WATERSHED INITIATIVES IN THE SKAGIT RIVER AND TILLAMOOK BAY WATERSHEDS: AN EXPLORATORY ANALYSIS OF PLANNING, IMPLEMENTATION, AND INTEGRATION

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Abstract

Watershed initiatives in the Skagit River and Tillamook Bay Watersheds:
An exploratory analysis of planning, implementation, and integration

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Watershed initiatives in the United States have grown substantially over the last decade, and due to several perceived benefits are likely to remain an important method of planning into the future. These efforts are receiving considerable federal, state, and local support; therefore, it is crucial that we understand how they are functioning and seek ways to maximize their effectiveness. One method of increasing this effectiveness is to reduce the vulnerability of watershed planning to significant drivers, such as environmental variation and change (e.g., climate impacts). This study involves an exploratory analysis of the planning, implementation, and integration of various watershed-wide planning efforts to provide preliminary information regarding how to best address climate impacts. Findings from this research show that the work of watershed initiatives and other stakeholders in the Skagit River and Tillamook Bay watersheds provides important opportunities to begin to confront these impacts. The initiatives and their partners are playing a valuable role in addressing watershed resource issues that were either previously unaddressed or addressed in a limited way. While these initiatives have made impressive progress and achievements, this research identified potential constraints to their ability to effectively respond to climate impacts, which included a lack of complete plan ownership, needs to strengthen adaptive management mechanisms, implementation barriers, variable levels of trust and leadership, conflicts, and variable levels of stakeholder and watershed integration. For

example, while many stakeholders believed watershed integration was improving, neither watershed was perceived as especially well integrated. Major barriers to furthering comprehensive watershed planning included politics, stakeholder relations, and diverse land use policies. In addition, the Skagit River watershed lacked a local facilitator. The Tillamook Bay watershed had such a facilitator, but issues of competition and confusion between the roles of local stakeholders need to be further resolved. The results of this research can be used to help develop a strategy to address climate impacts in these watersheds, to reduce the vulnerabilities of local resources and improve the effectiveness of planning and implementation.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

GLOSSARY

AF	Acre-feet
BLM	Bureau of Land Management
CAO	Critical Areas Ordinance
CCMP	Comprehensive Conservation Management Plan
CFS	Cubic feet per second
CIG	Climate Impacts Group
CSRI	Coastal Salmon Restoration Initiative
CZMA	Coastal Zone Management Act
ENSO	El Niño/Southern Oscillation
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
GMA	Growth Management Act
IFIM	Instream Flow Incremental Methodology
IRC	Implementation Review Committee
MGD	Million gallons per day
MRC	Marine Resources Committee
NEP	National Estuary Project
NFIP	National Flood Insurance Program
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NPS	National Park Service
NWSC	Northwest Straits Commission
ODA	Oregon Department of Agriculture
ODEQ	Oregon Department of Environmental Quality
ODF	Oregon Department of Forestry
ODFW	Oregon Department of Fish and Wildlife
ODWR	Oregon Department of Water Resources
OFM	Office of Financial Management
OPSW	Oregon Plan for Salmon and Watersheds
OWEB	Oregon Watershed Enhancement Board
PDO	Pacific Decadal Oscillation
PNW	Pacific Northwest
PPS	People for Puget Sound
PSAT	Puget Sound Action Team
PSE	Puget Sound Energy
RCW	Revised Code of Washington
SaSI	Salmonid Stock Inventory
SASSI	Salmon and Steelhead Stock Inventory
SCD	Skagit Conservation District

SCDEM	Skagit County Department of Emergency Management
SCDOH	Skagit County Department of Health
SCEA	Skagit Conservation Environmental Alliance
SCL	Seattle City Light
SCMRC	Skagit County Marine Resources Committee
SCOG	Skagit Council of Governments
SCPDS	Skagit County Planning and Development Services
SCPUD	Skagit County Public Utilities District #1
SMP	Shoreline Master Program
SRA	Salmon Recovery Act
SRFB	Salmon Recovery Funding Board
SRSC	Skagit River System Cooperative
SSHIAP	Salmon and Steelhead Habitat Inventory and Assessment Project
SWC	Skagit Watershed Council
SWPU	Samish Watershed Planning Unit
TBHEID	Tillamook Bay Habitat and Estuary Improvement District
TBNEP	Tillamook Bay National Estuary Project
TBWC	Tillamook Bay Watershed Council
TCCA	Tillamook County Creamery Association
TCPP	Tillamook County Performance Partnership
TCSWCD	Tillamook County Soil and Water Conservation District
TCWRC	Tillamook Coastal Watershed Resource Center
TEP	Tillamook Estuaries Partnership
TMDL	Total Maximum Daily Load
UGA	Urban growth area
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WAC	Washington Administrative Code
WAP	WAC 400-12 Watershed Action Plan
WSCC	Washington State Conservation Commission
WDFW	Washington State Department of Fish and Wildlife
WDNR	Washington State Department of Natural Resources
WDOH	Washington State Department of Health
WMC	Watershed Management Committee
WPA	Watershed Planning Act
WPM	Watercourse Protection Measures
WRIA	Water Resource Inventory Area
WWGMHB	Western Washington Growth Management Hearing Board

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INTRODUCTION

Watershed initiatives in the United States have grown substantially over the last decade, and due to several perceived benefits are likely to remain an important method of addressing natural resource issues into the future. These efforts are receiving considerable federal, state, and local support; therefore, it is crucial that we understand how they are functioning and seek ways to maximize their effectiveness. Within a watershed there are often many watershed-based efforts and these may address different issues, scales, and/or constituencies, and may or may not be coordinated. Due to variations within and between watersheds, there may be no universal rules for understanding the function and value of watershed initiatives, or for assisting their work. However, it is helpful to examine these variations to compare what may be working well and to identify various strategies to increase the effectiveness of these efforts.

The major focus of this study is an exploratory analysis of the planning, implementation, and integration of various watershed initiatives in the Skagit River and Tillamook Bay Watersheds (See Appendix I for watershed maps). Although an understanding of these elements could be used on many levels, the objective of this study is to provide preliminary information for entities wishing to help watershed initiatives and their stakeholders address impacts of environmental variation and change (e.g., climate) on watershed resources. The major questions regarding this objective are:

1) What are the various watershed initiatives in the Skagit River (WRIAs 3 and 4)[1] and Tillamook Bay Watersheds, and what basic information is needed to work with these groups?
2) What factors may influence the effectiveness of watershed initiatives, or their ability to address environmental variation and change impacts on watershed resources?

[1] WRIAs (Water Resource Inventory Areas) delineate watershed boundaries in the State of Washington, and were developed for management purposes under the Water Resources Act of 1971 (Chapter 90.54 RCW) through the Washington Department of Ecology (WDOE). There are 62 WRIAs in the State.

3) How could climate variation and change impact these watersheds?
4) What strategies might entities use to help these groups decrease the vulnerability of their planning and watershed resources to climate impacts?

A minor element of this study will be to examine the degree to which planning is integrated across watersheds—including the uplands, estuaries, and the coast—and consider the opportunities of further promoting this planning and management approach. The integration of all these features into one management framework could significantly increase the effectiveness of planning for important issues (e.g., salmonids, water quality, flooding) by improving the incorporation of drivers that operate across these areas, such as climate variability and change.

THESIS ORGANIZATION

This study begins by providing background information on watershed initiatives and climate variation and change. Chapter 1 defines watershed initiatives and describes their increasing popularity, the benefits and constraints associated with this type of decision-making, and the importance of critically evaluating these groups to ensure they are maximizing their effectiveness. This chapter also highlights the significance of climate variation and change to watershed processes and planning, and briefly discusses how various watersheds can be assessed regarding the relative importance of climate impacts specific to that area. Chapter 2 outlines the study framework and describes what components are used to evaluate the potential adaptability of watershed initiatives to climate impacts, and to a lesser degree describes how the sensitivity and vulnerability of watershed resources are evaluated. Data collection techniques, as well as limitations of the research design on analysis, are also noted. Chapter 3 describes why the Skagit River and Tillamook Bay watersheds were selected and provides basic information to give context for these areas. Results from the study are presented for the Skagit River watershed and the Tillamook Bay watershed in Chapters 4 and 5, respectively. Chapter 6 provides a discussion, which compares some of the basic strengths and potential

constraints on the effectiveness of initiatives in both the Skagit River and Tillamook Bay watersheds. Finally, Chapter 7 summarizes the watershed initiatives' strengths and potential constraints on effectiveness, provides preliminary recommendations for a strategy to address climate impacts in these watersheds, and discusses general lessons learned and questions posed from this analysis regarding basic watershed planning insights.

CHAPTER 1: BACKGROUND

WATERSHED INITIATIVES

1. What is a Watershed Initiative?

Watershed initiatives may be labeled differently throughout the country, and might be also known as watershed councils, partnerships, or groups. Their structure, size, composition, process, and purpose often also vary. However, these organizations generally have similar characteristics. Huntington and Sommarstrom (2000) defined watershed councils as "a group of people involved in a process that often combines: a) the watershed approach for managing natural resources, b) collaborative partnerships between the public and private sectors, c) a composition of diverse interests and individuals having an interest or stake in the watershed – stakeholders, d) a local, community-based location, and e) consensus as the basis for decision-making. Kenney (1999b) noted that many groups are voluntary, flexible, ad-hoc, lack independent powers, and have an informal structure and a self-defined mandate. Kenney continued to state that watershed institutions "commonly address water quality, species protection and recovery, environmental and socioeconomic sustainability, and related natural resource issues." Initiatives may vary between watersheds, and there may also be many within one watershed. Some of these efforts may be distinct and not well-coordinated, while others may have a higher level of integration.

Watershed initiatives are increasingly being recognized formally and affiliated with government processes and funding mechanisms. The popularity of the watershed approach among governments has been represented by support from the prior Clinton administration, the U.S. Environmental Protection Agency (USEPA), and more than 18 other federal agencies (McGinnis et al. 1999), as well as many states, including Oregon and Washington. As an example, Washington State passed the Watershed Planning Act

in 1998 (Chapter 90.82 RCW[2], ESHB 2514), which included state support for watershed groups addressing water quantity issues, along with requirements regarding organization structure and process. Therefore, some initiatives are more similar in structure and function due to programmatic requirements.

2. The Increase of Watershed Initiatives

The number of watershed initiatives in the United States has grown substantially over the last decade. The New Watershed Source Book stated that there are over 400 in the West alone (NRLC 2000). Many of these organizations have developed, in part, due to both a dissatisfaction with traditionally centralized natural resource management and a desire to increase local participation (Kenney 1999b). While there is optimism from both the government and public regarding the value of these organizations, studies are attempting to systematically evaluate their true effectiveness (Huntington and Sommarstrom 2000; WPP 2002; Bidwell 2003). Considering the growing investment in watershed initiatives it is crucial to evaluate methods to improve their impact.

3. Benefits and Constraints of Watershed Initiatives

The number of watershed initiatives has grown substantially because of several perceived benefits. For many natural resource issues the watershed unit is a much more appropriate scale to use than traditional political boundaries. This scale is thought to better address the "causal relationship between land use and land management activities on water quality and quantity" (Griffin 1999).

The participatory processes may also allow decision-making to be more in tune with specific local issues and resource conditions by increasing citizen awareness of environmental issues, consensus on resource management plans, and interagency

[2] http://search.leg.wa.gov/wslrcw/RCW%20%2090%20%20TITLE/RCW%20%2090%20.%2082%20%20CHAPTER/RCW%20%2090%20.%2082%20%20chapter.htm.

coordination (Durham 1999). One of the perceived results of this approach is that it can avert costly delays and litigation (Leach and Pelkey 2001). One study (Huntington and Sommarstrom 2000) reported more specific results. It found that most Oregon council restoration projects appeared beneficial to salmonids or to restoring stream processes. However, it was not proven that the work of these groups benefited overall watershed health or salmonid populations.

Concerns have been raised about the constraints of watershed initiatives and the true effectiveness of these organizations. Some issues include difficulties in defining appropriate scales at which to work (Griffin 1999), as well as challenges using the collaborative, participatory approach. As Kenney (1999a) noted, these groups are "not immune to bitter controversies, coercive behavior, and intolerable boredom." One study (WPP 2002) recognized that a large portion of the literature stated that these groups may be less likely to address controversial issues; however, the WPP's results found evidence to refute this idea. Although, the WPP provided a caveat that data were based on perceived impacts (i.e., subjective), which may be inflated. It seems that some problems are simply not amenable to consensus as well. This form of decision-making may "only work for a nonzero-sum game: that is both parties can come out ahead instead of one party coming out ahead" (Griffin 1999). The literature also highlights concerns with the general effectiveness of these groups. Evaluations of the watershed plans created by these groups have been shown to vary in quality (Huntington and Sommarstrom, 2000). Watershed initiatives were also often conducting projects (i.e., restoration) based on opportunity, not well-planned prioritization.

Despite the constraints listed above, many people feel that there is an appropriate role for watershed initiatives. Although some elements of natural resource management may be inappropriate for the watershed scale and collaborative process, many negative elements noted above can be addressed to improve success.

4. Critical Evaluation of Watershed Initiatives

As mentioned previously, a considerable amount of time, effort, and money is currently being invested on watershed initiatives. The State of Oregon, for example, provided more than $30 million to watershed groups in the 1999-2001 biennium (OFRI 2002). Given these significant investments, it is crucial to understand the "success," or effectiveness of these groups. However, evaluations have proved somewhat challenging because the true impact of these groups may be difficult to measure. Most groups are working on very complex issues that are affected by a myriad of factors (i.e., salmonid restoration), many of which are outside of the group's influence (i.e., fishing, climate, etc.).

