of a larger system connected to many other issues in the area. Some interviewees expressed understanding that fixing environmental problems in the Sound would take time, effort, and money and that both individuals

and organizations (such government and businesses) would need to participate. Many leaders believed that people needed to be educated and to change their behaviors. In terms of communicating the situation to the public, the interviewees suggested that communications should be based on science and focus on making the issues personal, stressing stewardship and legacy, connecting the Sound to the economy, avoiding hyperbole or threats, and highlighting the benefits for individuals, communities, and quality of life. They believed that an approach which involves many stakeholders and avoids making the Sound a political or partisan issue would be best received by the public. The public must also be able to see progress and projects should be broken down into manageable parts which can be achieved.

Cocker Fennessy, 2006c, Public forums and online survey—Summary report (prepared for Puget Sound Partnership): Seattle, Wash., Cocker Fennessy, 30 p. Accessed on March 25, 2008, at *http://www.pugetsoundpartnership.org/our_work/charge_2/Forums_report.pdf.*

Cocker Fennessy conducted public forums and an online survey regarding the environmental issue surrounding the Puget Sound on behalf of the Puget Sound Partnership. Over 600 people attended the six public forums, which were held in Everett, Port Townsend, Seattle, Shelton, Bellingham, and Tacoma. Participants identified several characteristics of a healthy Sound: abundant fish and wildlife, clean water, decrease in non-point source pollution, and controlled growth and development. Many thought that measurable goals should be set to improve the Sound. Many believed that a public which was more knowledgeable about the problems of the Sound would behave in ways which helped the Sound. The benefits of the Sound included: economic, lifestyle, emotional, spiritual, cultural, historic, moral, and legacy. Many participants suggested more education and outreach programs to get the public involved in protecting and restoring the Sound. Across the region, people were most concerned about population growth and development (and its resulting non-point source pollution), as well as the lack of enforcement of environmental laws, education, funding, and collaboration with local groups. In each city, development and population growth were the most important concerns, but each area also had specific issues. In Everett, other concerns were invasive species and lack of enforcement; in Port Townsend, it was septics and industrial pollution; in Seattle, toxics; in Shelton, septics, toxics, and overregulation of landowners; in Bellingham, contamination of the bay, toxics, and logging in the watershed; and in Tacoma, the Thea Foss cleanup. Finally, participants did believe progress was being made in some areas, such as a decrease in point source pollution, more awareness about environmental issues among the public, low impact development efforts, and existence of leadership which led to the forums. The online survey was completed by 335 residents of the Puget Sound region. Over 80 percent of the respondents believed that the health of the Sound was not so good or poor and more than half thought that the health of the Sound was worse now than in the past. They believed that restricting development, restoring degraded ecosystems, and reducing toxic chemical discharges into water were the most important actions for restoring the health of the Sound. They also thought that the most progress was being achieved in preventing oil spills, educating the public about environmental problems, and cleaning up land contaminated by chemicals. The three most important reasons for restoring the Sound were that fish and wildlife need healthy habitat, we have a responsibility to future generations, and the health of the Sound affects our quality of life. Many people received information about the Sound from non-profit organizations, news media, and government agency publications.

Connelly, N.A., and Knuth, B.A, 2002, Using the coorientation model to compare community leaders' and local residents' views about Hudson River ecosystem restoration: Society and Natural Resources, v. 15, p. 933–948.

The authors used a coorientation model to compare the views of community leaders and local residents regarding ecosystem restoration on the Hudson River. The coorientation model measures the agreement, accuracy and congruency of the views of two groups. The similarity between the attitudes of the two groups is agreement. How well one group predicts the attitudes of the other group is accuracy. How similar those predictions are to their own attitudes is congruency. Surveys of 434 leaders and 730 residents were conducted. Leaders were drawn from a variety of organizations including nongovernmental organizations, special-interest citizens' groups, State, Federal and local government agencies, academic institutions, and regional businesses. A cluster analysis identified three groups of leaders from their rankings of the importance of various environmental actions which could be taken on the Hudson River: environmental protectionists, supporters of resource use and environmental protection, and moderate environmental protectionists. None of the views of these three groups matched the views of local residents exactly. Environmental protectionists thought all the actions were more important than did the residents. Supporters of resource use and environmental protection allocated the same importance to contaminant clean-up, protecting and restoring wetlands, acquiring open space, and managing fish as the local residents did, but more importance to educational programs, economic development, and access. Moderate environmental protectionists believed most of the actions were less important than residents did, but placed about the same amount of importance on economic development and access. Community leaders consistently underrated how important the actions would be to residents, except for economic development and access for which they overrated the importance to residents. In reality, community leaders and residents rated most of the actions very similarly.

Connelly, N.A., Knuth, B.A., and Kay, D.L., 2002, Public support for ecosystem restoration in the Hudson River Valley, USA: Environmental Management, v. 29, p. 467–476.

The authors conducted a study of the environmental beliefs, support for restoration actions, and willingness to pay (WTP) for ecosystem restoration and protection of residents of the Hudson River Estuary. The Theory of Planned Behavior (TPB) was used as a theoretical framework for the research. The authors hypothesized that general restoration goals would be more supported than specific restoration management actions. They also used TPB as a framework to explore how environmental beliefs, beliefs about the economy and the environment, knowledge about and involvement with the Hudson River, and sociodemographics affect support for specific restoration actions and WTP for ecosystem restoration and protection. The authors received 730 completed surveys. Respondents were more supportive of general goals and specific actions related to cleaning up, protecting, and conserving the river and its living resources than to goals and actions related to public use of the river. On average, respondents supported general goals more than specific actions related to those goals. However, three actions related to cleaning up contaminants were on average just as important as the general goals. Knowledge, concern for the environment, and environmental activism were all positively related to the perceived importance of actions related to cleaning up, protecting, and conserving the river. Concern for humans over nature was negatively related to those actions. Knowledge, concern for the environment, concern for humans over nature, participation in fishing or hunting, and education were all positively related to the perceived importance of actions related to public use. Support for actions related to cleaning up,

protecting, and conserving the river, income, education, and knowledge were positively related to WTP for ecosystem restoration and protection, while support for actions related to public use were negatively related to WTP. This negative relationship may be due to several factors. For instance, increase in public use may be linked to economic development which people see as anti-environment. Additionally, the river is only used by a small portion of residents so support for public use actions was weak in the first place. The authors found that their hypothesis of general goals being supported more than specific actions is supported in this case. They also found that beliefs and past behavior were better predictors of support for restoration actions than sociodemographics. WTP was best predicted by support for restoration actions, knowledge, and some demographic variables. The authors conclude that public involvement and outreach must continue well past the initial stages of restoration projects, because specific actions are bound to be more controversial than the general goals of a program. Beliefs and past behaviors, rather than sociodemographics, should be used to target groups who may be more or less supportive of specific actions.

Dalton, T.M., 2006, Exploring participants' views of participatory coastal and marine resource management processes: Coastal Management, v. 34, p. 351–367.

Public participation in natural resources management assists in sharing information, creates inventive management approaches, increases support of management decisions, and guarantees that those decisions are based on the public's values. The author conducted 19 interviews with participants in marine and coastal resource management processes in the northeastern United States to explore their perceptions of participatory processes. In general, the respondents felt that public participation was a necessity and that stakeholders should be involved as early as possible in the process. Most thought they had been given the opportunity to express their opinions during the process but were unsure whether they were considered in final decisionmaking. Even though most processes were considered to be "open" by respondents, they noted that not many people actually participated in the process. The public did not get widely involved in decisionmaking unless an issue was controversial. Information sharing was viewed as extremely important by most respondents and many felt they had learned a lot during the process. Scientific information was singled out as being particularly important but some respondents did not believe that the best available science had been used in the process. Others noted that many people think science has the answers to the management questions but that is not the case and it can cause problems. Additionally, not all scientists have the personality or time to participate in these processes. Local knowledge was also mentioned as a good source of information. Respondents felt that information should be shared in a variety of ways, from presentations to written reports to email. Facilitators who were neutral, flexible, and willing to listen were praised by respondents, but some had experiences with facilitators who were too rigid and who may have not helped the process as much as they could have. Being able to trace the decisionmaking process was important to respondents. Lack of transparency in decisionmaking led to beliefs that the processes were not fair. The lead agencies in the processes were often criticized by respondents who felt the agencies did not use the processes correctly. Some respondents complimented agencies who addressed their concerns. The lead agencies were also seen as responsible for ensuring access for all participants. Physical access to meetings, as well as access to information, was important. Respondents noted that distant meetings, lack of time, and lack of internet access were all barriers to participation. These processes often create strong working relationships among participants. Participants must listen to, respect, and be honest with other stakeholders in order to develop these relationships. Respondents did not expect to agree with everyone else in the group but some noted that their own position had

changed because of interactions with other stakeholders. They felt that public meetings were a good way to disseminate information but that smaller working or focus groups were also necessary to get things done. Respondents believed it was important to recognize the heterogeneity within interest groups, rather than assume all of the people in one group share the same values and attitudes. They also noted that the same process will work differently in different communities and that the process must be tailored to each community. None of the respondents mentioned the cost effectiveness of the process, which may indicate that it is not important to them.

DePhelps, C., 1996, Partnerships for preserving and enhancing the Padilla Bay agriculture/ estuarine ecosystem: Journal of Soil and Water Conservation, v. 51, p. 274–279.