Due to this challenge in effectiveness evaluation, researchers have attempted to focus instead on stakeholder perceptions and quality of products and programs. For example, Huntington and Sommarstrom (2000) conducted an evaluation of the ecological basis and effectiveness of restoration programs along with the structure, function, and planning processes of watershed groups. Leach (et al. 2002) analyzed stakeholder perceptions of the impacts of their groups and evaluated implementation of restoration, monitoring, and education and outreach projects.

ENVIRONMENTAL VARIATION AND CHANGE

The specific objective of this study is to provide preliminary information for entities wishing to help watershed initiatives and their stakeholders address impacts of environmental variation and change (e.g., climate) on watershed resources. Climate impacts may be important drivers in many watersheds, and should be assessed to determine appropriate methods to reduce the vulnerability of watershed resources and thereby increase the effectiveness of watershed efforts.

1. Climate Variability and Climate Change Impacts in the Pacific Northwest

Many of the issues addressed by watershed initiatives may be impacted by environmental variation and change. Climate processes can significantly affect watershed dynamics. The Climate Impacts Group (CIG) at the University of Washington and other climate research institutions have been studying the impacts of natural climate variability (e.g., El Niño/Southern Oscillation, or ENSO, and Pacific Decadal Oscillation, or PDO) and human-induced climate change on the resources of the Pacific Northwest (PNW) for several years. The ENSO has a warm phase (El Niño) and a cool phase (La Niña) driven by changing ocean temperatures in the equatorial belt of the Pacific Ocean[3]. ENSO is considered an inter-annual pattern (e.g., 16-18 months) and can cause changes in ocean and air temperatures, winds, and precipitation patterns around the world. PDO also produces variations in ocean temperature, but on an inter-decadal climate period (e.g., 20-30 year cycles) of alternating warm and cool phases. Climate change, driven by increases in atmospheric concentrations of carbon dioxide (CO_2) and other greenhouse gases, has led to a warming of global average surface temperatures by 0.7-1.5° F (0.4-0.8° C) over the 20th century. Pacific Northwest average temperatures appear on the high end of that increase at 1.5° F (0.8° C).

Both climate variability and climate change involve potential alterations to PNW precipitation, temperature, storm intensity, and sea-level. These changes can affect the region's mountain snowpack, river flows and flooding, forest and agricultural productivity, and quality and quantity of stream, estuarine, and near-shore habitat. These in turn can impact such issues as water availability, water quality, salmon abundance, and infrastructure – all of which relate to the sustainability of socio-economic, political, and legal processes.

[3] The following climate information was extracted from Whitely Binder 2002 and from the Climate Impacts Group website (http://www.cses.washington.edu/cig/).

A study of Washington State's Watershed Planning Program[4] found that while many watershed planning units recognized climate impacts as an issue, most addressed it as a lower priority (Whitely Binder 2002). Climate is often perceived as a problem of the future. Limited resources and funding restrict planning to what are considered the most current pressing issues. In addition, this study highlighted the potential limited flexibility of groups to adapt to climate impacts and identified possible natural, political/cultural, and administrative barriers to adaptation. Due to the significant influence of climate on watershed dynamics and resources, and because climate is often not addressed at the watershed level, it is important to develop strategies to improve the incorporation of climate information in order to reduce vulnerability to its impacts.

2. Sensitivity, Adaptability, and Vulnerability to Climate Impacts

Of course, it should be noted that not all watersheds or planning efforts will be equally affected by climate variation and change. The degree of climate impacts on resource management and relevant social institutions may be evaluated by determining the sensitivity, adaptability, and vulnerability of a system, which are defined by the IPCC (1995). Sensitivity is the degree to which a system will respond to a change in climate conditions. Adaptability refers to the degree to which adjustments are possible in practices, processes, or structures of systems to projected or actual changes of climate. Vulnerability defines the extent to which climate change may damage or harm a system; it depends not only on a system's sensitivity but also on its ability to adapt to new climatic conditions.

[4] Established by the Watershed Planning Act (Chapter 90.82 RCW, ESHB 2514).

CHAPTER 2: STUDY FRAMEWORK

This research provides preliminary information on the sensitivity, adaptability, and vulnerability of watershed resources and stakeholders to climate variability and change impacts. Two watersheds in the PNW were selected: the Skagit River watershed in Washington and the Tillamook Bay watershed in Oregon. The aim of this study is to provide information for developing strategies to reduce the vulnerability of watershed resources to climate impacts. In turn, these efforts will help increase the effectiveness of watershed initiatives addressing these resources. Due to the exploratory nature of these efforts, the main focus of this research is on adaptability. A lesser focus of the study is on the potential sensitivity and vulnerability of these watersheds. Table 1 summarizes the study criteria discussed below.

DESCRIPTION OF WATERSHED INITIATIVES

Basic organizational information for the watershed initiatives are outlined to guide those who are interested in assisting and improving their effectiveness. This portion of the research will specifically highlight elements such as the mission, focus, formation and structure, decision-making methods, and relevant laws and programs guiding action. Because the latter can be quite extensive, generally only the law and program that directly guide and support organizational formation are discussed.

ADAPTABILITY

The focus of this study is to identify factors that may affect the potential adaptability of watershed initiatives and their stakeholders to climate impacts. Because the general effectiveness of watershed initiatives has been increasingly questioned, it is important to start with an evaluation of this basic concept. If watershed initiatives do not have a basic level of effectiveness, it is unlikely that they can effectively respond and adapt to climate impacts. In addition to criteria evaluating this general effectiveness, the study will also

look at some attributes, which are thought to affect the ability of organizations and stakeholders to effectively respond to environmental variation and change, specifically. As noted previously, evaluations of the effectiveness of watershed initiatives have proved somewhat challenging because the true impact of these groups may be difficult to measure. Therefore, researchers have attempted to focus instead on stakeholder perceptions and quality of products and programs. Both of these components will be used in this study.

1. Evaluating General Effectiveness

General effectiveness of the initiatives is determined by evaluating planning attributes using criteria developed by Huntington and Sommarstrom (2000), the status of implementation, and additional components, such as the time since inception and level of trust and leadership.

Huntington and Sommarstrom (2000) conducted an evaluation of the ecological basis and effectiveness of restoration programs along with the structure, function, and planning processes of watershed groups. These researchers found that "better council processes tend to be associated with technically stronger conservation plans. In addition, councils with better planning processes were better at avoiding projects with low restoration value and at implementing projects with higher mean restoration value." The planning processes were evaluated using criteria for plan development, communication, and ownership/adaptability (Table 1).

In addition to evaluating the quality of planning, it is also important to determine the success of implementation. The planning evaluation criteria begin to touch upon implementation when considering plan ownership/adaptability; however, it is helpful to expand assessment of implementation further to perceive what has been successful and what have been barriers to implementation.

There are several other factors that researchers believe may impact general watershed initiative effectiveness. This study will focus on three factors. A study by Leach and Pelkey (2001) compiling "lessons learned" regarding watershed partnership effectiveness from 37 studies, found the top three recurring themes were the necessity of adequate funding, effective leadership and management, and interpersonal trust. A later study (WPP 2002), involving approximately 50 watershed case studies and these same researchers, found that trust, funding, and time since inception[5] were the most significant predictors of success. Bidwell (2003) also found that leadership (as well as number/diversity of interests) was identified as an important factor, which led to the completion of action plans within watershed councils in Oregon. Therefore this study evaluates trust, leadership, and time since inception as additional factors that may impact effectiveness. Funding is captured separately within evaluations of implementation.

2. Effective Response to Environmental Variation and Change – Conflict and Integration

In addition to general effectiveness attributes, this study will also focus on two factors, which may affect the ability of watershed initiatives to specifically respond to environmental variation and change – conflict and integration. The presence of major conflict and fragmented systems have been noted as potentially significant barriers to adaptability (Callahan 1997). Unresolved conflicts, such as those between fisheries, instream flow, and water rights, constrain the flexibility of managers in the Columbia River Basin and fragmentation means that there is no single authority which can prioritize water uses. Of course, not all conflict causes negative impacts. WPP (2002) found that ideological conflict is "positively related to social capital building, and may have a positive impact on agreements, restoration projects, and monitoring." However, while it is likely that some conflict is good, and only specific conflicts may pose barriers

[5] Most studies reported that watershed partnerships often took four years to reach major multiple milestones. Therefore, those initiatives less then four years old will be highlighted.

to adaptability, all conflict needs to be documented. Understanding conflict is also important for determining how and with whom partnerships may be formed to address watershed resource issues, such as climate impacts.

In addition, Young (2002) discusses the influence of "fit, scale, and interplay" on the ability of institutions to respond effectively to environmental variation and change. Due to the limited nature of this thesis, the focus will be on the latter. Interplay may be especially important because of multiple initiatives in each watershed. Young found that "in complex societies, institutional interplay is common, and the resultant interactions can be expected to loom large as determinants both of the performance of individual institutions and of their robustness or durability in the face of stresses or pressures for change (Young 2002)." Young notes that both horizontal and vertical interplay are important components. Horizontal interplay involves the same level of social organization and vertical interplay involves cross-scale interactions, or different levels of social organization. Vertical interplay is important to account for local knowledge and the rights and interests of local stakeholders, while incorporating higher social organizations to address more regional or global ecosystem dynamics and allowing for increased efficiency. Horizontal interplay can address solving problems or enhancing cooperation of separate entities to promote the common good.

Young also discusses both within (or intra) and between (or inter) horizontal interplay. An example of intra-horizontal interplay could be represented by two stakeholders acting together to institute salmon habitat restoration projects in a watershed, and inter-horizontal interplay would be how efforts addressing salmon habitat and water quality efforts may relate. Vertical interplay may be represented by how the salmon habitat restoration work in one watershed is nested within salmon recovery efforts at the Evolutionary Significant Unit (ESU), or regional level. This evaluation focused on identifying mechanisms facilitating intra-horizontal, inter-horizontal, and vertical

interplay. Mechanisms for horizontal interplay identified, and their effectiveness is discussed. However, it was outside the scope of this research go beyond simply identifying vertical interplay mechanisms, because it is especially difficult to assess their effectiveness without conducting an organizational evaluation of the parent or top organization. Although, some information collected during interviews and literature reviews allowed limited insights regarding this level of interplay.

A minor element of this study involves examining a general goal of watershed planning – integration across the landscape, including the uplands, estuaries, and the coast. While the original intention of watershed initiatives are to accomplish this integration, it is likely difficult to implement due to numerous reasons, including the diversity of stakeholders, size of the watershed, or simply a lack of resources. Because the effects of climate variability and climate change will operate across these areas, resulting at least partially from coupled hydrologic regimes, a lack of integration may be a barrier to addressing climate impacts comprehensively.

SENSITIVITY, ADAPTABILITY, AND VULNERABILITY

These components were evaluated by gathering stakeholders perceptions on the sensitivity, adaptability, and vulnerability of watershed resources to both climate variation and climate change. Interview questions were guided by the research of Callahan (1997) and Whitely Binder (2002). In addition, information was collected on potential sensitivity and vulnerability indicators developed by Whitely Binder (2002).

Table 1 Study Elements Used in Evaluation of Watershed Initiatives and Stakeholders

STUDY ELEMENTS	
Adaptability - General Effectiveness	Planning attributes (Huntington and Sommarstrom 2000) Plan Development 1. Date Plan(s) adopted by group, and date of updates 2. Use of joint fact finding to determine problems and potential solutions 3. Use of scientific input (scientists with local knowledge, appropriate scientific expertise, and any independent external review); any disagreements with science? Plan Communication 1. Goal, objectives, strategies, and tasks clearly stated. Plan understandable by non-technical participants 2. Access to Plan and supporting documents; publicity of availability Plan Ownership and Adaptability 1. Ownership of Plan (who is advocating plan and implementation?); and is lack of complete ownership a problem? 2. Adaptive Management – what changes have been made based on experience and monitoring?
	Implementation status and barriers
	Age since inception (<4 yrs), trust, and leadership (Leach and Pelkey 2001)
Adaptability - Effective Response to Environmental Variation and Change	Presence of conflict (Callahan 1997)
	Intra- and inter-horizontal and vertical interplay (Young 2002)
	Watershed integration (uplands to nearshore)
Sensitivity, Adaptability, and Vulnerability	Climate effects on watershed processes, conflict, and approach to management; flexibility of decision-making to climate impacts; and vulnerability of watershed resources to climate impacts (Callahan 1997 and Whitely Binder 2002) Nominal watershed characteristics for evaluating sensitivity, adaptability, and vulnerability (Whitely Binder 2002)

DATA COLLECTION TECHNIQUES

Information for this study was collected through stakeholder interviews, document search, and website review. Interviews were conducted in Summer and Fall 2004 with selected representatives of the watershed initiatives and with additional stakeholders key to watershed planning and implementation. The latter interviewees were selected by characteristics such as: whether they were involved in parallel efforts of watershed planning and implementation, engaged in the work of the watershed initiatives, and/or major government landowners. Interview methodology included the use of elite and semi-structured interviewing techniques (Dexter 1970; Fontana and Frey 1994; Kvale 1996). A questionnaire was developed to guide interviewing (Appendix II) and was pre-tested. Interviews generally lasted between forty-five minutes and one and a half hours.

In the Skagit, representatives from four watershed initiatives and eight additional stakeholders were interviewed (Table 2). In the Tillamook, represents from two initiatives and six additional stakeholders were interviewed. There were occasionally multiple respondents for an organization, due often to a request by the originally selected interviewee to speak with others that may be better able to answer certain questions (noted in parenthesis in Table 2). Additional respondents generally only provided information for portions of the interview questions.

Interviewee Category	Skagit River Watershed	Tillamook Bay Watershed
Watershed Initiative	Skagit Watershed Council Skagit Conservation Education Alliance Skagit County Marine Resources Committee Samish Watershed Planning Unit	Tillamook Estuaries Partnership Tillamook Bay Watershed Council
Additional Stakeholder	Skagit Conservation District Skagit County Department of Public Works (2) Skagit County Department of Emergency Management Skagit Fisheries Enhancement Group (3) Skagit River System Cooperative (2) Seattle City Light (2) U.S. Forest Service – Mount Baker-Snoqualmie National Forest National Park Service – North Cascades National Park Complex	Tillamook County Department of Community Development Tillamook County Emergency Management Office Tillamook County Soil and Water Conservation District Tillamook Bay Habitat and Estuary Improvement District Oregon Department of Forestry – Tillamook State Forest (4) Bureau of Land Management – Tillamook Resource Area (3)
Total	4 Initiatives + 8 Additional Stakeholders = 12	2 Initiatives + 6 Additional Stakeholders = 8

Table 2 List of Watershed Initiatives and Additional Stakeholders Interviewed
The number of individuals who provided information from each stakeholder organization is noted in parenthesis.

REPORTING RESULTS AND DATA LIMITATIONS

This research was conducted under a University of Washington Human Subjects exemption; therefore, all interviewee responses are reported anonymously. These requirements have resulted in some limitations on reporting, due to the fact that responses must be aggregated so that identification of individuals is not possible. Attempts to mitigate these limitations included synthesizing views as reliably and systematically as possible. Outlying responses are also shared to reflect upon variability provided. Information extracted from public documents and websites was directly attributed to watershed initiatives and stakeholders.

There are additional limitations due to the design and scope of the study. Each watershed initiative does not have an equal number of additional stakeholders who were able to provide information regarding that initiative. As noted above, additional stakeholders were selected because they were key players and not necessarily because of their representation on the watershed initiatives. In addition, due to the limited number of interviews in each watershed it is possible that some issues and potential responses were not identified. This is especially important to consider when making comparisons between watersheds. If an issue was raised in one watershed and not in the other, it should not be assumed that that issue does not exist in the latter watershed. Also, watershed initiatives in the selected watersheds may not be representative of efforts that are occurring in other watersheds in the state, which also limits comparisons between Washington and Oregon.

CHAPTER 3: STUDY AREAS

SELECTION OF PILOT WATERSHEDS

This study evaluated watershed initiatives in two coastal watersheds, the Skagit River Watershed (WRIAs 3 and 4) in Washington and Tillamook Bay Watershed in Oregon. These areas were selected because of the diverse resources and activities that may be affected by climate impacts. Both watersheds include the following elements: 1) coastal watersheds with estuaries, 2) several significant salmonid runs, 3) mixed land uses (e.g., agriculture, forestry, and urban/suburban), 4) water quality concerns, 5) water use conflicts, and 6) flooding problems. One watershed was chosen in each state in order to conduct preliminary comparisons of state efforts. The descriptions below provide basic information on the watersheds to provide context for the study. Information more specific to climate impacts was also collected for each watershed and is discussed later (Appendix IV).

DESCRIPTION OF SKAGIT RIVER WATERSHED (WRIAS 3 AND 4)

The Skagit River is 162 miles long, drains 3,140 square miles (~1.7 million acres), and is the largest watershed in the Puget Sound basin (Figure 1). It accounts for approximately one-third of the freshwater flowing into the Sound (WDOE 2004a). The river also represents the sixth largest drainage on the west coast of the contiguous United States. The watershed is located between Seattle, Washington and Vancouver, British Columbia, and spans Skagit, Snohomish, and Whatcom Counties, as well as approximately 28 miles into Canada. The Skagit runs from the Cascade Mountains[6], through low-lying valleys, then the delta, and empties into Skagit Bay. The major tributaries are the Sauk, Suiattle, Baker, and Cascade Rivers. Discussions of the Skagit River watershed usually also include the small watersheds to the north, Samish River (140 square miles) and Padilla Bay (36 square miles). It is likely that the Skagit River had at times flowed to these

[6] The highest elevation is Mount Baker (10,770 feet; 3,285 meters).

northern bays, but now only empties into Skagit Bay due to diking and land development (SWC 2004a). Together these watersheds are designated as WRIAs 3 and 4, which are the geographical units evaluated in this study, and will be referred together in this paper as the Skagit River watershed.

Much of the populated areas of the watershed are located in Skagit County, which contains approximately 106,700 people (Skagit County 2003b). The most concentrated areas are in the lower basin below the confluence of the Sauk River and the population centers are Mount Vernon and Sedro Woolley. The county is experiencing a rapid growth rate due to those seeking retirement and recreational opportunities, and its location between two metropolitan counties (Skagit County 2003a). The upper watershed is generally undisturbed and protected, and lies within the North Cascades National Park Complex and Pasayten Wilderness Area in the United States and Skagit Valley Provincial Park and Manning Provincial Park in Canada. The upper and middle watershed are generally comprised of forested lands, while the lower is dominated by agricultural land use. Members of the agricultural community are considered to be important and influential players in this watershed.

Some additional significant stakeholders include, Seattle City Light (SCL), which owns and manages three hydropower dams (Ross, Diablo, and Gorge) along the upper mainstem of the Skagit, above what is considered to be a natural barrier to anadromous fish migration. This hydropower project was re-licensed by the Federal Energy Regulatory Commission (FERC) in 1995 and certified as a "Low Impact Project" by the Low Impact Hydropower Institute in 2003[7]. Puget Sound Energy (PSE) also operates two hydropower dams in the Baker River. There are four federally recognized tribal groups in the watershed (Swinomish Indian Tribal Community, Sauk-Suiattle Indian Tribe, Upper Skagit Tribe, Samish Indian Nation), plus additional tribes that claim "usual

[7] http://www.lowimpacthydro.org/

and accustomed" fishing rights in portions of the watershed. In addition, the two largest water suppliers in the County are the City of Anacortes and the Skagit County Public Utilities District #1 (SCPUD).

This watershed has been recognized both locally and nationally as an important area. A portion of the Skagit River was designated as a Wild and Scenic River in 1978. The Padilla Bay was also designated as a National Estuarine Research Reserve in 1972. The watershed provides significant habitat for wildlife, including salmon, shellfish, and birds. Commercial and recreational harvesting of shellfish is important in this area and Padilla Bay contains one of the largest eelgrass habitats on the Pacific Coast (PB/BVWMC et al. 1995). In addition, Padilla Bay and Samish Bay provide habitat for one of the largest known wintering populations of peregrine falcon in North America (PB/BVWMC et al. 1995). The Skagit also provides habitat for one of the largest wintering populations of bald eagles in the lower 48 states, and the Skagit delta provides habitat for 80 percent of wintering waterfowl in western Washington (MBSNF 2001).

The Skagit is the only river in Washington that supports all five species of wild Pacific salmon.[8] Biologists have identified six stocks of Chinook salmon in the watershed: upper Skagit mainstem and tributary summer; lower Skagit mainstem and tributary fall; lower Sauk summer; upper Sauk spring; Suiattle spring; and upper Cascade spring (SCL 2003). The Skagit also supports the largest runs of chum and pink salmon in the continental U.S., the largest population of native char (bull trout and Dolly Varden) in Puget Sound, and likely the largest population of bull trout in the state, as well as sizable runs of coho, sockeye, and steelhead salmon (SCL 2003). The Skagit was historically the most productive basin for salmonids in Puget Sound and it retains that distinction today. Currently it is estimated that this river produces 30% of Puget Sound salmonids (WSCC 2003), and 50% of Puget Sound Chinook. Puget Sound Chinook and bull trout were

[8] http://www.sharedsalmonstrategy.org/watersheds/watershed-skagit.htm

listed as threatened under the Endangered Species Act in 1999. The major factors responsible for decline of salmonid production in freshwater include: increased landslides from timber harvest and road building on unstable slopes causing sedimentation, loss of floodplain and wetland habitat, dams which control river flows, nutrient enrichment, and high levels of lead and copper (WSCC 2003). Due to diking and land development, approximately 72% of the historic tidal marsh habitat in the Skagit River delta has been lost (SWC 2004a). In addition, upstream of the delta, 32 miles (62%) of the mainstream channel edge contains riprap or diking. The Skagit River System Cooperative (SRSC) and others have conducted research over the last ten years, which has found that conditions in the Skagit estuary are limiting the production of delta-rearing chinook (SWC 2005).

Several streams and sloughs in the watershed contain segments, which are listed on the 303(d) list, generally due to fecal coliform, temperature, and dissolved oxygen violations (SWC 1998). The sources of these water quality concerns include point sources such as sewage and water treatment plants, and non-point sources such as agricultural practices, forest management practices, urban runoff, highway runoff, inadequate septic systems, landfills, wild animals, and birds (SWC 1998). Water quality and biological conditions have resulted in impacts on some beneficial uses, including domestic water supply, anadromous fish, wildlife, primary and secondary recreation, sport fishing, and aesthetic enjoyment (PB/BVWMC et al. 1995). The Samish Bay has also experienced shellfish bed closures. Temperature (WDOE 2004a) and fecal coliform (WDOE 2000a) Total Maximum Daily Loads (TMDLs) have been established for the lower Skagit River.

Flooding is a significant issue in the Skagit River area. The average annual precipitation ranges from less than 80 in the lowlands to over 140 inches in the mountains (WSCC 2003). The Skagit area received over $50 million in damage from the floods of 1990 and

1995 (~150,000 cfs)[9]. Flooding threatens urban areas, agricultural lands, major transportation corridors (Interstate 5, Route 20, and Burlington-Sante Fe Railroad), and ecosystem structures, functions, and processes.

[9] http://www.skagitcounty.net/Common/Asp/Default.asp?d=PublicWorksSalmonRestoration&c=General&p=main.htm

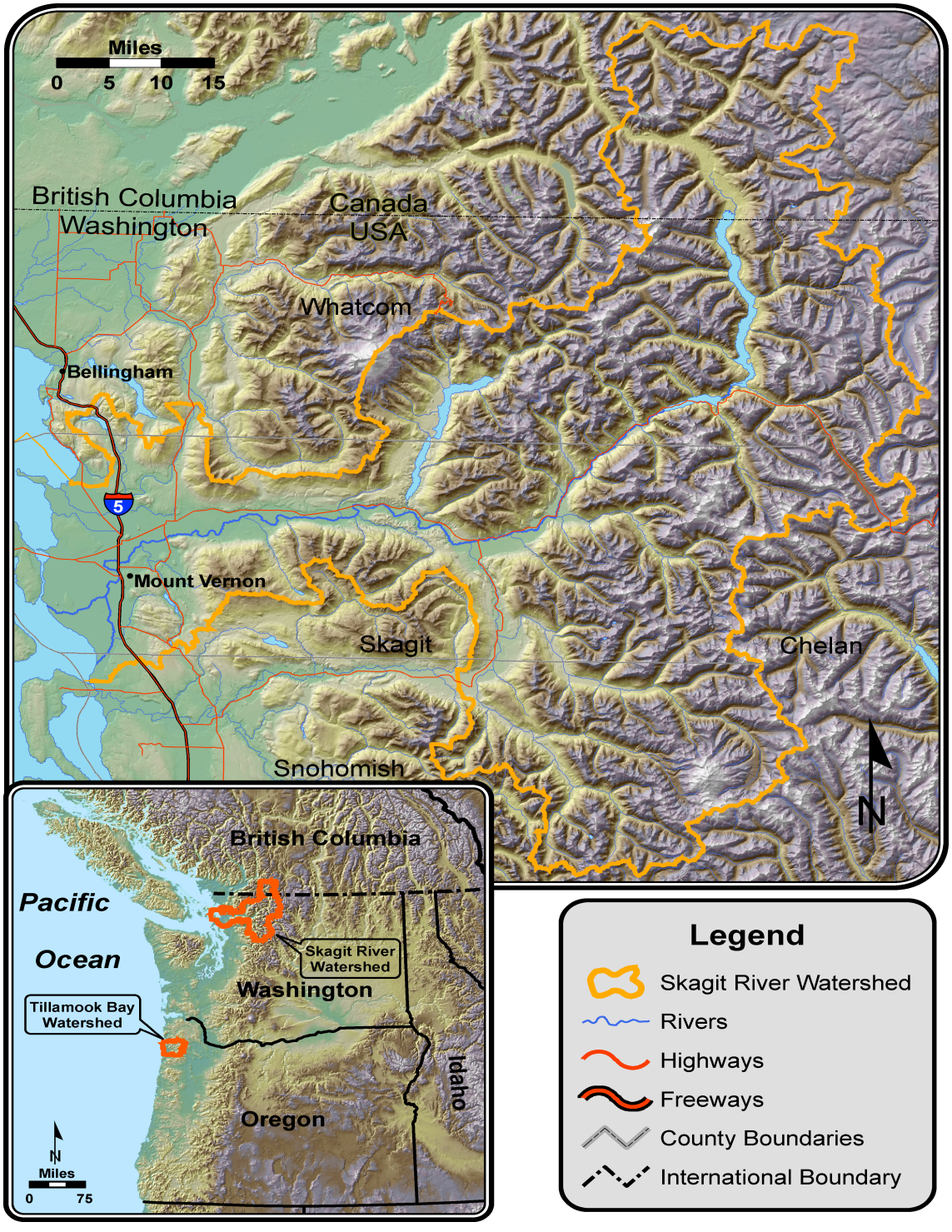

Figure 1 Map of the Skagit River Watershed (WRIAs 3 and 4)
(Map by Robert Norheim/Climate Impacts Group 2005)

DESCRIPTION OF TILLAMOOK BAY WATERSHED

The Tillamook Bay watershed drains 597 square miles, or 364,800 acres (Figure 2). It is located within Tillamook County on the Oregon coast, almost directly west of Portland. Its five major tributaries are the Tillamook, Trask, Wilson, Kilchis, and Miami Rivers. Tillamook Bay is Oregon's second largest estuary at 13 square miles, although it is shallow averaging only six feet deep. The watershed is characterized by a rugged, low mountain range and narrow coastal plain, and is composed of 89% forest land, 6.5% agriculture, 1.5% urban or rural and 3% water (TBNEP 1999). A large portion of the forest land is part of the Tillamook State Forest, managed by the Oregon Department of Forestry (ODF). Tillamook Bay estuary was nominated by local citizens and the Governor to the USEPA's National Estuary Program in 1992, and was established as a National Estuary Project (NEP) in 1994.