DePhelps describes the efforts of the Padilla Bay Feasibility Study Team (PBFST) to address the effects of agriculture on the health of the estuary ecosystem. In 1993, PBFST was formed to explore the possibility of creating a research and education program. PBFST reviewed relevant literature and conducted 63 interviews with people involved in agriculture and estuary management. Overall, respondents felt that agriculture can be a benefit and a problem for the estuary and the people that live there. It was determined that a program based on a demonstration farm owned by the Reserve would benefit both the environment and local residents. PBFST decided that the best way to manage a demonstration farm would be through collaborative partnerships with local farmers. A planning group including Reserve staff, Washington State University employees, and local community members (farmers, environmentalists, agency staff, and farmland preservation advocates) was created to guide the creation of the program and the management of the farm. Local community members were to be involved as decisionmakers and managers rather than as advisors in the hopes that the research and education program would be more successful. However, the author notes that involving the community at this level will make the process more difficult and that scientists and academics may feel uncomfortable dealing with the informal nature of information exchange and research among community members. In 1994, 100 acres of farmland near the estuary was purchased by the reserve and in 1996, an operational plan was created for the farm. The author hopes that the collaborative model used by the Reserve can be used as a guide by other groups to create coalitions to solve environmental problems related to agriculture and estuaries.

Duram, L.A., and Brown, K.G., 1999, Assessing public participation in U.S. watershed planning initiatives: Society and Natural Resources, v. 12, p. 455–467.

To explore public participation in watershed management in the U.S., surveys focusing on watershed organization, watershed participation characteristics, and other key issues were sent to watershed partnerships across the country. Sixty four surveys were returned from partnerships in 26 states. The watersheds ranged in size from a few hundred hectares to millions of hectares and contained almost no people to millions of people, though half of the watersheds were rural. Most of the respondents worked for government agencies, with over half working for the Federal Government. Over half of the agencies managed agriculture as their primary function and over 70 percent of the respondents managed the watershed as part of many other duties. Two-thirds of the partnerships were initiated by government agencies and another fifth by a combination of organizations. Before the partnership, the majority of planning was conducted by the government, with a fifth of respondents saying no planning took place. Almost half the respondents stated their main goal as addressing agricultural practices, followed by water quality issues and habitat/living resource stabilization. Almost half of the partnerships were currently implementing a basin

management plan. The number of active participants in watershed planning ranged from 3 to 325. Over 75 percent of the partnerships used newsletters, public meetings, and informational programs to communicate with the public. However, almost half the respondents felt that public meetings were not effective in encouraging public participation. Overall, respondents thought that two-way communication (meetings, programs, door-to-door contact, and so forth) was more effective than one-way communication (newsletters, pamphlets, and so forth). At least 75 percent of the partnership solicited public participation during the outreach, determining resource status, identifying issues, and prioritizing issues phases of their project. It was considered to be useful by the same percentage in all of those phases except for determining resource status. Less than half of the partnerships believed that participation was helpful for clarifying the issues, selecting a planning approach, drafting a plan, review hearings, or updating a plan. Those partnerships which actively solicited participation were more likely to believe that participation was useful. Public participation was seen to have a positive effect by a majority of partnerships on reaching consensus on plan goals and on the final plan, on the legitimacy of the final plan, and on the organizing capacity of local communities. Using watershed-based planning was seen by a majority of partnerships to have a positive effect on public awareness of watershed concerns, interagency coordination, data availability, legitimacy of final plan, reaching community consensus, and data dissemination. Respondents who were more positive about the effects of public participation were more likely to be more positive about the effects of watershed-based planning. Three important issues were also gleaned from qualitative responses on the surveys: stakeholders' awareness and ability to work together, agricultural land use, and integration of Federal, State, and local efforts. Many respondents noted that their efforts had increased awareness and cooperation, but others had been less successful and felt there was a long way to go. In some watersheds, farmers were working with the partnerships successfully, while in others, farmers had issues which were serious obstacles to restoration. Most projects are funded and administered by a mix of agencies which can result in increased data dissemination but also can scare off landowners who do not want to be involved with certain agencies. The authors conclude that public participation should be an important part of watershed planning initiatives because it increases the chances of long-term success, watersheds do not follow political boundaries, and provides a coordinated framework of stakeholders to manage resources.

Eisenhauer, B.W., and Nicholson, B., 2005, Using stakeholders' views—A social science methodology for the inclusive design of environmental communications: Applied Environmental Education and Communication, v. 4, p. 19–30.

Environmental communication is often perceived as "preaching to the choir" rather than reaching the broad audience for which it is intended. The communications themselves can be seen as biased by some people who believe the communicators have an agenda. The authors describe the process they used to develop a plan for educating a diverse public about the Greater Great Salt Lake Ecosystem Wetlands (GGSLEW) in Utah. The plan was intended to meet four objectives (1) increasing the audience's knowledge of the functions, values, and importance of GGSLEW, (2) providing opportunities for active involvement in restoration, conservation, and preservation activities, (3) addressing the threats to GGSLEW, and (4) building a network of interested parties which would support and implement educational activities. The authors used open houses, presentations, and mass media, focus groups of stakeholders, and surveys for outreach purposes and to gather information on stakeholders' and the general public's knowledge and preferred message content of communications about wetlands. The focus groups were comprised of people with an interest in recreation/outdoors issues, land stewardship, growth and development, or education.

Focus group members were chosen by a snowball method and 20 groups comprised of over 100 people were conducted.

Elway Research, Inc., 2005, Skagit County opinions on salmon recovery issues: Seattle, Wash., Skagit Watershed Council, 41 p. Accessed on February 21, 2008, at *http://www.skagitwatershed.org/pdf/REPORT%20Skagit.pdf*.

Elway Research, Inc., conducted a telephone survey of 478 adult residents of Skagit County for the Skagit Watershed Council in April, 2005. They found that the primary problem identified by county residents was growth/development/sprawl, followed by loss of land and traffic/transportation issues. Concern for the environment and for the river/fish was mentioned by less than 5 percent of the respondents in each case. Over half of respondents said that the health of the Puget Sound and the Skagit River, as well as the number of salmon, were very useful as indicators of environmental health. However, more respondents believed that the county is losing ground concerning the health of local rivers and salmon runs than those that believed that the county is making progress in those areas. Additionally, just over 30 percent of respondents believed that there is not enough fish and wildlife habitat in Skagit County and that the trend is moving in the wrong direction. Over 80 percent of respondents agreed that salmon habitat restoration could occur without impacting farmland or forest, but over half also felt that the loss of farmland, forests, and fish and wildlife species was inevitable. Still, more than 65 percent of respondents were willing to pay a small amount and to allow restrictions on private land use in order to protect fish and wildlife. More than two-thirds of respondents believed that local government, people like them, farmers/landowners, State government, environmental organizations, local Indian tribes, and local businesses all bear at least some responsibility to determine the future of Skagit County. More than 85 percent of respondents agreed that all these stakeholders must work together on environmental issues; however, 71 percent also believed that this cooperation would never occur. Still, over 80 percent of respondents were willing to support or take an active part in each of six different restoration activities, including planting along river banks, restoring salmon runs, and removing invasive plants. Overall, respondents were hopeful about the possibility of protecting and restoring the environment, but they did not believe that the political will existed to make it happen.

Fraser, D.A., Gaydos, J.K., Karlsen, E., and Rylko, M.S., 2006, Collaborative science, policy development and program implementation in the transboundary Georgia Basin/Puget sound ecosystem: Environmental Monitoring and Assessment, v. 113, p. 49–69.

The Georgia Basin–Puget Sound ecoregion consists of the Georgia Strait, the Puget Sound, and the Strait of Juan de Fuca and straddles the Canadian/United States border. There are many environmental issues within this region: loss of habitat, threatened species, sewage contamination, persistent bioaccumulative toxins, climate change, air pollution, oil spills, stormwater runoff, and other non-point sources of pollution. Population growth and urban sprawl are particular concerns. To address these issues, institutions on both sides of the border (Puget Sound Action Team in the U.S. and the Fraser River Action Plan and the Georgia Basin Ecosystem Initiative in Canada) have worked toward improving the health of the region. There have also been several transboundary agreements related to the area (for example, the Environmental Cooperation Agreement between the Province of British Columbia and the State of Washington and the Canada-U.S. Joint Statement of Cooperation on the Georgia Basin Puget sound Ecosystem). In 2003, the Georgia Basin–Puget Sound Research Conference was held in Vancouver, British Columbia to disseminate research

findings among scientists and managers working in the area. The conference was also attended by First Nation and Tribal representatives, politicians, students, and community leaders. The authors conclude that formal agreements can only go so far in managing the transboundary region and that the conference provided a venue for more meaningful cooperation among various stakeholders.

Golet, G.H., Roberts, M.D., Larsen, E.W., Luster, R.A., Unger, R., Werner, G. and White, G.G., 2006, Assessing societal impacts when planning restoration of large alluvial rivers—A case study of the Sacramento River project, California: Environmental Management, v. 37, p. 862–879.