There are approximately 24,600 people living in Tillamook County.[10] The major towns are Tillamook, Garibaldi, and Bay City. The primary industries are dairy farming (95% of Oregon's cheese is produced in the County), logging, commercial fishing, and tourism; although, significant sources of income are also derived from transfer payments (TBNEP 1999). Tillamook County's per capita income is below both the state and U.S. averages.

A local planning process initiated by the NEP identified salmon habitat loss and simplification, water quality, erosion and sedimentation, and flooding as the top issues of concern for the watershed (TBNEP 1999). Five species of anadromous salmonids use the estuary and watershed, including Oregon Coast coho salmon, which are being considered for listing as threatened under the Endangered Species Act. In 1998, the Wilson River produced more juvenile Chinook salmon than any other monitored river in coastal Oregon (TBNEP 1999). Declining salmon runs have been attributed in the past to poor

[10] http://www.co.tillamook.or.us/gov/default.htm

logging practices, forest fires, and development. Regarding other wildlife, Tillamook Bay has important recreational and commercial shellfishing areas, and was rated by Oregon Department of Fish and Wildlife (ODFW) as a premier area for these activities (TBNEP 1999). In addition the area is important habitat for waterfowl and shorebirds.

The Tillamook Bay watershed contains many stream reaches that do not meet water quality criteria for bacteria or temperature, and exceed recommended concentrations for suspended solids. In addition, commercial shellfish beds have experienced closures due to high levels of fecal coliform bacteria. A temperature and bacteria TMDL was developed in 2001 for this basin (ODEQ 2001).

Regarding erosion and sedimentation, while current and past land use activities have contributed to this degradation, historic forest fires have also left a significant legacy. The Tillamook Burn, a series of forest fires that burned over 300,000 acres between 1933 and 1951, and subsequent salvage logging significantly impacted the watershed resulting in habitat degradation and serious sedimentation.

The watershed has also experienced significant flooding throughout its history. Average rainfall ranges from 90 inches in the lower basin to 200 inches/year in the upper basin. Such flooding has resulted in millions of property damage, which lead to the designation of the Tillamook as a Project Impact "disaster resistant" community.[11] This designation allows Federal Emergency Management Agency (FEMA) to provide money to the county to minimize and prevent future damage.

[11] http://www.co.tillamook.or.us/gov/emgmgnt/Dem-Project-Impact.htm.

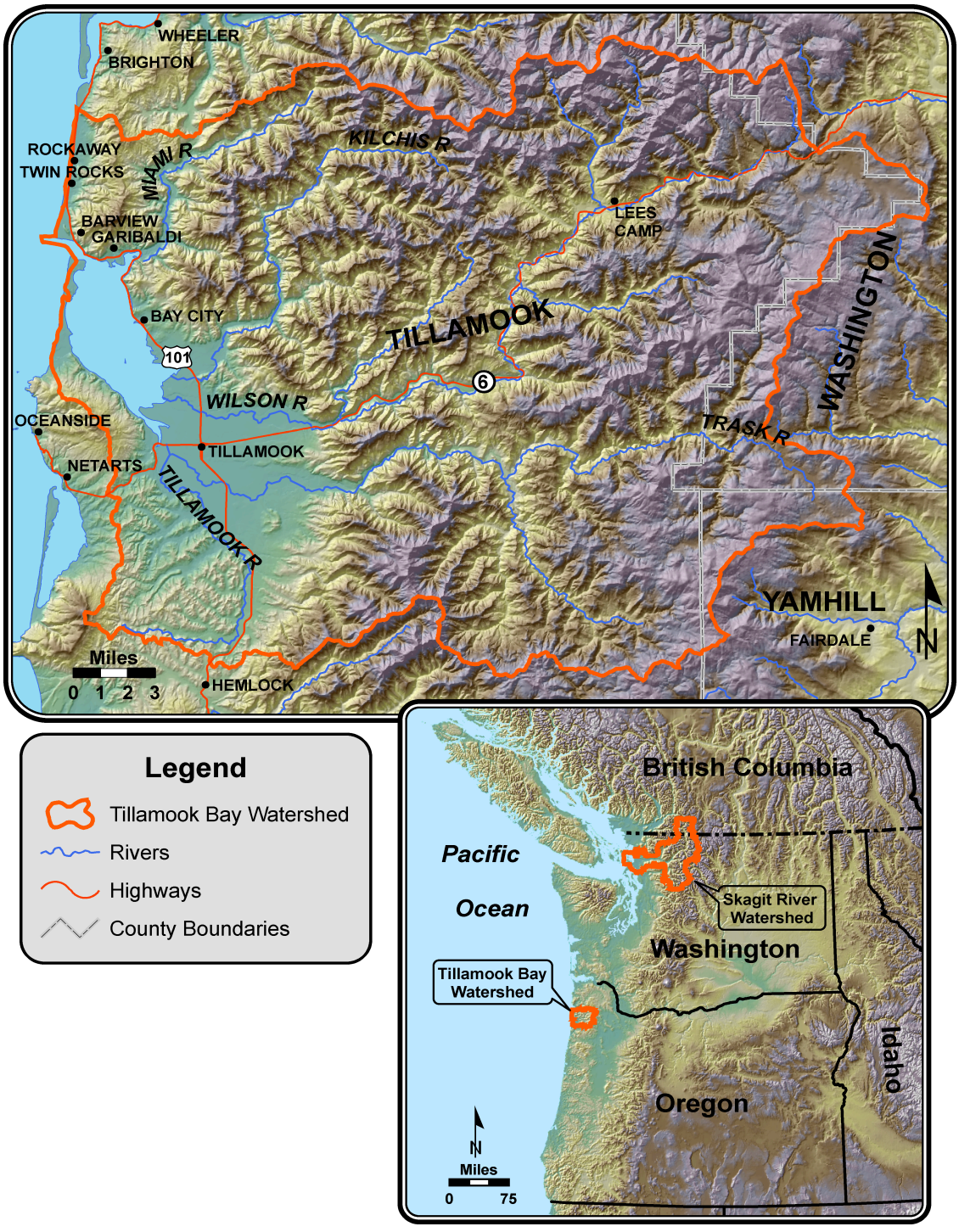

Figure 2 Map of the Tillamook Bay Watershed
(Map by Robert Norheim/Climate Impacts Group 2005)

CHAPTER 4: RESULTS - SKAGIT RIVER WATERSHED

DESCRIPTION OF WATERSHED INITIATIVES

In addition to the descriptions below, more organizational information (e.g., activities, formation and structure) is provided in Appendix V. Further details on the watershed planning legislation, programs, and mechanisms (e.g., Washington's Watershed Planning Act) noted below that support these initiatives are also provided in Appendix III.

1. Skagit Watershed Council

The Skagit Watershed Council (SWC) is a non-profit organization whose mission is to understand, protect and restore the production and productivity of healthy ecosystems in order to support sustainable fisheries. In order to address this mission, the SWC "supports and endorses voluntary restoration and protection of natural landscape processes that formed and sustained the habitats to which salmon stocks (as well as other native aquatic and riparian dependent species) are adapted."[12] This work is accomplished through collaboration, technical assistance, and education. The group has also been designated as the Lead Entity for WRIAs 3 and 4, under the Washington State Salmon Recovery Planning Act (ESHB 2496, RCW 77.85[13]), and is therefore responsible for submitting a habitat restoration project list to the Salmon Recovery Funding Board (SRFB). It should be noted though that SWC was formed before this designation.

Interviews revealed that work done prior to this group's formation in 1997 was considered well-intentioned, but relatively ineffective.[14] Therefore, the purpose of creating the SWC was to improve coordination and the quality of restoration projects. Some of its most important tasks are getting agreement on a strategy which focuses on

[12] http://www.skagitwatershed.org/
[13] http://www.leg.wa.gov/RCW/index.cfm?fuseaction=chapterdigest&chapter=77.85
[14] Responses from interviews did not expand on who was conducting this work or how it was being accomplished.

landscape processes, better understanding how the system functions and the needs of the community, and building partnerships. While SWC's long-term strategy focuses on a multiple species approach, the top priority target species for this group is wild Skagit Chinook, which are classified as threatened under the Endangered Species Act (ESA) and depressed in Washington's 2003 SASSI/SaSI (SWC 2004d)[15]. The second-tier priority target species are bull trout, Suiattle River Chinook (both threatened under ESA), and Skagit River winter steelhead populations (depressed in SASSI/SaSI), and third-tier priority species are all other anadromous salmonids. This group does not generally address issues of harvest, hatcheries, or hydropower.

2. Skagit Conservation Environmental Alliance

The Skagit Conservation Environmental Alliance (SCEA) is a non-profit organization whose mission is to "bring people together in the spirit of cooperation to protect, conserve, and enhance the natural ecosystems in the Skagit Watersheds." This group addresses water, soil, and related natural resource concerns, but generally focuses on water quality and non-point source pollution. It is also involved in shellfish protection and geoduck cultivation projects. Through alliance-building, and support of research, education programs, and community projects, SCEA engages local citizens and brings agencies and citizens together. SCEA attempts to inspire participation, decrease duplication, and coordinate sharing of staff and technical expertise.

This group also facilitates the activities of the Implementation Review Committee (IRC). The role of the IRC is to evaluate the status and results of the Samish, Padilla, and Nookachamps WAC 400-12[16] Watershed Action Plans (WAPs) (NWMC et al. 1995; PB/BVWMC et al. 1995; SWMC et al. 1995); to recommend revisions to the plans as

[15] The Salmonid Stock Inventory (SaSI), previously known as the Salmon and Steelhead Stock Inventory (SASSI), is a cooperative product of Washington Department of Fish and Wildlife (WDFW) and the tribes, which identifies and monitors the status of Washington's salmonid stocks. Wild stocks are classified as healthy, depressed, critical, unknown, or extinct.

[16] http://www.leg.wa.gov/WAC/index.cfm?fuseaction=chapterdigest&chapter=400-12

needed; to monitor implementation of the plans; to provide public outreach and education; and to evaluate the need to re-rank the 1988 Skagit County Watershed Ranking Report (Skagit County 1988). The WAPs were published in 1995 and undergo review after five years. This first IRC published a status report in 1999 (IRC 1999). The second IRC, which generally includes the same participants as the first, formed in Spring 2003 to begin the next review process and was still meeting in the Spring of 2005. Formation of the SCEA to coordinate these reviews was one of the action tasks of each WAP.

3. Skagit County Marine Resources Committee

The purpose of the Skagit County Marine Resources Committee (SCMRC) is to discuss marine related issues and determine action items to enhance and protect local marine habitat. While this group focuses on marine resources, as opposed to watershed resources, it was selected because marine resources are also affected by upland and shoreline uses and processes. In addition, the work of the SWC and SCEA both involves marine components, including salmon and shellfish resources. It is important to see how these type of community-based groups interact with each other because of overlapping issues and shared impacts affecting these systems.

SCMRC is one of seven MRCs, guided and supported by the Northwest Straits Commission (NWSC) and formed to address marine resource issues in Northern Puget Sound. The SCMRC was established by Skagit County resolution (Resolution #17433; SCBOC 1999). This resolution stated that "despite the considerable research and regulatory efforts, previous efforts have failed to protect natural habitats and fish and wildlife populations adequately within these waters." The SCMRC initiates activities in the North Bays of Skagit County such as, selecting candidate marine protection areas for rocky reef bottomfish habitat; re-establishing the native Olympia oyster; removing invasive Spartina; inventorying beaches for signs of forage fish habitat; removing derelict

fishing gear; developing nearshore restoration projects; and planting the non-indigenous Pacific oyster. A key task of this group is to involve and educate the public about these issues. Much of the SCMRC's work is guided by performance benchmarks established by the Northwest Straits Commission.[17]

4. Samish Watershed Planning Unit

The Samish Watershed Planning Unit (SWPU) was formed as a result of the availability of funding from the Washington State Watershed Planning Act (Chapter 90.82 RCW[18], ESHB 2514). This group chose to address water quantity and instream flows for the Samish River (WRIA 3). The Samish was chosen because it was thought that this watershed could be used as "test case" for other watersheds in WRIAs 3 and 4, which did not have instream flows already designated by the WDOE. The SWPU is now considered defunct because it could not reach consensus on the inclusion of an instream flow recommendation during 2003 in the Draft Samish River Management Plan. An analysis of natural flows in the Samish River indicated that instream flows recommended by biologists are met only infrequently, particularly during the summer months. This finding would potentially close off the ability to allocate additional out-of-stream diversions. However, it should be noted that existing water users could not be affected by these decisions and a "water rights analysis showed only moderate current use and limited future needs" (WDOE 2005). There were also some differences of opinion regarding the mitigation strategies proposed.

This inaction resulted in the abdication of the development of instream flows to WDOE; although WDFW and the local co-managers (e.g. Upper Skagit Indian tribe, Swinomish Indian Tribal Community, and Sauk-Suiattle Indian Tribe) are still involved in drafting the proposed rule. In addition, WDOE will be working with counties and utilities to

[17] The NWSC performance benchmarks can be found at http://www.nwstraits.org/benchmarks.html.
[18] http://www.leg.wa.gov/RCW/index.cfm?fuseaction=chapterdigest&chapter=90.82

develop reliable sources of water, including water-storage facilities, conservation and efficiency measures, water reuse and reclamation efforts, and the establishment of trust water-right programs to ease leasing, purchasing, or donating existing water rights and saved water.