The authors explore combining social and ecological information to make restoration of the Sacramento River in California more successful. The Sacramento River Project was started by The Nature Conservancy (TNC) in 1988 and includes Federal and State governmental agencies and nonprofit organizations. The Project has focused some efforts on the town of Hamilton City and their efforts to fix problems with their unstable and insufficient levee. The Project aimed to create benefits for the town and local farmers in the form of reduced flooding impacts and for the environment in the form of restoring natural flooding, erosion, and sediment deposition processes. The authors conducted five studies to examine the effects of potential restoration activities: hydraulic modeling of flood impacts, geomorphic modeling of meander migration, a socioeconomic assessment, a public recreation access study, and a cultural resource study. In the two modeling simulations, local landowners and stakeholders were included in the process, both as sources of information for the models and as reviewers of the models. This led to greater acceptance of the results, which indicated that moving the levee back from the river and revegetating the landscape with native plants would both reduce flooding impacts and improve ecosystem health. The shifting of the levee further from the river was chosen as the best option by an Army Corps of Engineers feasibility study team. To address concerns about possible economic impacts from restoring riparian areas, the authors conducted a cost/benefit analysis of the impacts on the four counties bordering the project area. The analysis found that economic effects would be small and localized and that they could be offset by State and Federal funds and by creating more recreational opportunities. Agricultural sectors would slowly lose money over a 30-year period, resulting in annual losses of as much as $11.5 million. This would lead to losses in jobs and personal income or around $7.5 million annually. However, the percentages that these numbers represent for all four counties are very small. There would be a likely increase in recreational spending by almost $1 million annually and it would probably be more. Site monitoring would also bring in money for salaries and equipment purchases estimated to be $185,000 annually. Finally, there would be a small decrease in property taxes but these would probably be replaced by government funding. However, the socioeconomic assessment was considered incomplete by stakeholders and the authors admit that more attention should have been paid to the stakeholders' suggestions for economic indicators to be measured. At the time, the public recreation access study showed that much of the river was not accessible to the public because it was being restored or was part of a U.S. Fish and Wildlife Refuge. However, this situation has changed and almost 80 percent of the Refuge is now open to the public. The cultural resources study revealed 104 archaeological sites, three of which could be eligible for the National Register of Historic Places. The authors conclude by stressing the importance of including stakeholders in the entire process. By incorporating stakeholder information into research, a sense of ownership and a certain trust can be developed which can make restoration efforts not only easier, but beneficial to a wide range of stakeholders.

Gregory, R., and Wellman, K., 2001, Bringing stakeholder values into environmental policy choices—A community-based estuary case study: Ecological Economics, v. 39, p. 37–52.

The Tillamook Bay National Estuary Project (TBNEP) was initiated to create a management plan for the watershed which was based on science and incorporated community input. A Comprehensive Conservation and Management Plan (CCMP) was developed and the authors were charged with conducting an analysis of the environmental and economic consequences of the CCMP. First, the scope of the project was defined through collaboration with TBNEP staff and other stakeholders, resulting in six fundamental objectives or goals. Then the authors chose to conduct value-elicitation sessions with key stakeholders (dairy farmers, foresters, local residents worried about flooding, and other local groups and individuals) to gather information on stakeholder values. These meetings identified three management actions that were both important but controversial (1) "limiting livestock access to streams," (2) "protecting and restoring tidal wetlands," and (3) "upgrading forest management roads." To examine the trade-offs involved with each of these actions, the authors developed a workbook divided into three sections of evaluation questions for stakeholders to complete. The first part, Action Alternatives, involved making choices between two plans with three benefits and two costs for each action. For each action, Plan A was less expensive but resulted in fewer environmental gains (lower intensity), while Plan B was more expensive but of higher intensity. Respondents were then asked more questions about only one of the actions in the second section, Detailed Choice Tasks, which varied the costs and benefits to obtain a more accurate estimated value. The third, Staying in Contact, asked how much involvement participants wanted with the project but the results are not presented here. Five workshops resulted in a total of 79 completed workbooks. Almost half of the respondents felt that protecting and restoring wetlands was the most important action, followed by slightly over a quarter favoring upgrading roads and a quarter preferring limiting livestock access. Most also chose the more intense plan for each action which resulted in greater environmental gains, even though these were the more expensive plans. Respondents listed many positive aspects of protecting wetlands: improving water quality and habitat, distribution of costs among many people, and most benefit for the cost. The most frequently mentioned negative aspect was the cost, followed by restrictions on rights and over-regulation. A majority of the respondents did not know if the plan they chose was included in the CCMP. Respondents were willing to pay $3,000 to $5,000 per acre to create new habitat by restoring wetlands. Increasing floodwater storage was very important to respondents in choosing a plan, but creating more fish habitat was not. Limiting livestock access was more controversial, with about half of the respondents choosing each plan. The respondents were most concerned about losing farmland to riparian buffers, not about the cost which farmers would incur. However, the majority were in favor of using public funds to install fencing and plant buffers of 50 feet on each side of streams. The authors note that around one-third of the respondents who addressed the livestock issue did not complete their workbooks, possibly because they did not agree that the management options were realistic. The majority of respondents who addressed upgrading roads chose Plan B and did not change their choice even when some aspects of Plan A were improved, indicating they were willing to pay to have all the benefits from Plan B. This information helped TBNEP staff to ascertain that the public would probably accept the purchase of farmland valued at $2000-3000 an acre for restoration purposes.

Howell, R., Casad, G., Fries, D., Roberts, K., Russo, B., and Wallis, A., 2007, Wildlife-friendly shoreline modifications on Lake Washington—Summary of shoreline property owner survey and regulatory interviews: Seattle, Wash., Environmental Management Keystone Project, University of Washington.

The authors were part of a University of Washington project which aimed "to identify effective methods to encourage creation of natural shoreline habitat on private property in Lake Washington." To help achieve this goal, they conducted an online survey of 441 owners of private shoreline properties on Lake Washington. The survey addressed four issues (1) perceived and real barriers to shoreline modification resulting in a more natural area, (2) potential incentives for modification, (3) most effective outreach methods regarding modification, and (4) knowledge of ecological functions of shoreline. Over 85 percent of the owners had hardened or partially hardened shorelines and almost all of them had a dock or pier. Over 80 percent of respondents used their backyards for viewing the lake, swimming, wildlife viewing, motorized boating, and boat storage. More than a third of the owners had never heard of bioengineered or natural stabilization techniques or had heard of them but did not know what they were. A majority of the respondents believed that providing habitat (including food and shelter) for fish and wildlife and preventing erosion are desirable functions of the lake's shoreline. However, over half believed that providing bass habitat was a desirable function, even though bass are an invasive species. Two-thirds of respondents had not attempted or considered modifying their shoreline in the past 10 years. Of those who did, the most common modifications were building or repairing a dock, repairing or replacing an existing bulkhead, and incorporating natural conditions. Many respondents had to perform mitigation requiring a permit for these modifications, though almost 40 percent did not. Only half the projects were completed and it took a quarter of the owners more than a year to receive their permits. The greatest barriers to naturalizing shorelines were the permitting process, cost, ineffective erosion control and wake and wave protection, and time. The most effective incentives for naturalizing shorelines were tax breaks, matching funding, streamlined permitting, clear requirements, faster permitting, and increase in property value. Most people used city newspapers/newsletters, neighbors/friends, and local mailings as their primary sources of information about their neighborhoods and believed that local mailings and city newspapers/newsletter would be the most effective manner to get information related to their shorelines. Around three-quarters of the respondents thought they received too little information about the health of the lake and about shoreline regulatory processes. The authors also interviewed representatives of five of eleven municipalities on Lake Washington, as well as King County. The interviews addressed the use of incentives for modification and how the permit process could be made easier for both the jurisdiction and landowners. None of the municipalities give incentives to property owners for naturalizing shorelines. However, King County has a program which provides tax breaks to landowners for preserving or creating natural shorelines in which all the municipalities could participate. There were many ideas for possible incentives to naturalize shorelines: waiving permitting fees, streamlining the permit process, tax breaks, awarding grants, education and outreach about the ecology of the lake, and so forth.

Hulse, D., Branscomb, A., and Payne, S.G., 2004, Envisioning alternatives—Using citizen guidance to map future land and water use: Ecological Applications, v. 14, p. 325–341.

The authors describe the use of an alternative futures analysis in the Pacific Northwest Ecosystem Research Consortium's application of the analysis in the Willamette River Basin in Oregon (for an overview of the project, see Baker and others, 2004, in this bibliography). Specifically, this article focuses on the development of the future scenarios and the role of stakeholders in the process. Alternative future analyses can be driven primarily by citizens, experts, or by a mix of both groups. Citizen-driven analyses tend to be more politically realistic and are more likely to be accepted by institutions. However, they produce a small number of scenarios which limits the statistical

analysis of the alternatives. Expert-driven analyses tend to result in a lot of scenarios which can be statistically analyzed, but may not be politically realistic. For this project, political plausibility, scenarios which could be mapped and researched scientifically, and results which were useful for research management institutions were all important. A primarily citizen-driven approach was selected, though experts were also involved several times in the process. Future alternatives are represented by maps of land use and land cover types so stakeholders must envision scenarios using indicators for which data is already available. A main group of citizen stakeholders met monthly for two and a half years to develop the scenarios described below. Additionally, a group of experts was on hand to assist in the process and the Willamette Valley Living Forum and Willamette Restoration Initiative groups reviewed and gave input on the scenarios as they were developed. Three futures were created: Plan Trend 2050, Development 2050, and Conservation 2050. The first assumed all trends remained the same into the future, the second assumed an emphasis on development, and the third assumed an emphasis on environmental protection and restoration. Though the population growth remained the same in all three scenarios, the way the population would be distributed changed. In the Plan Trend, there are higher densities of growth inside urban growth boundaries (UGBs) and rural residential zones. Conservation has similar assumptions but rural growth is clustered, thus reducing the rural land taken by development. Development allows lower density development over a wider area. The scenarios are a combination of several land allocation models which consider agriculture, forestry, urbanization, rural residential development, natural habitats, and water use. One of the most publicized products of the project was the delineation of conservation and restoration opportunities (CROs) as part of the Conservation scenario. Six native vegetative communities were identified for conservation and restoration: floodplain forest, oak savanna, wet and dry prairie, emergent wetlands, conifer forests, and riparian. The authors found that the growth of UGBs was different under each scenario. UGBs increased the most in Development and about the same in the other two scenarios. Because sensitive natural areas were protected within UGBs in Conservation, UGBs grew slightly more than in Plan Trend but had higher population densities. Loss of farmland also varied among scenarios. The most farmland was lost in Development (24 percent) to urban and rural residential expansion. The second most farmland was lost in Conservation (15 percent) primarily to native vegetation. In Plan Trend, less than 2 percent of farmland was lost. The authors also discuss the pros and cons of the stakeholder process. The main stakeholder group was relatively small to facilitate decisionmaking which could pose problems with representativeness. However, by using a tiered stakeholder group structure, the team was able to present the scenarios to and get feedback from a wider audience while continuing to work on the project. The combination of citizen and expert involvement resulted in very specific and relevant scenarios.