There was no prior history of water quantity planning in the Samish River watershed. However, an instream flow rule for the Skagit River was adopted by WDOE in 2001 through a separate process (Chapter 173-503 WAC) [19]. This rule has recently been contested (see Conflict Section), and WDOE is developing an amendment to the Skagit instream flow under a court-sanctioned schedule.[20] This amendment should be adopted by mid Summer 2005, if there are no significant changes. WDOE has also submitted a proposal for rule-making for the Samish River (Chapter 173-503A WAC) [21]; however, they will wait to finalize the Samish rule until after the Skagit amendment has been adopted. Final language is expected to be filed in late July 2005. It is undetermined whether the SWPU will reform and finish the plan due to the impasse, as well as a lack of funds.

GENERAL EFFECTIVENESS

1. Planning Attributes

Plans of the watershed initiatives below were evaluated by the author of this study based on criteria for plan development, plan communication, and plan ownership and adaptability, developed by Huntington and Sommarstrom (2000).

[19] http://www.leg.wa.gov/wac/index.cfm?fuseaction=chapterdigest&chapter=173-503
[20] http://www.ecy.wa.gov/programs/wr/instream-flows/skagitbasin.html
[21] http://www.ecy.wa.gov/laws-rules/activity/wac173503a.html

Skagit Watershed Council

Plans evaluated – Habitat Protection and Restoration Strategy (SWC 1998), Application of the SWC's Strategy (SWC 2000), Strategic Approach (SWC 2004d and SWC 2005); only the Strategic Approach has been updated (the first version was produced in 2002)

Based on results of interviews, the SWC strategic plan raised the bar for restoration, and incorporated a more thorough focus on components of the whole system. Plan development was good, with a high level of joint fact finding and scientific input. Development of the plan was guided by the Habitat Restoration and Protection Committee, which was generally composed of local and regional scientists, industry, and non-profit representatives. Scientific papers were distributed among reading groups of this committee and synopses were presented once a month during the planning stage. While direct community input (as compared to that from member and technical advisors) into the Strategy and Application appears low, after development of these documents the SWC has hosted forums to gain public input. The specific purpose of these events was to address landowner interest in participating in salmon recovery, and explore landowner ideas on problems and solutions (SWC 2002). Regarding original plan formation, it was noted that initially there was some disagreement over the science, but the group was able to come to a level of agreement necessary to move forward. The plan was also peer-reviewed using scientists from outside the watershed.

Plan communication was also good. Goals and objectives were clearly stated, and all major documents were on the SWC website. On occasion some terms and concepts in the documents may have been too complex for non-technical readers, but generally the understandability was good.

Plan ownership and adaptability were also good, but could be improved relative to certain stakeholders. The work of many members appeared to be well aligned with the plan.

However "on its own, the Council has not yet been able to garner significant support and participation from agricultural landowners and if (they) are unable to change that over the next few years (they) will be greatly impeded in what (they) are able to accomplish" (SWC 2002). In addition, it appeared that the salmon restoration efforts conducted by Skagit County were not highly aligned with the SWC. One interviewee noted a strained relationship between the SWC and the County.

The SWC had an adaptive management program, and stated that it will revise its major documents based on new information. The SWC Strategy noted that each project monitoring plan "should be linked to the SWC's overall habitat protection and restoration strategy to ensure 'feedback' for adaptive management (SWC 1998)." While the Strategy and Application have not been updated yet, each year the SWC revisits the target areas of its Strategic Approach to determine if they need to be changed or refined based on new or better information. The 2004 Strategic Approach for the first time had a nearshore component, clearer prioritization, and a streamlined method for project prioritization (SWC 2004b). The group has also attempted to guide project monitoring through the development of the Monitoring Strategy (SWC 2004c), which acknowledged four types of monitoring: baseline, implementation, effectiveness, and validation.[22] The first priority of this strategy was to account for implementation and effectiveness of SRFB funded projects, the second priority are projects funded outside of SRFB depending partially on the willingness of project sponsors, and the third priority is to evaluate the recovery success of salmonid stocks in response to the work being done. The SWC requires baseline and implementation monitoring for all projects, although

[22] Effectiveness monitoring is "the evaluation of whether an action achieved the desired effect. For example, in a sediment reduction project, effectiveness monitoring would determine whether sediment supply was actually reduced." Implementation monitoring is "the evaluation of whether an action was carried out as designed (an "as built" evaluation)." Validation monitoring is " the evaluation of hypothesis regarding the cause and effect relationship between the action and habitat conditions or ecosystem function were correct. For example, in a sediment reduction project, validation monitoring would determine whether reduced sediment supply actually restores desired habitat condition or ecosystem function." (SWC 19998)

Plans evaluated – Nooksachamps, Padilla Bay, and Samish Watershed Action Plans (NWMC et al. 1995; PB/BVWMC et al. 1995; SWMC et al. 1995); WAPs reviewed by IRC in 1999 and currently going through a second review

effectiveness monitoring will be required as funding allows. In addition, the SWC has a system to manage project changes and track project progress. However, they have been unable to do validation monitoring, which is currently outside the scope of the SWC. The SWC noted that validation monitoring is a long-term goal, may or may not directly involve the SWC, and will depend on multiple partnerships, increased funding, and intensive cooperation (SWC 2004c). Regarding organizational evaluation and adaptability, the group has made adjustments. In 2004, the SWC revised their bylaws, changed the Administration Committee to the Board of Directors, and clarified the roles and responsibilities of the membership.

Skagit Conservation Education Alliance

SCEA is currently working on a strategic plan to guide its efforts, and therefore only the Watershed Action Plans (WAPs) were evaluated. The plans designated 39 entities with varying responsibilities, and made over 100 recommendations. Plan development appeared good with appropriate joint fact finding and scientific input. The watersheds were originally ranked through the use of technical and citizen advisory committees. The plans were then developed by Watershed Management Committees (WMCs) that were generally composed of local residents, government agencies, environmental groups, agriculture industry, timber industry, and tribes. In addition, the process involved the formation of Citizen Advisory Committees during plan development, and the hosting of public meetings, field trips, and education projects to solicit comments from and engage the community. Existing information on water quality data and non-point sources were compiled and background information was presented to the WMCs by experts in various fields. WAPs were reviewed by WDOE, who had final approval over the plans. There did not appear to be any disagreements with the science.

Plan communication was generally good due to clear goals and objectives, and a good level of understandability. However, access to these plans was poor. There were no electronic copies, and there seemed to be a limited supply of hard copies of these documents. The plans are most likely too large to make electronic, although it would have been helpful to make a portion of the WAPS, like the Executive Summary and Action Plan list available on a website.

Plan ownership and adaptability were generally good. Recommendations of the plan were required to be reached through consensus and all actions had to be evaluated and approved by the lead implementing entities. In addition, commitment from these entities to carry out specific actions in the plan was obtained through a "concurrence" process. However, there were some agencies that did not produce letters of concurrence for the Samish WAP, including the Skagit County Department of Emergency Management (SCDEM), local diking and drainage districts, the, and Whatcom County Public Utilities District. A significant portion of the Samish (one of the three priority WAP watersheds) is located in Whatcom County. In addition, the diking and drainage districts were labeled by one interviewee as "powerful" groups and important to watershed planning. These special service districts are made up of board of commissioners and have the exclusive charge for the construction and maintenance of diking and drainage systems constructed by the district, and the authority to assess fees to complete this work. They have the right of eminent domain, although they must receive the necessary permits to conduct their work. In addition, some agencies submitted concurrence letters conditional on funding.

The WAPs contained a section on adaptive management. The IRCs were tasked to evaluate the overall effectiveness of the WAPs in preventing and correcting non-point pollution water quality problems. They were meeting under their second review process during this study in 2005. Their goal was to monitor implementation, evaluate the need

to re-rank watersheds, and recommend revisions to the plans. Plan effectiveness was also partially evaluated through water quality monitoring. The Skagit Stream Team, a citizen volunteer group formed in 1998, and its sponsors have collected seven years of water quality data and produced annual reports for the three priority watersheds. Beyond reporting on implementation and water quality, it does not appear that any actual revisions to the plans have been made. Although, the IRC was considering initiating this planning process in additional watersheds.

Skagit County Marine Resources Committee

The SCMRC has several documents which describe its work. Two were considered planning documents for this evaluation: the Skagit Bays Restoration Blueprint, and the Bottomfish Plan. The latter stands by itself and involves recommendations of marine reserve sites for bottomfish recovery. The Blueprint was developed with People for Puget Sound (PPS) to identify specific conservation and restoration targets, in northern Skagit County's nearshore environments, aimed at forage fish, juvenile salmonids, aquatic vegetation, shorebirds, and sediment supply. In addition, the SCMRC used workplans and was drafting a five-year Strategic Plan (SCMRC 2004), which relies on priorities from the Blueprint and addresses issues such as failing septic systems, creosoted logs, and Spartina. Much of its planning and reporting was based on NWSC performance benchmarks. One interviewee noted that until this year, the SCMRC planning efforts were not driven by the scientific process found in the Blueprint. Instead, its past work was more opportunity driven. Work was often driven by available funds from NWSC and interests of the members. The criteria for approval of NWSC funds were based on action projects not just planning. An interviewee noted that this was a positive funding attribute, as groups like the SCMRC can plan forever.

Plan development was good and incorporated an appropriate level of joint fact finding and scientific input. The Bottomfish Plan involved the participation of SCMRC members, a Technical Review Committee, which consisted of local and state agency, tribal, and academic scientists, and the public through community meetings and surveys, as well as the consultation of WDFW. Agency biologists, resource experts, and SCMRC members developed a biological scoring matrix, and used the public input to develop a social scoring matrix to rank potential reserve sites. The plan also received review from outside sources. There was some debate over the use of two biological criteria (as well as one social criteria) for ranking sites, "Currents for Larval Dispersal, and "Absence of Predatory Fish," due to lack of data and unpredictable conditions. Therefore, these criteria were dropped. The Skagit Bays Blueprint involved the collaboration of People for Puget Sound, members of the SCMRC, and Skagit County staff, with input from the Puget Sound Nearshore Ecosystem Restoration Project Technical Workshop. Existing datasets from sources such as state and federal agency surveys (e.g., WDFW, Washington Department of Natural Resources (WDNR), National Oceanic and Atmospheric Administration (NOAA), U.S. Fish and Wildlife Service (USFWS), etc.), local and county, tribal, and university research were organized and combined with shoreline photo data inventoried by well-trained volunteers. SCMRC members and some local stakeholders provided feedback on sources of information, and expertise on development of scientific, social, economic, cultural, and political criteria to prioritize projects Beyond members of the SCMRC, community input in joint fact finding appeared limited. Reviewers were invited to critique certain elements of the plan.

Plan communication was also generally good. Both plans have clear goals and objectives and would be understandable to a non-technical audience. However, while the Bottomfish Plan was on the SCMRC website, the Blueprint was not and hard copies did not appear to be readily available.

Plan ownership and adaptability were generally good. However, as with many of these types of community-based groups, authority to implement the plan lies elsewhere. The WDFW and tribes, for example, are the co-managers of the bottomfish fisheries and it is unclear how these entities will proceed with the recommendations of the Bottomfish Plan. The Blueprint was a fairly recent document and therefore it was difficult to assess its level of ownership. For example, it is unclear how the County will incorporate the Blueprint and other SCMRC work into its Shoreline Master Program (SMP) and Critical Areas Ordinance (CAO) growth management processes. The SCMRC acts as an advisory board to the County and is staffed by a County employee, and therefore is likely to be more closely tied to the County than other initiatives.

An adaptive management framework has been built into the work of the SCMRC. The Blueprint was not considered to be a final document and discussed the addition of new data. Monitoring was also conducted by the SCMRC and collaborators, including periodic monitoring of the growth and survival of Pacific and Olympia oysters, and regeneration of Spartina in areas of removal. In addition, the Olympia oyster study includes ongoing monitoring used to redesign and strengthen future seeding projects. However, the Blueprint did not discuss a mechanism for monitoring and evaluating the success of identified projects, and it is unclear what role adaptive management will play in the Bottomfish Plan.

Samish Watershed Planning Unit

The Samish Watershed Planning Unit (SWPU) completed assessment work and a draft Samish Watershed Management Plan in 2003, although the latter was never finalized. It is unclear what will happen with this draft document. Plan development was good, with

seemingly appropriate joint fact finding and scientific input. The plan was developed by through consultants and the SWPU, which included city, county, tribal, and utility representatives and various interest groups. This participation involved specialists in surface water, ground water, water rights, instream flow, and data management. In addition, SWPU hosted forums for public input. However, there were disagreements over the science used to determine instream flow recommendation. Instream Flow Incremental Methodology (IFIM), the technique under debate, identifies the optimum streamflow required to support specific life stages of target fish species, such as Chinook, coho, chum, and steelhead salmon, and cutthroat trout. Plan communication could not be determined because the plan was never completed. Despite this incompletion it could be said that plan ownership was poor. Lack of plan ownership was a significant problem with this process, due to disagreements over recommendations. Adaptive management was considered in various stages of planning; however, the group did not reach a stage to incorporate this properly. One interviewee noted that the County and some agricultural interests could not agree on the instream flow recommendation provided by WDFW and the tribes.

2. Implementation Status and Barriers

The information below reflects the implementation status for the work of the three initiatives (SWPU, the fourth initiative, did not get to the implementation stage), and implementation barriers experienced by the watershed initiatives and the additional stakeholders interviewed (See Table 2). The latter are included because many are involved in watershed initiative implementation and/or are engaged in other relevant watershed-based activities. In general, the three watershed initiatives have been able to successfully implement many projects. For example, the 1999 SCEA/IRC review showed that a large majority of the recommendations were being addressed at some level or were completed (IRC 1999). A second review was ongoing during this study; however, preliminary reporting had shown that implementation entities were working on

some previously unaddressed issues. Although this sheds some light on progress, it is difficult to determine to what level of activity may be defined as "addressed."