Hulse, D., and Gregory, S., 2004, Integrating resilience into floodplain restoration: Urban Ecosystems, v. 7, p. 295–314.

The authors use geographical prioritization based on both biophysical and socioeconomic data to identify areas of the Willamette River in Oregon which are suited for restoration, as well as investigate the effects of policy, pattern, and practice changes on future restoration. Four parameters were used to classify possible restoration areas (1) river channel complexity and hydrology, (2) floodplain vegetation, (3) pattern of human population and development in the floodplain, and (4) economic value of floodplain land. Areas with high potential for ecological recovery and few constraints from socioeconomic factors were considered to have the best potential for restoration. Those with low potential for ecological recovery and many socioeconomic constraints were considered bad choices for restoration. Those that had either high potential and

many constraints or low potential and few constraints were considered to be opportunities for policy makers to work on changing the situation. The four parameters were measured every kilometer for 228 kilometers of the Willamette River. The results are displayed in different ways to illustrate their usefulness for managers and other stakeholders involved in river restoration. The parameters can be weighted by what is important to the people analyzing the data: by data or models, professional opinion, theory, policies, or the beliefs of local stakeholders, for instance. The authors argue that this flexibility in land use/land cover information is necessary to provide relevant results to a variety of groups. They further argue that data visualizations, such as time-lapse graphics, are important for communication between policy makers and the public

Huppert, D.D., 2001, Columbia River salmon recovery—Where are we going? and How do we get there? [revised] *in* Portland State University's Salmon Symposium July 7-8, 2000, Proceedings: Portland, Oreg., Salmon Symposium, 47 p. Accessed on March 5, 2009 at *http://faculty.washington.edu/huppert/SMAWorkingPaper-00-5.pdf*.

Huppert first outlines the history of salmon fisheries and the institutions which affect the salmon population in the Columbia River basin. He then continues with a discussion of the ends and means of the recovery of west coast salmon. Huppert argues that most salmon recovery plans frequently confuses means with ends by not specifying what the ends should be. He believes that means and ends should be kept separate, even if it proves difficult. Huppert continues with a discussion of what the ends should be regarding salmon recovery. However, people have very different ideas about what salmon recovery means. Huppert categorizes these ideas into three broad views: romantic/religious, economic/utilitarian, and biodiversity preservation. The romantic/religious view is based on respect for salmon and entails restoring ecosystems to their "natural" state. Salmon are seen as one part of a larger goal to restore ecosystems. Native Americans frequently hold this view, as do some urban, middle class people. The economic/utilitarian view regards salmon as a commodity and focuses on a balance between salmon fisheries and other industries (forestry, agriculture, hydropower, and urban development) in a river system. The biodiversity preservation view focuses on the dangers of allowing salmon to go extinct and seeks quick action to prevent this from happening. In this viewpoint, there is little consideration of larger scale restoration and the preservation of genetic diversity is foremost. Huppert notes that these views are frequently intermixed, though some people hold relatively pure forms of them. He believes that the economic/utilitarian view should be used to plan salmon conservation in the Columbia basin but acknowledges that the other views must be considered. He provides three things which should be done to answer the question "Where are we going?": recovery objectives should specify the size and location of salmon runs, the extinction risk for individual runs should be calculated and related to measurable indicators, and the division of funding for recovery for salmon restoration and for economic impacts on communities should be considered. Next Huppert addresses the means by which to achieve these ends. Two main means must be addressed: fixing the river and fixing the institutions. Fixing the river can be achieved through technical means, such as fish ladders and increased flows during upstream migration, and through establishing more normative river conditions, such as improved riparian areas and considering the entire life history of salmon in restoration activities. Fixing the institutions is extremely complicated because of the many different institutions at various scales which are involved. Huppert points out that there are few economic incentives provided to change individual behavior and that the lack of a water market in the U.S. is a hindrance to salmon recovery. Though he admires volunteer groups who are attempting on a small scale to improve habitat, he believes that these efforts are too small to have an impact on the entire Columbia basin. Huppert ends with

three main conclusions (1) more ecological and biological research is needed to facilitate the combining of technological fixes and establishing normative river conditions, (2) conflict resolution among stakeholders must be improved, possibly through the creation of a new institution which can coordinate basin-wide recovery plans, and (3) try non-conventional ways of dealing with problems, like giving tribes controlling shares in hydropower dams in exchange for lost fishing opportunities caused by those dams.

Huppert, D.D., Johnson, R.L., Leahy, J., and Bell, K., 2003, Interactions between human communities and estuaries in the Pacific Northwest—Trends and implications for management: Estuaries, v. 26, p. 994–1,009.

Huppert and his colleagues examined the socioeconomic issues which affect estuary management in Willapa Bay and Grays Harbor in Washington, and in Tillamook, Yaquina, and Coos Bays in Oregon. The goals of the study were to explore socioeconomic trends in communities near the estuaries, to describe the values, perceptions, and activities of residents related to the estuaries, to look at the relationships between people and the estuaries, and to explore the relationships between land prices and the condition of the environment. Secondary data on demographic and economic trends was gathered from the Federal and State governments. Primary data was gathered through a survey of 2,117 residents of the five counties. Information on residential property values was also collected for the Grays Harbor area from the County government. The populations in all the counties were growing relatively slowly and aging relatively faster than the populations of their respective states. A large proportion of the residents are retired, while the next largest segment of the population is employed in white-collar jobs and the third largest segment is employed in the natural resources industry in all counties. Across all Counties, a rural lifestyle (lower crime, fewer people, and so forth) and environment-related characteristics (views and scenery, recreation opportunities, near ocean, and so forth.) were cited as the top reasons for living near a bay. In general, respondents believed that the environment had stayed the same over time, while economic conditions and congestion had worsened. Older, more educated, and shorter term residents were more likely to have been motivated to move to their community by environmental characteristics, while younger, wealthier, and longer term residents were more likely to have been motivated by economic considerations. Around half the respondents believed that there should be a balance between environmental conditions and economic considerations. People who work in the natural resources industry were more likely to prioritize economic considerations, while those who work at home or in white-collar jobs were more likely to favor protecting the environment. Shorter term residents also favored protecting the environment more than longer term residents. More than 39 percent of respondents ranked fish habitat loss, oil spills, shoreline development and erosion, spread of green crabs and logging upstream as serious threats to the bays. People who ranked at least one environmental threat high were more likely to rank other threats high as well and those who favored protecting the environment were also more likely to rank the threats more highly. If the current demographic trends continue, more people will favor protecting the environment and will view the environmental threats to the bay as serious in the future. The results of the examination of property values and ecological attributes in Grays Harbor were inconclusive.

Kronthal, M., 1998, Local residents, the Anacostia River, and “community”: San Jose, Calif., Environmental Anthropology Project, Society for Applied Anthropology. Accessed on March 24, 2008, *http://www.sfaa.net/eap/kronthal/ kronthal.pdf.*

Kronthal investigated the relationships to the river and perceptions of community held by residents living near the Anacostia River in Washington, D.C. In interviews with 22 residents from three neighborhoods, he found that they related to the river negatively, naturalistically, and aesthetically. Natural areas in general were associated with crime and lack of safety and residents were also concerned about the deteriorated environmental condition of the river. However, many interviewees also viewed the river as a place of calm and relaxation, though many stated they did not use the river as they once did when it was cleaner. Despite its condition, the river was also a source of aesthetic pleasure, particularly in contrast to the industrial surroundings. The interviewees all mentioned similar things when asked to define community: "people living in a common place who are bound together by the social bonds they create amongst themselves." Though residents of two neighborhoods referred to their community by the same name as the neighborhoods, residents of the third neighborhood did not. This may have been due to the larger size and lack of defined boundaries of that neighborhood. The interviewees defined their communities by its social characteristics and talked about social changes. They were proud of personally improving their community and this sense of pride could be used to galvanize residents into restoring the river, as long as residents were directing the process. Most interviewees were interested in learning more about the river and the environment in general so outreach informing residents how to prevent nonsource point pollution may be effective.

Leach, W.D., Pelkey, N.W., and Sabatier, P.A., 2002, Stakeholder partnerships as collaborative policymaking—Evaluation criteria applied to watershed management in California and Washington: Journal of Policy Analysis and Management, v. 21, p. 645–670.