In addition, it was noted that the work of two watershed initiatives and one additional stakeholder was moving from opportunistic to more strategic approaches. However, one initiative noted that it was better able to complete projects when it was more opportunistic, and recent successes were probably attributable to the limited number of landowners involved. For the additional stakeholder, the easy projects have been done, and the more complex and multi-landowner projects remain uncompleted. Some interviewees partially attributed becoming more strategic to demands made by funding sources. Although one additional stakeholder noted that its implementation it still funding-driven and opportunistic. Because reporting shifts from opportunistic to strategic approaches was not a direct interview question, it is unclear whether this was a trend or not with other organizations.

Regarding implementation effectiveness, an interviewee commented that one of the watershed initiatives has failed to address the major cause of impairment to the resource and that its work has discouraged that stakeholder from participating. While this may be a significant reflection on the initiative, it is difficult to say how representative it is of the other stakeholders involved.

Regarding barriers to implementation, responses addressing the work of both the watershed initiatives and the additional stakeholders were synthesized and categorized by theme. The common themes included, problems with funding and staff resources, landowner cooperation and complex ownership, implementing entity participation, lack of knowledge, and initiative capacity and structure. This information is displayed in a graph (Figure 3) according to the number of entities (initiatives plus additional stakeholders) that experienced implementation barriers related to these themes.

2.1 Funding and Staff Resources

A general lack of funding was a problem for all three initiatives and six (out of eight) additional stakeholders. Some also spoke of challenges caused by the structure of funding programs. The SRFB, for example, has presented challenges because more projects are developed than are possible to implement due to the funding available. Watershed groups affiliated with this process often do not know how much money will be available and there have been equity issues regarding how funds are distributed among the lead entities around the state. However, the same funding program was noted to have helped move the SWC from opportunistic to strategic. There have also been challenges created by the legislature, who were said to have limited the funding available for land acquisition for salmon habitat, due to pressure from the rural community. The latter group was apparently concerned that land has been increasingly entering government and private conservation ownership. The legislature also did not originally envision programmatic funding for the ESHB 2496 process, which has created challenges for non-profit groups that cannot rely on resources from general funds or project funding, but must fundraise. Working in areas with many small parcels was also difficult for one initiative and one additional stakeholder, partially due to limited staff and resources to be able to work with so many individual landowners.

The funding and accountability bureaucracy were noted to be difficult to address. Significant accounting and justification are required in order to show the results of program investments; however, groups cannot accurately convey the information needed to justify spending because the appropriate monitoring is not being done. The Joint Legislative Audit and Review Committee of the Washington State Legislature was noted by an interviewee as one important program that is influential to the ability to implement projects. This group evaluates the efficiency and effectiveness of state programs, policies and activities. An additional stakeholder noted that much of their work relies on “soft-

money," and that they do not have access to long-range stable funding. Educational programs have been especially difficult to find funding for because the results are again difficult to quantify.

2.2 Landowner Cooperation and Complex Ownership

Landowner cooperation was a barrier for all three initiatives and two additional stakeholders.[23] In their Strategic Approach, one of SWC's goals was "achieving community support to realize significant habitat gains in the estuarine areas that impact privately owned lands (SWC 2004)." SWC hoped to address this through a better understanding of the social and political complexities, and of the potential impacts of restoration actions on land use from a physical and regulatory perspective. An additional stakeholder classified the issue of salmon habitat with landowner cooperation as a "widescale rejection." Another noted that some agricultural interests, who are well-connected and politically savvy, have held back the progress of implementation. This community has been able to stop local and state initiatives. For example, the agricultural community was influential in getting E2SHB 1418[24] passed in 2003. One element of this bill is an exemption of tide gates and flood gates statewide from fish-passage requirements. Part of this reaction is related to one observance that "salmon have polarized the community." Difficulties with landowner cooperation were also attributed to concerns about liability, such as related to moving dikes and letting the river change its course. On the other hand, one stakeholder noted that they are making good progress with the agricultural community. Regarding other or more general landowners, one interviewee also noted a lack of cooperation by septic owners to address potential water quality problems. In addition landowner cooperation was also related to challenges in complex ownership. It was noted that many of the easy projects have been done, but many more complex and multi-landowner projects have not been done.

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[23] Note that some additional stakeholders are large landowners themselves, so it is understandable that landowner cooperation is not as much of a problem.

[24] A description of this bill can be found at http://www1.leg.wa.gov/documents/opr/AGNR/2003/2003AGNR.pdf

2.3 Implementing Entity Participation

Lack of, or reliance on, implementation entity participation has also been an issue for two initiatives and four additional stakeholders. Initiatives tend to lack authority and rely not only on willing cooperators, but also on others to actually implement their recommendations. For example, the SCMRC cannot designate and enforce reserves, and any recommendations must have the support of WDFW and Treaty Tribes. The latter group is not in a position to negotiate with the County or the SCMRC because they reserve negotiations for State and Federal level entities. Regarding the SCEA/IRC work, the diking and drainage districts and Whatcom County failed to sign concurrence letters for the WAPs. Also, an original recommendation stated that the WAPs should be adopted as a water quality supplement of the Environmental Section of the Skagit County Comprehensive Plan. However, the current review reports (IRC 2004) that the County Commissioners have written a letter acknowledging the WAPs, but stated that they are unlikely to be incorporated in the Comprehensive Plan, which was noted to already contains resource and environmental elements. Other general difficulties included, implementation participation included the learning curve associated with partnering, implementing entities assigning lower priorities to projects and issues, and lack of current political desire to implement projects. In addition, regarding County implementation, one stakeholder also noted that County enforcement of regulations is weak and another that the County Commissioners "micromanage" work on salmon.

2.4 Lack of Knowledge

A lack of knowledge was identified as a challenge to implementation for two initiatives and one additional stakeholder. For example, SWC's Strategic Approach (2005) stated the need for more detailed research linking specific habitat conditions and landscape processes in the nearshore to salmon production. Other interviewee comments included

that the marine nearshore environment is poorly understood, and that the efficacy of nearshore restoration is relatively untested in comparison to riparian restoration.

2.5 Initiative Structure and Capacity

There were also challenges in organizational structure and capacity with two initiatives. One initiative faced an obstacle educating its members. In addition, some issues have not been addressed within one initiative due to the use of consensus-based decision-making.

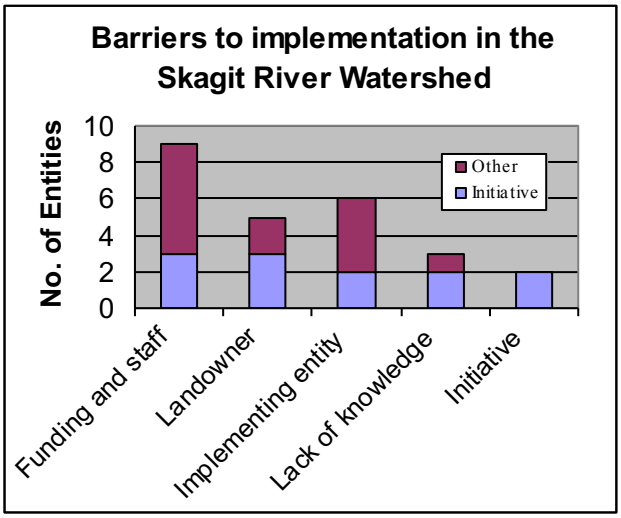

Figure 3 Barriers to Implementation in the Skagit River Watershed

3. Age, Leadership and Trust

Regarding age, the SCEA is the only initiative that is younger than four years old. However, stakeholders affiliated with the SCEA, through the IRC, have been working together on water quality issues for a longer period of time. The stakeholders though have not worked together consistently as a large group during this period because they disbanded and then reconvened for reviews of the WAPs. The SWC was initiated in 1997, and both the SCMRC and SWPU were initiated in 1999.

The SWC has recognized that "results, partnerships, and *leadership* . . (are) crucial to successful local salmon recovery planning (SWC 2003)." The four watershed initiatives generally were reported to have strong leadership. However, it was noted that one initiative was purposefully set up to avoid political issues, and focus instead on voluntary efforts, which may have increased its ability to have strong and willing leaders. In addition, one initiative had decidedly more moderate levels of leadership, and experienced some political struggle and confusion regarding who were the true leaders.

Trust was more variable throughout the initiatives. One initiative had a generally moderate level of trust. Another initiative had a moderate to high ranking of trust, although it was noted that there was a lot of suspicion at the formation. The interviewees that ranked trust as high also provided caveats. One interviewee noted that the high level was attainable because the group decided it would not deal with certain issues, as noted above regarding leadership. Additional interviewees noted that trust was high within this initiative among certain members; however, trust was variable (high to low) among others, simply because there are many organizations represented. Issues with trust were particularly noted between members of the group and some landowners. The interviewee who ranked trust as moderate noted that there were still some guarded interests, and few aligned missions, although people were trying to work together. The third initiative noted a variability among level of trust. While a high level of trust existed among the

agencies, the level was more mixed with the citizens and non-agency groups. The interviewee stated that people expressed some concern that this process would involve "finger pointing." However, these same people decided to participate because the process was consensus-based. The last initiative attained a relatively high level of trust early in the process due to optimism from early agreements. Significant disagreements though decreased trust to a moderate to low level. Relations were described as acrimonious between some of the stakeholder groups.

EFFECTIVE RESPONSE TO ENVIRONMENTAL VARIATION AND CHANGE

1. Presence of Conflict

Conflict was a significant issue in the Skagit. The main points of conflict from interviewee responses were organized into themes, which included stakeholder complexity, tribal issues, general county politics, general threats to land ownership, agriculture versus salmon restoration, flooding, water quantity/water rights, and locals versus outsiders/urban (Figure 4). These categories are not mutually exclusive and several contain common issues, one of which is salmon protection.

1.1 Stakeholder Complexity

Many people noted the difficulty in working with such a broad number and type of stakeholders. Of these interests few may have aligned missions and agendas, and some have strongly guarded interests, as well as turfs and egos. Some interviewees noted the complexity of land patterns and jurisdictional boundaries in the County. One interviewee stated that it can be difficult for individuals to take their "organization hat" on and off in a consistent manner. Despite these responses, it should be remembered that the initiatives have inspired many partnerships, as well.

1.2 Tribal Issues

Issues with tribal relations were also commonly cited. Many remarked on the strained relationship between the tribes and the County, which often seemed to revolve around salmon protection. For example, there was conflict between the effectiveness and enforcement of regulations, especially the CAO, which is described below. However, it appeared that there is a myriad of conflicting issues and litigation between these stakeholders. While many spoke generally about tribal-county relations, there are several tribes in the area and this relationship is not reflective all the tribes. One interviewee stated that the Upper Skagit Tribe broke off from the Skagit River System Cooperative, which currently represents the Swinomish and Sauk-Suiattle tribes, due to some of differences in opinions regarding economic development and the County.

There was also conflict regarding tribes and fishing. The Boldt decision resulted in significant contention and antipathy towards the tribes. The Skagit Tribal-Agricultural Alliance, spearheaded by leaders from both communities, has recently formed to address issues of conflict regarding salmon and farmland protection. It is currently unclear if this group will be successful in reducing these conflicts; however, they appear to be working together well currently, and reaching consensus on agreements to protect both their interests.[25]

1.3 General County Political Climate

Interviewees also commented on impacts of the general political climate in Skagit County. Many remarked on the strong ties between the agricultural community and the County elected officials. An interviewee stated that the Commissioners are aligned with natural resource users. In addition, one person noted that the "Skagit is more volatile and

[25] http://www.skagitvalleyherald.com/articles/2005/06/01/news/news01.txt

political than anywhere."[26] Others stated that Skagit County has a low voter turn-out, that the political climate is "unsophisticated," and the "leadership of the County still operates in the 1950s." The latter person noted that the County has an old charter system that may be inadequate, and that the County is soft on planning, not capable of meeting the challenges of change, and unable to stem development pressure.

1.4 General Threats to Land Ownership

Interviewees remarked on issues that can be classified generally as threats to land ownership. Many of these comments related to farmers confronting impacts from land development, as well as land conservation (often related to salmon recovery). An interviewee discussed a distrust on the part of small landowners and farmers. "The 3rd and 4th generation (farmers) think they know and have seen it all, maybe they have, and they don't trust the feds coming in." These farmers feel threatened by development, and have a strong voice. Another interviewee noted that it is hard to prove that people are not taking land, and to show the long-term benefits of the work being done. In addition, the agricultural base was also characterized as not robust and under a lot of pressure from expanding municipalities and general development, especially along the I-5 corridor.

1.5 Specific Threats to Land Ownership - Agriculture versus Salmon

As noted above, a specific land ownership threat concerned conflict between salmon habitat protection and restoration and agricultural interests. The debates were often couched in terms of farmers versus fish. However, it was noted by one that this commonly held characterization is actually a misperception, and that it is really farmers versus development and fish versus development. Several stakeholders in the area, including The Trust for Public Land, The Nature Conservancy, Skagitonians to Preserve Farmland, and the Skagit Watershed Council initiated the Greater Skagit Delta Initiative,

[26] It was unclear whether the interviewee was truly familiar with relative levels of conflict in other watersheds throughout the region.

a coordinated effort attempting to address the conflict between farmers, fish, and development. However, this particular project created some controversy because it apparently was perceived as not collaborative enough from the farmer's perspective, and the originating groups are now pursuing other venues to decrease this conflict (Zaffos 2005). However, the tribal-agricultural group noted above may help address these issues.

1.6 Specific Threats to Land Ownership - Critical Areas Ordinance

In attempting to instate its ongoing agricultural Critical Area Ordinance (agCAO; Skagit County Ordinance 020040011; Skagit County Unified Development Code Chapter 14.24[27]), the County has faced a significant amount of controversy.[28] Many landowners voiced concerns regarding the potential loss of property rights and others believe the regulations should be more protective of the environment. Both sides appear to be debating the scientific rational behind how wide protected riparian areas should be. Some landowners have demanded a better quantification of habitat acreage needed to support salmon recovery on a watershed scale. The Swinomish Tribe has litigated the ordinance for many years because they believe it is not protective enough of salmon. The latest compliance order given by the Western Washington Growth Management Hearing Board (WWGMHB 2005) found Skagit County in continuing non-compliance due to inadequacy of the County's monitoring and adaptive management program.[29] WWGMHB gave the County until July 2005 to achieve compliance.