The authors examine the definition of stakeholder partnerships, what they can accomplish, and how long they take to accomplish things. Stakeholder partnerships may be defined as consisting of "representatives from private interest groups, local public agencies, and State or Federal agencies, who convene as a group, periodically and indefinitely, to discuss or negotiate public policy within a broadly defined issue area." The word "stakeholder" refers to "any individual or organization interested in a particular policy issue." Conflict is an inherent part of stakeholder partnerships because of the diverse stakeholders involved. Case studies of 44 watershed partnerships which had existed at any time from 1995 to 1990 in Washington and California were conducted. Information was gathered from relevant documents, 157 interviews and 770 surveys. Most of the respondents were resource users, environmentalists, or agency officials. The motive for participation in the partnership which was deemed important by the highest percentage of respondents in each group was "to improve the watershed," followed by helping to achieve the goals of their organization, except in the case of resource users. The second highest percentage for them was to stop the partnership from changing law or policy in undesirable ways. Sixty percent of resource users also felt that protecting their financial interests was important, while 20 percent or less of other groups felt that way. Over 80 percent of the respondents believed that consensus-based processes were the best way to solve watershed issues. Over 90 percent of the partnerships used a consensus-based process to make decisions. Three-quarters of the partnerships obtained funding from a government agency or private foundation. Six criteria were identified to evaluate the success of the partnerships (1) perceived effects of partnership on watershed problems, (2) perceived effects of partnership on social and human capital, (3) extent of stakeholder agreement, (4) restoration projects, (5) monitoring projects, and (6) education and outreach projects. Older partnerships were perceived as having made more progress on watershed problems when compared to younger partnerships. Partnerships believed that conflict between stakeholders, threatened species or habitats, and impaired water quality were the most serious problems and deemed themselves as most effective at

solving those three problems. Over 80 percent of partnerships felt they had negatively affected at least one of the 12 listed problems. Older partnerships were seen as better at building social and human capital when compared to younger partnerships, though on average, all partnerships believed they were doing well in this area. Older partnerships (over 4 years of age) also tend to have reached more agreements and implemented more restoration, monitoring, and education projects than younger partnerships. The authors conclude that partnerships must be around for a certain amount of time before significant progress is made. They also warn partnerships to use different measures when assessing their own success. Perceived effects should be replaced by actual effects to gain a more accurate understanding of the effects of the partnerships on watershed problems.

Leschine, T.M., Ferriss, B.E., Bell, K.P., Bartz, K.K., MacWilliams, S., Pico, M., and Bennett, A.K., 2003, Challenges and strategies for better use of scientific information in the management of coastal estuaries: Estuaries, v. 20, p. 1,189–1,204.

Leschine and his colleagues review several studies conducted as part of the Pacific Northwest Coastal Ecosystems Regional Study (PNCERS) which investigated the capacity for environmental management in the region, regional communication between managers and scientists, how environmental threats to estuaries are perceived by different groups, and how indicators can be used in managing estuaries. Both interviews and surveys of practitioners in Coos, Tillamook, and Yaquina Bays in Oregon, and Grays Harbor and Willapa Bay in Washington, were conducted. One survey investigated the cultural differences between scientists and managers. Many scientists and managers felt that the differences between their two groups led to research being less useful and to a breakdown in communication between the two groups. However, managers were just as likely to say that the differences had no effect on communication between the two groups as they were to say they led to a breakdown in communication. Managers were also more likely than scientists to feel positively that the differences resulted in being able to see many sides of an issue. In terms of gaining and disseminating information, scientists rely on professional journals for gaining information and on journals and agency archives/databases to disseminate it. Managers rely most on agency scientists to gain information and agency archives/databases to disseminate it. Both groups felt that integrated teams of scientists and managers and workshops would be most helpful in bridging the communication gap between them. Practitioners were also asked to name the top threats to the estuaries they were most familiar with in the PNCERS region. There was a different top threat for each estuary, though certain threats were of concern in each estuary: upland logging was in the top three in each estuary and fish habitat decline was in the top three in three of the five estuaries. Practitioners and residents differ greatly in their perceptions of the severity of environmental threats to the estuaries. An online survey and interviews with practitioners addressed the utility of indicators in estuary management. Practitioners who were knowledgeable about indicators believed they were useful; however, many were not familiar with them at all. Researchers were more likely to choose research as the primary use of indicators, while those specializing in education and outreach were more likely to choose measuring success as the primary use. State and local employees used indicators for monitoring most frequently, while Federal employees used them for making decisions. The most limiting factor in using indicators was lack of resources, while the primary limiting factors of indicators themselves were selecting the wrong indicator, having a good understanding of the ecosystem, and too much reliance on indicators.

Leschine, T.M., Lind, K.A., and Sharma, R., 2003, Beliefs, values, and technical assessment in environmental management—Contaminated sediments in Puget Sound: Coastal Management, v. 31, p. 1–24.

The National Research Council has recommended that risk assessment be used to "bridge the gap between science and decisionmaking" regarding environmental problems. The Washington Department of Ecology used a risk-based management approach to set sediment management standards for the state. This approach included the participation of many outside stakeholders. The authors used the Advocacy Coalition Framework (ACF) to examine whether the risk assessment approach was successful. ACF is based on the idea that members of a coalition hold deep core beliefs, policy core beliefs, and secondary beliefs. Deep core beliefs are almost impossible to change, policy core beliefs are slightly more adaptable, and secondary beliefs are much more flexible. Analytical debate takes place in which members of the coalition bring forth information to support their points of view and counter their opponents' points of view. In order for policies to be created, learning must occur among all members and the resulting policies will reflect the belief system of the coalition. The authors conducted a survey of participants in the establishment of sediment management standards for the State of Washington, as well as others affected by those standards. One purpose of the survey was to discover whether there were distinct factions within the sediment management debate, such as those supporting economic development and those supporting environmental protection. Another purpose was to determine how the risk assessment approach contributed to learning and policy change. Sixty surveys were returned from members of regulatory and resource agencies, regulated and potentially liable public agencies, environmental groups, universities, industry, environmental consulting firms, and tribes. Six scales were created from the items on the survey: marine ecosystem problems, social and economic problems, habitat loss/development threats, threats from discharges and spills, air and terrestrial pollution, and marine and aquatic pollution. The respondents were grouped into two coalitions: pro-environment (resource agencies, environmental groups, academics, and tribes) and pro-development (liable public agencies, industry, and consultants). The pro-environment respondents were likely to have higher scores on the five environmental scales than the pro-development respondents. Conversely, pro-development respondents were likely to have higher scores on the social and economic problems scale than pro-environment respondents. On other scales, pro-development respondents were likely to score lower on concern for species impacts and source control and about the same on site size and ecological effects of contaminated sediments as pro-environment respondents. The results indicate that the two groups have different deep and policy core beliefs but exhibit fewer differences on secondary beliefs.

McDaniels, T.L., Gregory, R.S., and Fields, D., 1999, Democratizing risk management—Successful public involvement in local water management decisions: Risk Analysis, v. 19, p. 497–510.

The authors facilitated the public involvement involved in developing a plan for managing water flows in the Alouette River in British Columbia. Research has shown that individuals frequently make decisions about complex issues based on instinct and heuristic reasoning processes unless aided in the decisionmaking process. The authors argue that public involvement should guide policy but should never set it. There are two extremes of public involvement: one in which participants make all the decisions and one in which participation is highly structured and limited. The authors chose the middle ground, providing some structure for the process but also relying on participants for much of the process. They used value-focused thinking, adaptive management, a

structured decision process, and an informative decision rule as guides for the public involvement process. Specifically, the authors helped to structure and facilitate discussions of the Alouette Stakeholder Committee (ASC). The ASC was composed of 17 stakeholders, including local residents, city employees, government employees, First Nations, and the hydroelectric company. Fifteen meetings were held over a period of 6 months and products included minutes from each meeting, progress reports, and a final report made available to the public. The process began with identifying the main objectives of the group. The overall objective was to "select the best possible operating plan for the Alouette River." There were five more specific objectives (1) "avoid adverse effects of flooding," (2) "promote the ecological health and productivity of South Alouette River and Alouette Lake," (3) "avoid cost increases for provincial electrical supply," (4) "promote recreational opportunities associated with Alouette Lake and South Alouette River," and (5) "promote flexibility, learning and adaptive management regarding impacts of water flows on ecology of South Alouette River and Alouette Lake." Measures were established for each of these objectives. The ASC requested and was given scientific and technical information on a variety of topics: recreation, flood protection, costs, fisheries and ecological health, water licenses, adaptive management, and First Nations rights and interests. Several alternative plans were constructed and how well they fulfilled the objectives was determined. Many technical issues influenced the choice of alternatives: fisheries and ecological health, flood control, recreation activities, power production, and learning and adaptive management. The ASC eventually adopted several management actions which met the objectives stated above which resulted in changes in the way the dam was managed. The authors view the process as a success because a consensus was reached among diverse stakeholders, insight was provided to decisionmakers, a decision framework was selected and followed, a plan was constructed which met the objectives, and the benefits of the process to the electrical utility were substantial when compared to the cost of funding the public involvement process.

Milon, J.W., Adams, C.M., and Carter, D.W., 1998, Floridians' attitudes about the environment and coastal marine resources: Gainesville, Fla., Florida Sea Grant College Program, University of Florida.