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[27] http://www.skagitcounty.net/PlanningAndPermit/Documents/Code/title14/Ch14_24.pdf

[28] Skagit County imposes voluntary best management practices and Watercourse Protection Measures (WPM) for ongoing agricultural lands, but not buffers. Although, the County requires scientifically based buffers on all streams in other designated areas (WWGMHB 2005).

[29] The WPMs are considered to be "less than precautionary" due to their uncertainty in effectiveness, and therefore require an adaptive management program (WWGMHB 2005).

1.7 Flooding

Three interviewees noted that flooding and flood control create conflicts in the Skagit. The only detail provided on this category of conflict was that Skagit County and Puget Sound Energy have been in negotiations during the FERC re-licensing efforts regarding potential flood control provided by the Baker River dams.

1.8 Water Quantity/Water Rights

Although water quantity and water rights are closely tied to the salmon issues noted above, these issues are commented on separately because of specific significant conflicts regarding instream flow setting. One interviewee described the water rights conflict as between the County, WDOE, tribes, well-drillers, farming community, and development community. As noted previously, the SWPU experienced serious conflict and could not come to consensus on recommended instream flows for the Samish River. This process attempted to address the competing goals to protect instream resources and safe reliable water supply for the future. It seemed that the heart of the debate regarded the methodology used, which resulted in WDFW recommending instream flow needs that were at times higher than had ever been reached. An interviewee noted that the Swinomish Tribe and WDFW agreed on these flows, but the County and others disagreed. Another interviewee stated that there was also "some thought in general that people wanted to screw up the process." Due to this disagreement, WDOE will make a decision on instream flow without community consensus, and it is possible that litigation may follow this decision. The proposed rule is estimated to be adopted by mid-summer 2005; however, the Samish rule will not be finalized until the Skagit rule amendment is completed (see below). It is possible that the SWPU will reconvene, but this will probably not be decided until the Samish River instream rule is finalized. One interviewee noted that future management of instream and out-of-stream uses may be helped partially through development of the Comprehensive Irrigation District Management Plan, which was not elaborated upon.

There has also been conflict regarding instream flows established in 2001 (Chapter 173-503 WAC) for the Skagit River through collaborative processes. The instream flows were challenged by a more recent set of County commissioners, and WDOE responded by proposing to amend the rule to allow new exempt withdrawals that are mitigated. This was a completely separate process from the Samish, although some of the same players were involved (e.g., Skagit County, SCPUD, WDOE, City of Anacortes, Swinomish Indian Tribe). The instream flow rule is subject to on-going litigation, but litigation is on hold while WDOE updates its rule. The amendments reserve a limited amount of ground water for future uses, human health requirements for businesses, and future livestock watering. They also include closures for certain tributaries, and clarify how future water right permits are obtained.

1.9 Urban/Outsiders versus Rural

Two interviewees discussed this issue, although they did not provide detailed explanations. In general, one discussed the feeling that people from outside areas are attempting to control County development through conservation measures. An urban/rural tension regarding sprawl was also discussed.

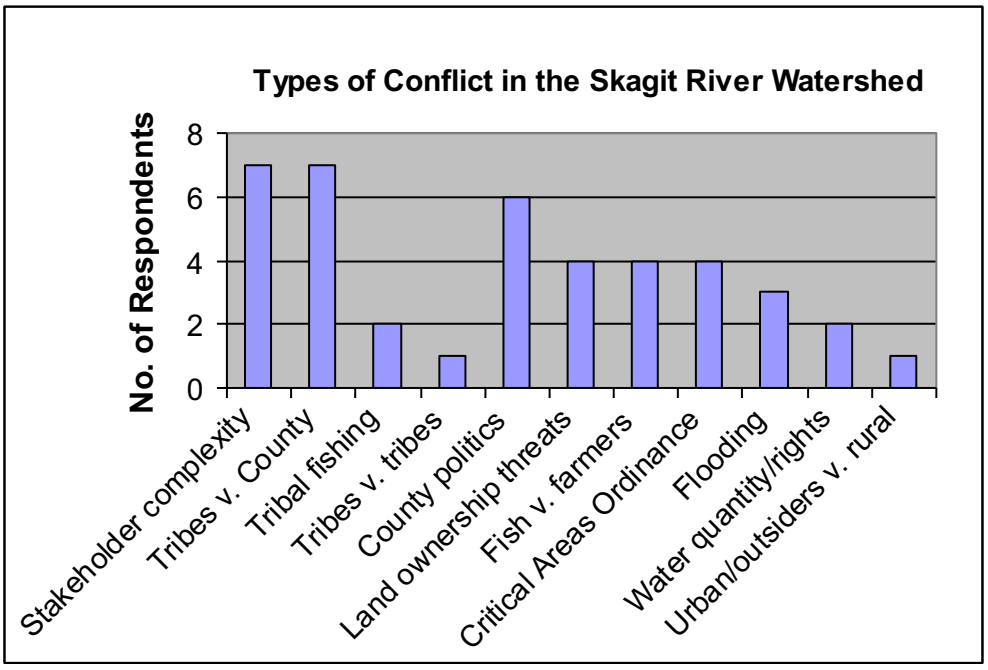

Figure 4 Types of Conflict in the Skagit River Watershed

2. Integration

2.1 Intra-Horizontal Interplay: Within Organizations and Issues

All of the watershed initiatives seemed to have a relatively good level of intra-horizontal interplay, which was likely due in part to programmatic requirements and guidance. Each program (e.g., ESHB 2514, WAC 400-12) stated that initiatives must be broadly representative, and provide examples of who should participate. The ESHB 2514 process seemed the most stringent regarding this issue in terms of requiring participation by several distinct stakeholders (e.g., largest city or town and water supply utility; See Appendix III). However, most of the initiatives did lack the participation of some players, as discussed regarding plan ownership above.

Regarding salmon habitat restoration and protection, there appeared to be a relatively good level of integration among many players. Many of the stakeholders interviewed

seemed either closely or relatively well aligned with the SWC Strategy. There have also been many project partnerships. One example of good coordination given was the Wiley Slough Restoration Project (restoration of a historical tidal and riverine system to benefit salmon and migratory birds), which involved a collaboration between the WDFW, SWC, SRSC), USFWS, and private interests including Ducks Unlimited and the Washington Waterfowl Association. In addition, the work of the Seattle City Light's Early Action program (SCL 2003) includes the SWC, tribal, federal, state, and non-profit partners. However, the relationship between the County and SWC was reported as not strong and seemed not as well aligned. The County appeared to develop their own list of salmon projects and it is unclear how or if its salmon habitat monitoring program for the agCAO (SCDPW 2004b) will relate to other salmon monitoring efforts being conducted by the SWC and its partners.

The SCEA/IRC also appeared to have many of the relevant players integrated. The WAC 400-12 process represented the "first fully integrated approach to non-point source pollution control in the Northwest." (NWMC et al. 1995) The group has also resulted in project partnerships. For example, SCEA/IRC partnered with Skagit County Health Department (SCHD), Washington State Department of Health (WDOH), and Puget Sound Action Team (PSAT) to host public informational meetings in response to an emergency closure of Samish Bay for commercial shellfish harvesting (SCEA 2004a). In addition, this process was reported to be coordinated with efforts of the Skagit TMDLs. However, while the County participates as an implementing partner, it is no longer a facilitator of this process. It is also unclear how or if the SCEA/IRC's work may relate to water quality monitoring conducted by the County for the agCAO. In addition, the SCEA/IRC is lacking the involvement of some players including Whatcom County.

The SCMRC also appeared to integrate many players addressing nearshore issues. Some examples of partnerships included the Skagit Noxious Weed Board (e.g., Spartina

removal), PPS (e.g., shoreline inventory, Spartina removal, Skagit Bays Restoration Blueprint), and SCHD (e.g., addressing downgrade problems for shellfish bed closures). This initiative seemed to have a stronger relationship with the County than the initiatives above. It is still being determined how the work of the SCMRC will be incorporated into the County's Shoreline Management Plan and CAOs.

The SWPU appeared to include the relevant players for water quantity discussions in the Samish River watershed. The only comment made during the interviews was regarding tribal participation. It was noted that all tribes were invited to participate, but only the Swinomish Tribe joined; however, the Upper Skagit Tribe may have joined after the plan was developed.

2.2 Inter-Horizontal Interplay: Between Organizations and Issues

Formal mechanisms which linked the four Skagit watershed initiatives were generally limited. The only formal link that could be discerned during the time of interviews was SCMRC's membership within the SWC (although there is no reciprocal membership of the SWC within SCMRC). In addition, the SCEA/IRC had voted to have a citizen representative on the SWC, but the representation was not fulfilled at the time of interviews in 2004. Recently this representation appears to have been filled and the SCEA is now a member of the SWC. The legislative and programmatic guidance for these initiatives (e.g., ESHB 2514, ESHB 2496) recognize the other watershed planning efforts, but leave coordination up to each group.

The initiatives' selection and avoidance of watershed issues should be noted here. As mentioned previously, through programmatic guidelines many of these groups could have addressed common issues. Therefore, these watershed programs may lead to better inter-horizontal interplay in other WRIAs. Under the WAC 400-12 process the SCEA/IRC could have also addressed habitat (in addition to water quality) and under the ESHB 2514

process, the SWPU could have addressed habitat (in addition to water quantity). The SWPU decided it did not want to be redundant with the SWC. This group was not officially linked with the SWC, but had hoped to eventually integrate its work before it disbanded. In addition, some members of the SCEA/IRC originally wanted to look at water quantity, but the group felt it was too much to consider. The SCEA/IRC had no formal connection with the SWPU, although the latter reviewed the former's WAPs.

While the formal mechanisms linking these organizations are limited there are some informal mechanisms, which may help to integrate the work of these groups. The regularly scheduled organizational meetings have been used to attempt to further a mutual understanding of various organizations' work, both through formal presentations, as well as through the occasional representative attendance. In addition, some of these initiatives have common members, as can be seen in the figure below (Figure 5), which highlights stakeholders that are members of each initiative. As a gross assumption, bold lines (board members or equivalent) may represent a greater opportunity for coordination because they are likely to be more engaged in the initiatives' work than partners (thin lines). In addition, the less people representing an organization for each initiative (number in parenthesis), the seemingly greater potential for increased coordination.

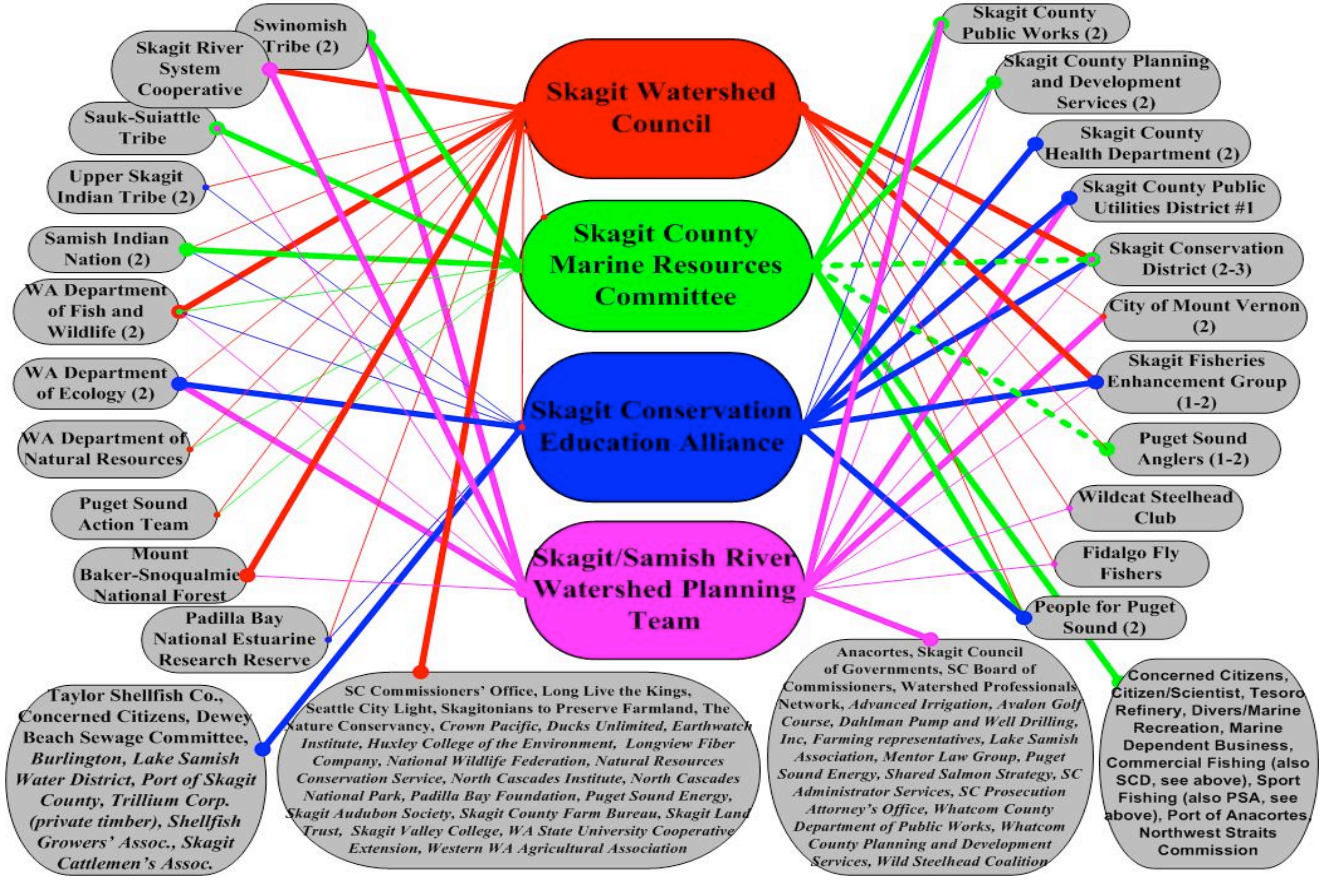

Figure 5 Diagram Showing Common Membership for Skagit River Watershed Initiatives

Bold lines indicate that stakeholder is a member of the Board of Directors (or equivalent), or a lead agency. Thin lines (or italics) indicate stakeholder is a partner, or general member. Dashed lines indicate stakeholder is affiliated, but does not necessarily represent, the associated organization. If more than one person is the contact for all initiatives, the number of contacts is noted in parenthesis.