A telephone survey of almost 1,800 Florida residents was conducted to determine their attitudes toward the environment and coastal marine resources, preferences for spending on government programs, and participation in coastal-related recreation. The New Environmental Paradigm (NEP) scale was used as a measure of attitudes toward the environment. The majority of respondents scored high on the NEP scale, indicating widespread concern about the environment. Females, non-Blacks, Democrats, Independents, contributors to environmental groups, or residents of South Florida were more likely to score high. More than half of the respondents believed that the state should spend more on environmental protection; however, environmental protection was less important than funding public schools, preventing crime, and caring for the elderly. Three-quarters felt that coastal habitats, coral reefs, and sea turtles were worse off now than in the past. More than two-thirds thought that current regulations and funding were not enough to protect coastal ecosystems. Respondents who had lived in Florida for more than five years, contributed to environmental groups, were Democrats or Independents, or lived in South Florida were more likely to be concerned about coastal habitats. Those who were under 65, more educated, wealthier, contributed to environmental groups, or lived in Florida more than five years were more likely to be concerned about coral reefs and sea turtles. Additionally, respondents who were white were more likely to be concerned about coral reefs and females were more likely to be concerned about sea turtles. Those who scored higher on the NEP or were active in coastal-related recreation were

more likely to be concerned about coastal resources and the effectiveness of current regulations and funding. Respondents who were more concerned about coastal resources were more likely to support increased funding for environmental programs.

Montgomery, M., 2003, Perceptions and opinions related to restoration and protection of the lower Cedar River, King County, Washington: Seattle, Wash., School of Marine Affairs, University of Washington, Master's Thesis.

Leschine, T., & Montgomery, M., 2003, Results summary for the restoration and enhancement opportunities for the lower Cedar River public opinion survey: Seattle, Wash., University of Washington, 18 p.

In these two documents, Montgomery and Leschine report on a survey of property owners and interested parties (people involved in the management of the watershed) in the Cedar River, Wash., watershed. A total of 418 surveys were received from 274 property owners and 143 interested parties. The majority of respondents believed that the health of the river has declined in the past 50 years. When identifying the most and least important environmental threats to the river, interested parties were more likely to choose loss of channel width and complexity than property owners and property owners were more likely to choose decline of fish in river. Interested parties were also more likely to choose pollution of the river as the least important threat compared to property owners. Around half the respondents believed that improving the general ecosystem health of the river is the most important goal for restoration projects, while two-thirds believed that maintaining in-river recreation is the least important. Both groups believed that land purchase and restoration is the most effective way to restore the river, though property owners were more likely to choose active restoration as most effective than interested parties. Property owners were also more likely to choose financial incentive programs as the least effective method, while interested parties were more likely to choose passive restoration. Though incentive programs were more likely to be chosen as the least effective method of restoration, they were more likely to be chosen as the action which would gain the most public support. Conversely, though land purchase and restoration was more likely to be chosen as the most effective method, it was more likely to be chosen as the action which would gain the least public support. Just under 30 percent of the respondents believed that multi-government/citizen panels should make decisions regarding river restoration and a similar percentage believed that local government should make those decisions. A combination of government entities was chosen most frequently by respondents as being responsible for funding restoration projects. When given a hypothetical half million dollars for restoration, respondents chose to spend it on land purchase and protection most often, followed by active restoration, and then passive restoration. Almost two-thirds of them would spend an additional one million dollars on the same activity. Of those that would spend the money on a different activity, a third would spend it on land purchase and protection, slightly fewer on active restoration, and a fifth on passive restoration. When given the choice to divide the money among the three activities, more money was given to land purchase and protection, then to active restoration, and the least to passive restoration. Twice as many interested parties as property owners believed that not enough money is being spent on restoration of the Cedar River. Property owners were more likely than interested parties to say they were not sure the right amount was being spent. Almost half of the respondents believed that financial incentive programs for restoration on private lands should be relied upon less than publicly funded projects, while just over a quarter believed they should be relied upon equally.

Moore Information, 2006a, Puget Sound residents survey (prepared for Puget Sound Partnership): Portland, Oreg. Moore Information, Accessed on February 5, 2008, at *http://www.pugetsoundpartnership.org/our_work/charge_2/Exec%20Summary%20of%20Poll%20Puget%20Sound%20Residents.%20April%202006.pdf*.

Moore Information conducted 825 telephone surveys of residents of the 12 counties bordering the Puget Sound. When asked to identify the top issue in the region, just under a third identified transportation, 8 percent mentioned environmental issues, and another 8 percent mentioned the economy or jobs. The majority of respondents believe that the environmental health of the region is pretty good or excellent. Clean water, air pollution, general pollution, and population growth were the most mentioned environmental concerns of the region. Three issues were rated as major threats by most of the respondents: population growth and development, loss of habitat and natural areas, and pollution of water near urban areas. Three other issues were also seen to be a threat by the majority of respondents: development on rivers and the Sound, industrial pollution, and toxic chemicals in water. The top reasons for improving the condition of the Sound were human health and children, followed by environmental safety, for the future, and quality of life. The single most important reason to improve the condition of the Sound was responsibility to future generations. However, protecting habitat was just as important a reason in rural areas. The majority of respondents were concerned about specific findings regarding pollution in the Sound, including pollution of the Sound, rivers, and streams, "dead zones" in the Hood Canal, and toxic fish and shellfish. Almost all of the respondents (97 percent) agreed that cleaning up the Sound should be done for future generations and 90 percent agreed that pollution is harming fish and wildlife in the Sound and that the condition of the Sound is important to the economy.

Moore Information, 2006b, Secondary research review with executive summary (prepared for Puget Sound Partnership): Moore Information, Portland, Oreg. Accessed on February 5, 2008, at *http://www.pugetsoundpartnership.org/our_work/charge_2/SecondaryResearchReview-Final.pdf*.

A literature review of environmental issues in the Puget Sound region and beyond found that restoration of the Sound was not an important consideration for the public. The most important issues overall for the region are transportation, taxes, and jobs/economy. However, the Puget Sound was deemed the most important body of water to consider when addressing environmental problems in the region. Among environmental concerns, water quality is the most important issue at the National, State, and regional level (though urban development is also very important in the Puget Sound region). Specifically, in King County, water pollution is rated as a very serious problem by many residents. Most residents were willing to pay more for sewage treatment if it prevented sewage from entering the Sound. Almost two-thirds of residents in the Sound area believed in 1998 that salmon would be extinct by 2018. Over 90 percent of respondents in five surveys conducted from 2001 to 2005 believed that water quality affects salmon. In a 2003 study, about half of respondents living in the Sound region chose the natural environment and beauty as the thing they like the most about the area. In 2005, a majority of voters supported a sales tax increase to fund protection, conservation, and restoration activities in Washington. The review also considered other ecosystem restoration initiatives. Research on the Chesapeake Bay restoration project revealed that most people do not understand how their personal behavior affects the Bay and do not believe they, as one person, can make a difference. More knowledge about the watershed did not translate into more action regarding restoration. In the Great Lakes region, concern about pollution was low though protecting the Lakes was very important to most residents. Again, around half of the residents do not believe their actions impact the Lakes. Similar results

were found in the Lake Tahoe region, where people wanted to protect the water quality, but did not understand what activities were most harmful to it and did not believe they personally impacted the Lake.

Paladino, S., 1998, Perceptions of a changing environment in Madison County, Georgia and some implications for river conservation: Athens, Ga., Environmental Anthropology Project, Department of Anthropology, University of Georgia. Accessed on February 3, 2008, at *http://www.sfaa.net/eap/paladino/paladino.html*.

Paladino conducted 21 interviews with residents of Madison County, Ga., concerning land use and environmental change in the county, the impacts of those changes, environmental concerns and need for environmental protection in the country, the importance of the Broad River, perceptions of certain conservation practices, and perceptions of their roles regarding and responsibilities to the environment. Interviewees were chosen using a snowball method from four broad categories: those whose livelihoods depended on the land, those involved in development, those in the business sector, and wage laborers. However, the majority of the interviewees were either farmers or in development, with others being involved in conservation organizations or in government. Interviewees identified four main changes related to development and growth in the county (1) increase in population, (2) shift from agricultural economy to non-agricultural economy, (3) more intensive forms of agriculture, and (4) increase in housing. They cited the county's cheap land and low taxes, proximity to Athens, and rural quality of life as the main drivers of these changes. While interviewees seemed to accept growth and development as inevitable, they were concerned about uncontrolled development, the strain of too much development on county services, too many manufactured homes, a lack of affordable housing, safety issues with manufactured homes, crime related to manufactured home developments, and loss of agricultural land and natural areas to subdivisions. When asked specifically about environmental changes in the county, farmers were aware of the possible consequences of their operations, but did not believe that their actions were contributing to environment degradation yet. Other interviewees expressed concern about the negative effects of development, including runoff, soil erosion, and unnecessary removal of trees. Many raised the issue of water supply in the future and conflicts over who gets water. When asked about watersheds and river ecosystems, farmers were, in general, much more knowledgeable about these topics than other interviewees. Most interviewees believed the Broad River to be clean and wanted it to be protected. Some farmers felt that many conservation practices were also good management practices in general, but that many people would not change due to habit or believing their current practices did no harm. Three farmers had allowed wetlands to remain or be re-created on their properties by beavers because they were home to wildlife and provided a source of irrigation water. Conservation easements were generally viewed with suspicion by farmers, mostly due to resistance to giving up property rights.

Rhoads, B.L., Wilson, D., Urban, M., and Herricks, E.E., 1999, Interaction between scientists and nonscientists in community-based watershed management—Emergence of the concept of stream naturalization: Environmental Management, v. 24, p. 297–308.

The authors argue that watershed management is primarily a social, not a technical or scientific, process. Scientists can hamper participation in planning processes by unconsciously favoring their knowledge over that of nonscientists and by conflating their knowledge with their values. Scientists should try to make a clear distinction between their values and their knowledge, acknowledge that their values and knowledge are not necessarily those of the community, try to

understand the values and knowledge of nonscientists to enable effective communication, and tailor their knowledge to the specific place in which they are working. In Illinois, agricultural land has long been viewed as "wet" and in need of draining. Legal statues and regulations support this "land-drainage ethic" which is still the prevailing view in watershed management. The authors participated in a watershed project on the upper Embarras River for which the district drainage commissioners had been unsuccessful in gaining a permit. The permitting agency recommended the commissioners work with the authors to create a more ecologically sound plan. Though the commissioners resisted at first, eventually personal relationships were formed between them and the authors, resulting in a plan which left river meanders in place instead of straightening the stream channel. The plan still addressed the main concerns of the commissioners regarding drainage but maintained important habitat as well. The authors present a model of how scientists and nonscientists interact in watershed management. The historical social/cultural context influences the values and attitudes that people have concerning the environment, which in turn influences the community ethic regarding the environment. This ethic is a fluid construct which can be changed through shifts in larger social factors and which influences a community's interaction with the environment. Local knowledge is developed within the context of this ethic and frequently this causes conflicts with the knowledge developed within the ethic of the scientific community. Both types of ethics and knowledge are valid and must be included for management that is truly community-based. The authors outline the concept of naturalization as an alternative to restoration in areas which have undergone intensive human modification, such as the predominantly agriculture Midwestern U.S. Naturalization's goal is "to establish sustainable, morphologically and hydraulically varied, yet dynamically stable fluvial systems that are capable of supporting healthy, biologically diverse aquatic ecosystems." Human influence on the system is accepted and incorporated as part of the naturalization process. Instead of focusing on a pristine end state, the current predominant state of a watershed, such as primarily channelized streams in the Midwest, is used as a starting point for a range of naturalization projects. The authors conclude that trust must be established between scientists and nonscientists in order for any watershed projects to move forward and that naturalization may provide a more flexible option in heavily modified watersheds.

Smith, C.L., and Steel, B.S., 1997, Values in the valuing of salmon *in* Stouder, D.J., Bisson, P.A., and Naiman, R.J., eds., Pacific salmon and their ecosystems—Status and future options: New York, Chapman and Hall, p. 599–616.

Smith and Steel begin with an overview of the ongoing divide between ecological and economic views of the environment. They briefly describe several dichotomous conceptualizations of the way people view the environment based on this division: conservation vs. preservation, natural economy vs. industrial or political economy, expansionist vs. limited, industrio-scientific vs. bioregional, dominant worldview vs. deep ecology, old Technological Social Paradigm vs. new Ecological Social Paradigm, and so forth. Many scholars have noted the shift in the U.S. to a more postindustrial society which is less concerned with survival and subsistence needs and more concerned with higher order needs such as belongingness and self-esteem. This coincides with a trend toward more ecological views of the environment, but in the Pacific Northwest, many environmental issues are still framed as ecology vs. economy. Smith and Steel use two main surveys (Oregon Forestry Survey and Western Rangelands Study) and other smaller surveys conducted in the early 1990s to investigate how people feel about salmon and their habitat. They found general support for protecting fish like salmon and their habitats across all the surveys. Women, younger people, members of environmental groups, urban residents and anglers were

more likely to support protection. Men, older people, and people making a living in the ranching and timber industries were less likely to support protection. Much of the public is not confident that scientists and managers can solve environmental problems and want to be involved in the process. Smith and Steel conclude that current economic valuing of environmental services and goods does not always take into account all of the costs involved with extraction of resources and that new ways to measure such costs should be explored. They note that science can provide information about the economic and ecological consequences of actions but cannot make the choice between the two for decisionmakers.

Smith, C.L., Gilden, J.D., Cone, J.S., and Steel, B.S., 1997, Contrasting views of coastal residents and coastal coho restoration planners: Fisheries, v. 22, p. 8–15.

The authors conducted a survey of Oregon coastal community leaders and residents to explore their values and knowledge about salmon. They received 505 surveys. A majority of respondents believed that salmon should be protected regardless of cost. Most thought that everyone was to blame for declines in salmon populations. Half the respondents wanted the state to lead salmon restoration efforts, though another group of respondents did not want the government involved at all. Almost half believed that resource users should fund restoration, just over 40 percent felt the Federal Government should fund it, and 38 percent believed that the State should fund it. Many respondents were upset that the Oregon Department of Fish and Wildlife (ODFW) had changed the Salmon Trout Enhancement Program (STEP). STEP had been focused on hatchery boxes maintained by volunteers but ODFW changed the focus to wild fish and ecosystem management without gaining the support of the volunteers which created hostile feelings toward the agency. Around half of the respondents believed that reducing the numbers of predators of salmon, improving forest management, improving wetlands, and increasing citizen participation were quite or very important. Most respondents did not believe it was important to decrease hatchery production and many thought that even more hatchery salmon were needed to boost the population. Over half agreed that private landowners should be paid for protecting salmon, though 16 percent disagreed. Some felt that landowners who cause environmental damage should have to pay to correct it, but others believed that landowners should be compensated regardless. Around a third of respondents were not willing to pay or to volunteer time to restore salmon, but many in this group were older people on fixed incomes or with health issues. Over a third would pay more than $10 a month, while another sixth would pay over $20 a month. Almost half of the respondents would volunteer half of a day or more a month. Those with higher incomes were more willing to pay, while those with greater knowledge were more willing to volunteer. On average, respondents trusted the U.S. Fish and Wildlife Service/National Marine Fisheries Service, university extension agencies, and the Governor of Oregon the most and Congress, the Federal courts, and industry groups the least. The most cited sources of information about salmon restoration were word of mouth, television and radio, and newspapers. Over half of respondents desired that environmental protection become more important than economic growth. Those respondents who favored the environment over economics were more likely to be concerned about restoring environmental quality, protecting salmon, and managing tourism and to trust environmental groups. Those were favored the economy were more likely to support changing the endangered species laws and protecting the rights of landowners. They were less likely to support changing forest and farm management and protecting wetlands and salmon and to be willing to pay or volunteer to restore salmon. The authors conclude that people's values have a much greater impact on how they feel about salmon issues than does their demographic characteristics. Residents distrust government and scientists and frequently compare what they are told by these groups with what they have

experienced. In general, respondents seemed to want a balanced, "common sense" approach to restoring salmon which produces measurable results.

Steel, B.S., Smith, C., Opsommer, L., Curiel, S., and Warner-Steel, R., 2005, Public ocean literacy in the United States: Ocean and Coastal Management, v. 48, p. 97–114.

The authors theorize that both trans-situational factors, such as education, income, and occupation, and situation-specific factors, such as living near the coast or being an environmentalist, will affect levels of knowledge of ocean and coastal management issues. They conducted a survey to explore the public's knowledge, as well as determine the impacts of various sources of information on knowledge. A total of 1233 mail surveys were received from residents of the lower 48 states. Analyses were conducted on the entire sample, as well as on the coastal (those on the Pacific, Atlantic, or Gulf of Mexico) and non-coastal states. Around two thirds of respondents felt they were at least somewhat informed about ocean and coastal policy issues. Respondents from non-coastal states were more likely to say they were not informed than those from coastal states. When given a list of 12 ocean and coastal-related terms, coastal residents knew an average of 5.53 terms and non-coastal residents knew an average of 4.67. On a five question knowledge quiz, only on one question did more than half the respondents answer correctly. There was little difference between residents of coastal and non-coastal states in the percentage of correct responses. In logistic regression analyses, more educated respondents were more likely to be knowledgeable, as were men. Those who visited the coast frequently and scored higher on the NEP scale were more likely to be knowledgeable, but where respondents lived (coastal or non-coastal states) was not a factor. Television and radio as information sources have a negative relationship with knowledge about ocean and coastal issues, while newspapers and the internet have a positive relationship. The authors conclude that the American public is, in general, not very knowledgeable about ocean and coastal management issues. Furthermore, television and radio are most likely not going to be good methods for disseminating information. In order to increase knowledge, the less educated and women should be targeted with education campaigns. Where possible, actually taking people to the coast would be the best possible educational experience.

Street, W.H., 2001, Watersheds in watershed restoration—The role of public and private partnerships in implementing restoration programs in the Chesapeake Bay region: Transactions of the North American Wildlife and Natural Resources Conference, v. 66, p. 588–597.

Restoration of the Chesapeake Bay and its watershed includes goals of restoring 2,010 miles of forested riparian buffers and 25,000 acres of wetlands by 2010. There is almost $1 billion available to meet these goals, most of it through Conservation Reserve Enhancement Programs (CREP). As of 2000, 334 miles of buffer and 3,314 acres of wetlands had been restored. Restoration can be facilitated by partnerships between public agencies and private organizations. Private funding can supplement monies provided by government, and staff of private organizations can help to implement programs to which public employees may not be able to devote a great deal of time. Though CREP is the program which many landowners choose to participate in, others do not feel comfortable working with the government or accepting government money. Private habitat stewardship programs allow landowners to benefit from restoration projects, are often much faster than CREP, and are more flexible. Private organizations can also help when programs get stuck, providing anything from political pressure to grass seed in order to complete projects. They also can assist with the promotion of programs, especially with marketing and solicitation, which government agencies are often not allowed to do. The author concludes that the progress which has

been made in the Chesapeake Bay region is a good start, but that much more still needs to be done. Continued and increased funding for CREP is extremely important as is increased delivery capacity of the programs. There must be commitment and interest at all levels of government if widespread restoration is to succeed. One dedicated person in an agency can make a huge difference, but if no one is actively pushing restoration activities, it is unlikely any will be implemented. Economic incentives should be offered to offset development losses, as well as agricultural losses. Especially on the heavily urbanized East Coast, development can have more of an impact than agriculture on watershed conditions.

Van Cleve, F.B., Simenstad, C., Goetz, F. and Mumford, T., 2004, Application of the "Best Available Science" in ecosystem restoration—Lessons learned from large-scale restoration project efforts in the USA: Seattle, Wash., Washington Sea Grant Program, Puget Sound Nearshore Partnership Report No. 2004-01, University of Washington, 30 p. Accessed February 13, 2008, at *http://www.pugetsoundnearhore.org*.

This report summarizes the "lessons learned" about integrating science into large-scale restoration projects in the U.S. The five programs explored here are the Chesapeake Bay Program, the Comprehensive Everglades Restoration Plan, the California Bay–Delta Authority, the Glen Canyon Adaptive Management Program, and the Louisiana Coastal Areas Ecosystem Restoration Program. Information was gathered from interviews with experts, a literature review, and websites. Several general lessons were gleaned from these sources:

1. Well-defined problems and goals are necessary for program success.
2. To be legitimate, science must be independent from policy pressures.
3. Science should be developed from both the "bottom-up" and the "top-down."
4. Independent peer review is the best way to ensure scientific credibility.
5. "Scientific information must be summarized in a way that is understandable to the general public and disseminated to stakeholders in a timely manner."
6. Horizontal integration of external sources of information and expertise is needed.
7. Conceptual and numerical models can be helpful in resolving conflict and building consensus.
8. Adaptive management is necessary but only works if all the participants understand it.
9. Specific indicators can be useful politically but the health of the ecosystem as a whole must be kept in mind.
10. Monitoring is critical.
11. The program must be led by a charismatic scientist who can work with all stakeholders.
12. Unknowns must be anticipated and planned for.
13. Data management should be a priority.
14. Social sciences must be incorporated to a greater extent in restoration programs.

Within each program, some of these lessons, as well as others, were learned. The Chesapeake Bay Program has a charismatic lead scientist and good horizontal integration, but did not plan well for the unexpected. The program stresses involving the public and gaining their support through partnerships with local non-profit groups and by communicating scientific results with publications. The Comprehensive Everglades Restoration Plan is based on the clearly articulated problem of water distribution, has a capable leader, and developed useful indicators which are being monitored, but science was not incorporated into the program until the later stages. The California Bay–Delta program chooses relevant projects, utilizes a bottom-up approach effectively, has an internal and independent peer review system, ensures science is incorporated into every part of the program, and uses conceptual models extensively. However, they are having problems instituting a

monitoring plan. The use of adaptive management in the Glen Canyon program demonstrated that intense participation and commitment, as well as understanding of the concept itself, are required for the process to work. The Louisiana program faces numerous problems: lack of involvement of science, political constraints, ignoring the broader picture when addressing problems, lack of monitoring, and tensions between stakeholders. The program does include an integration team and an external program review board.

Vigmostad, K.E., Mays, N., Hance, A., and Cangelosi, A., 2005, Large-scale ecosystem restoration—Lessons for existing and emerging initiatives: Washington, D.C., Northeast Midwest Institute, 51 p.

The goals of this report were to inventory restoration programs, "compare and contrast them, and evaluate them for lessons relevant to existing and emerging restorations." Seven case studies were examined: the Chesapeake Bay, Coastal Louisiana, Columbia River, Great Lakes, San Francisco Bay-Delta, South Florida Everglades and Upper Mississippi River. Interviews with seven people involved in the Chesapeake Bay or Everglades restoration programs provided additional information. All interviewees except for one became involved in restoration through study or recreation in the area. They believed that their ecosystem was important from local, national, and global perspectives. High-level elected officials, scientists, citizens, and reporters were all credited as responsible for restoration. Several factors which made restoration easier or faster were mentioned: dedication of individuals, leadership of high-level elected officials, continuation of signed agreements, appeal of the ecosystems themselves, public support of restoration, and measurable goals to be achieved within certain amount of time. Barriers to restoration included not enough funding, the difficulty in getting stakeholders to contribute to the process when they see few benefits, the tendency for people to believe that their actions contribute minimally to the problem, the lack of regulation of agriculture and other resource use, the difficulty in sustaining support for restoration over a long period of time, disagreements over the pace of restoration, logistical issues, and population growth and development. To move restoration forward, interviewees felt that more money, greater political leadership, more public engagement, more knowledge, and changes in the way land and water resources are used were needed. Successful restoration efforts were seen as being characterized by meeting specific ecological goals and sticking to legal and regulatory commitments. Most respondents felt they had some of the tools necessary to measure progress but needed more. Interviewees identified several lessons for other restoration programs: get support from high-level elected officials, science should guide restoration, scientists must come to a consensus before greater stakeholder consensus is achieved, all stakeholders must be included, and the public should participate in restoration projects. From this information, a conceptual model of the restoration process was developed based on the sequential steps of organizing, governing, planning, implementing, and accounting. The process is intended to be iterative, with a return to organizing after the final step of accounting has been completed. The authors then list several obstacles to obtaining authorization and funding for large-scale restoration projects from the Federal Government: there is competition among regional projects for funding so a political champion is needed, lead agencies must be identified before asking for funding, agency and public support must be obtained before political funding is sought, how the money will be spent must be identified before asking for funding, the legislation has a better chance of being approved if it is attached to larger bills and sent through the appropriate committees, the competition for funding among regional programs has led to inefficient use of funds, and funding is already being spent on basic programs which protect the environment so any attempt to fund regional programs could take money away from other areas. The authors conclude

that large-scale ecosystem restoration should become a national priority, restoration could transform human systems, and it is important to keep the goal of healthy ecosystems in mind at all times.

Whalen, P.J., Toth, L.A., Koebel, J.W., and Strayer, P.K., 2002, Kissimmee River restoration—A case study: Water Science and Technology, v. 45, p. 55–62.

The restoration of the channelized Kissimmee River in central Florida was initiated by the public. The public felt that channelization damaged the aesthetics of the river, as well as its ecological condition. Downstream river quality and loss of fish and wildlife habitat became issues. In 1988, reestablishing the ecological integrity of the river became the goal of restoration and a set of comprehensive guidelines and criteria were developed to meet that goal. Plans that did not meet all the criteria were not considered. The Kissimmee River Restoration Project will dechannelize some of the river, remove water control structures, establish a new river channel, acquire floodplains, and develop a new water release schedule. Evaluation of these projects is based on 60 performance measures. Generally, the project has enjoyed political support, but there have been conflicts over agriculture, development on floodplains, and the public's lack of trust in government. Navigation for small boats on the river is maintained in the plan as is maintenance of flood control. However, flood control is to be achieved through reestablishing floodplains and requires the purchasing of land from private landowners. Some landowners, particularly ranchers, were resistant to selling their land and pursued the matter in court. However, the Florida legislature took steps to ease the purchase of floodplain which mostly resolved the matter. Another problem arose when a feasibility study reveal that over 350 homes would be at risk from extreme flooding after restoration. Faced with stiff opposition, the plan was scaled back and less than 50 homes would now be at risk. The plan was also trimmed for cost reasons which resulted in the loss of around 26 square kilometers of restorable land. The authors provide ten recommendations for successful restoration projects (1) "establish a clearly defined and realistic goal early in the planning process," (2) "develop a solid scientific/technical basis," (3) "employ a decision analysis framework to ensure that limited resources are best directed toward established goals," (4) "develop rigorous criteria for achieving the established goal," (5) "thoroughly evaluate and integrate social, cultural, and economic issues and concerns in the planning process," (6) "place less emphasis on 'crisis management' and more emphasis on informed planning and research efforts," (7) "establish continuous lines of communication for educating the public, environmental organizations and support groups during all phases of the project," (8) "implement a well designed ecological evaluation program to document the success of the project," (9) "establish effective leadership," and (10) "implement integrated environmental management and restoration programs according to natural boundaries rather than political or jurisdictional boundaries."

Wyant, J.G., Meganck, R.A., and Ham, S.H., 1995, A planning and decisionmaking framework for ecological restoration: Environmental Management, v. 19, p. 789–796.

The authors argue that socioeconomic and ecological knowledge is necessary for successful ecological restoration. Ecological restoration is defined as "(1) the identification of ecologically and socially desirable ecosystem values, goods, and services, as determined through a number of scientific and public-input mechanisms; (2) identification of the functional and structural elements essential to a self-sustaining system that will provide those values; and finally, (3) facilitation of ecosystem recovery to a self-sustaining state by manipulation of the physical, biological, chemical, and even social or cultural elements of the system." Restoration goals are determined, in part, by

political and social demands and must be meaningful to the public. Choosing between these demands and balancing them with ecological goals is the challenge of restoration. The attitudes of stakeholders towards possible restoration outcomes must be considered at the beginning of projects, as must the costs and benefits and community goals related to those outcomes. Knowledge of stakeholders concerning the local ecosystem should also be determined and educational programs developed to fill in any gaps that exist. Risk assessment can be used to help determine which goals should be priorities. The authors note that when restoration projects fail, they can still be used to advance restoration science. They also suggest that the future context of a restoration should be considered in planning and prepared for.

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