Many of these initiatives were hoping to increase coordination. However, it seemed there were some barriers and challenges to furthering integration. While these watershed initiatives had several common members, it is unclear to what degree this helped in coordination. One interviewee noted that "it is difficult for members to represent their particular interests and (the watershed group's) interests," or in other words "to wear two hats." Another interviewee noted challenges with turfs and egos, due partially to shared funding sources. In addition, the focus and mission also may partially inhibit integration. For example, the SWC will not get involved in discussions of regulations, which would limit their participation in groups such as the SWPU. The SCMRC also does not get involved with quasi-government planning efforts, as represented by the SWPU. Integration may also be limited because of the reticence of one group to go through another group's funding process. Also, while the SCMRC and SWC both work on nearshore issues, it is not clear how they will integrate their work. One interviewee noted that the SCMRC does not currently address salmon corridors and that both groups are unsure of how to integrate the elements of each others' planning documents.

While this study focused on the potential connections between the four watershed initiatives, information was also found between some other relevant watershed planning issues. One interviewee noted that there had not been much coordination amongst various issues. The WAPs failed to address drainage issues and stormwater planning failed to address habitat issues. However, this person did state that coordination may be improving. It is also currently unclear how various flood mitigation efforts, such associated with the Skagit River Feasibility Study (USACE and Skagit County 2004) and the Natural Hazards Mitigation Plan (SCDEM 2003) will be integrated with other efforts, such as salmon habitat restoration. The Skagit River Feasibility Study, has a primary goal of determining methods to safely manage large flood events in the watershed, and an additional goal of improving salmon habitat. However, it is unclear how this effort will

be integrated into work such as orchestrated through the SWC and its partners. The Natural Hazards Mitigation Plan also addresses flooding, among other local hazards. While salmon habitat efforts seem relatively well integrated, there is not a multi-stakeholder planning group that addresses salmon recovery (e.g., harvest, hatchery, and hydropower) in the watershed. The co-managers (tribes and WDFW) are completing some technical work on salmon recovery, but there is no larger planning group, like those that exist in other Puget Sound watersheds (see Vertical Interplay for more information). Although, additional salmon related efforts should also be highlighted. SCL's Flow and Non-Flow Committees[30] (SCL 2003) address hydropower, hatcheries and habitat as a result of the 1991 FERC relicense settlement agreement. Also, PSE is currently undergoing its re-licensing process, which addresses salmon populations in the Baker River watershed, a tributary of the Skagit River. The Baker River is not currently included in the SWC target areas (SWC 2005); however, the SWC has encouraged the use of the FERC re-licensing process to address salmon concerns.

2.3 Vertical Interplay

Watershed planning programmatic guidelines also provided mechanisms for vertical interplay. Each initiative has a pathway for its work to feed into statewide and regional efforts. The HB 2496 process represents a portion of Washington's Statewide Strategy for Salmon Recovery, which addresses the "Four H's" (habitat, harvest, hatcheries, and hydropower). This strategy is lead by the Governor's Salmon Recovery Office, which coordinates state agency activities, monitors state and local progress, and conducts early actions to address areas of severe decline. SRFB, who provides project funding to the SWC and other lead entities, also considers statewide planning efforts, such as the SASSI, the Salmon and Steelhead Habitat Inventory and Assessment Project (SSHIAP),

[30] These committees are composed of SCL, National Park Service (NPS), USFWS, Bureau of Indian Affairs, U.S. Forest Service (USFS), NOAA Fisheries, Upper Skagit Tribe, Sauk-Suiattle Indian Tribe, Swinomish Indian Tribal Community, WDFW, and the North Cascades Conservation Council.

and Limiting Factors Analysis, when making funding decisions. The chair of the SWC has also served on a SRFB task force, and was the chair of the Lead Entity Advisory Group, which provides a forum to discuss lead entity issues statewide and an opportunity to improve communication among local and state organizations. In addition, there are several state agencies represented as SWC members, including WDFW, PSAT, WDOE, WDNR.

An additional aim of assessments and strategies developed by Lead Entities is to contribute to the habitat element of regional salmon recovery plans, which provide another mechanism for vertical interplay. This research was able to shed some light on the effectiveness of this mechanism. As mentioned above, there is not a local planning group (beyond the co-managers), which opted to comprehensively address salmon recovery planning in the watershed to contribute to the regional planning effort, Shared Strategy for Puget Sound.[31] The Skagit River watershed is the only watershed in Puget Sound that does not have such a group. The SWC and Skagit Council of Governments (SWC and SCOG 2003) prepared the "Options Plan," attempting to present ideas for developing a group to coordinate such an effort, but they could not get traction. Although interviews and feedback on the document reflected a shared agreement on the preference for the Skagit to control its own destiny using a local planning group, significant conflict between the major stakeholders was often stated as a roadblock. "It became clear that there was not enough trust among the principals to use an existing local group or to establish a new organization." (SWC 2004b) One interviewee noted that some players had no incentive to participate and think salmon recovery is the "cause of the day" and will go away. SWC was noted to be fairly well-nested within larger scale planning originally, and a "well-oiled machine" that would nest, if possible. "How the Council will respond to calls for regional coordination, better linkage with other efforts and integration of other salmon recovery programs remains to be seen (SWC 2002)."

[31] http://www.sharedsalmonstrategy.org/

However, one interviewee did state that much of the work of the SWC strategy will be incorporated in portions of the draft Chinook recovery plan being completed by the co-managers. Discussions are currently ensuing for how this work may be incorporated in the Shared Strategy ESU recovery plan, which should be released in summer 2005.

The work of the SCEA/IRC is incorporated into PSAT's water quality strategy, or the Puget Sound Water Quality Management Plan (PSAT 2000). One example of intended integration was the incorporation of local monitoring efforts into the regional Puget Sound Ambient Monitoring Program. In addition, the Puget Sound plan is in turn incorporated into the statewide Water Quality Management Plan to Control Nonpoint Source Pollution (WDOE 2000b). Another goal of the SCEA/IRC is to ensure that WAP implementation is meeting Washington State's Shellfish Closure Response Strategy. Also, both PSAT and WDOE have liaisons for the watershed. However, the WAC 400-12 process does not appear to be heavily used in the region, as many watersheds are addressing water quality through the ESHB 2514 process. In addition, only one quarter of the Puget Sound was covered by this planning process, which also may affect the strength of vertical interplay (PSAT 2000).

The SCMRC is a member of the NWSC, which regionally coordinates and evaluates all the MRCs. One SCMRC member is selected to serve on the NWSC. The SCMRC is also involved with the WDFW, regarding their groundfish planning, and is in discussions with WDNR, regarding their aquatic reserves program. PSAT also engages with MRCs at a regional level. One of the NWSC performance benchmarks includes coordination with PSAT regarding scientific data, as well as outreach and education. In addition, this initiative has teamed with Puget Sound Restoration Fund, the Swinomish Indian Tribal Community, and Taylor United Shellfish to conduct the first Olympia oyster restoration in the North Sound area. This area was selected because of its habitat quality and

apparent lack of oyster drills. The SCMRC hopes to expand cooperative efforts and joint projects with other MRC's and NWSC.

Regarding the work of the SWPU, WDOE acts as the liaison between the local groups and other participating state agencies. This local planning is incorporated in a statewide strategy by WDOE and WDFW (2004), which prioritizes watersheds for instream flow development and creates a timeline to ensure rules are adopted for watersheds without planning units, or if units were unsuccessful. However, it is unclear if this process may be tied into regional water supply needs.

2.4 Watershed Integration

The relative consensus from the interviewees is that watershed scale planning is not well integrated, or has a low level of integration (Figure 6). However, many of these interviews also stated that integration seemed to be improving. Five interviewees noted that the SWC has helped to integrate planning and bring players together. Some said that the SWC has led to "pretty good" integration, while others have said that the SWC has helped a lot, but that integration is "not great by any means." In addition, the IRC was also noted by one interviewee as helping to bring the players together. While the WAPs did not address upriver areas, many county-wide actions have resulted from implementation of these plans. Two interviewees also noted that progress is being made in bringing nearshore components into planning. Another interviewee noted that "at least stakeholders know each other, and partnerships have been inspired . . You can call anybody with questions." Another thought that the Skagit was a small watershed and community, and that everyone communicates and are "in each other's pockets."

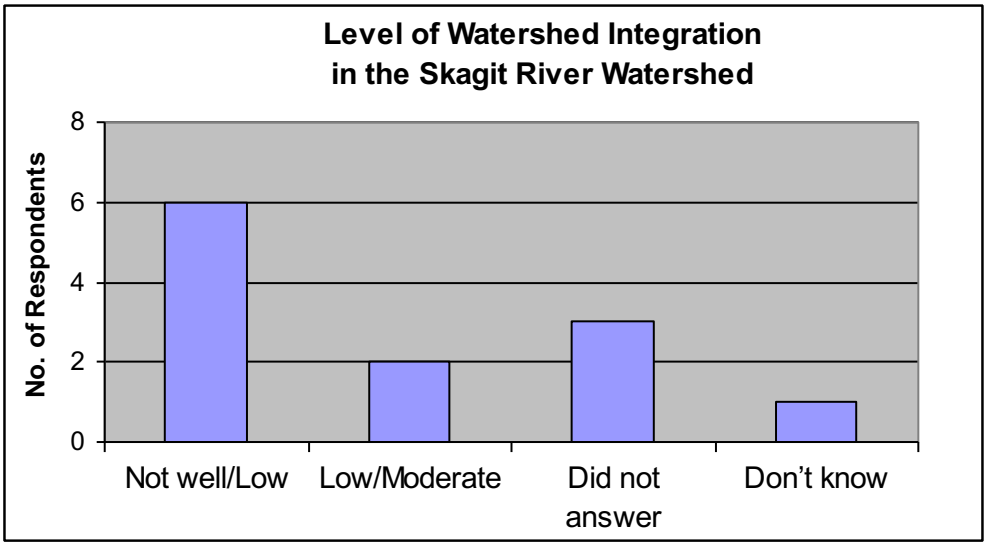

Figure 6 Level of Watershed Integration in the Skagit River Watershed

Many interviewees also stated barriers to past and future watershed integration. These obstacles included litigation, problems of development versus fish, staff turnover, politics, certain individuals, County regulations, and organizational/County capacity. Some of these barriers were expanded upon. An interviewee noted that it is difficult to consider integration because the County is still grappling with developing and updating the Comprehensive Plan, SMP, and CAO. In addition, barriers come from individuals that lack an openness, block process, and don't see the whole picture. One interviewee also stated that the capacity does not exist to address issues comprehensively. The interviewee questioned who the conveyor would be, and that normally the local government deals with these issues. It was also commented that the County is not seen as a whole, but as three areas – the uplands, Anacortes and La Conner, and I-5. Another noted a dividing line east of Sedro Woolley, and between the delta versus non-delta areas. An additional comment was that it is much easier to consider integration in the research phase, but much harder to realize during implementation.

CLIMATE IMPACTS

1. Stakeholders Perceptions of Sensitivity, Adaptability, and Vulnerability

1.1 Climate Impacts to Watershed Processes

Interviewees' understanding of climate impacts on watershed processes varied in depth. Some people were not able to comment, while others were able to give several examples. In addition, several people had difficulty differentiating between climate variation and change. The specific processes considered by interviewees as impacted by climate variation included flows, flooding, salmon runs and abundance, temperature, precipitation, drought, and subsidence (Figure 7). One interviewee noted that we are in a warming peak now and that El Niño conditions bring more flooding and bad weather. Another stated that ENSO brings more precipitation and milder winters; however, this person did not know what that meant for the watershed. Three people noted the effects of PDO on salmon populations. One of these interviewees stated that this concept is "well-known in the Skagit," and that ocean conditions have become an argument for variations in salmon trends, instead of a sole focus on watershed habitat. Another noted the resultant impact of PDO on salmon harvest and management, and another the indirect impact on climate variation on salmon populations, leading to ESA listings, and then to impacts on land management. This person also stated that climate variation, through events like floods, drives changes that are detrimental to the system (e.g., dikes, riprap). Drought years, cold spells, and low flows were also stated to create challenges for the success of plantings (e.g., riparian restoration); although, agriculture was thought by one to not be as affected because surface water irrigation is minimal. In addition, a bottomfish recovery report by the SCMRC noted that Eastern Pacific fish stocks have suffered decreases, in part, due to natural weather cycles (e.g., El Niño, PDO) and natural cycles of predator-prey relationships.

The effects of climate change on watershed processes discussed by interviewees included impacts on all of the elements noted above, except subsidence. Glaciers, vegetation, snowpack, sea level rise, drainage, salt water intrusion, and logging recovery were also noted. One interviewee questioned whether there was really evidence that climate change existed, but went on to note that climate change may affect the fishing industry because there are smaller and smaller catches in the County each year. This may be affected by the Pacific westerlies which dump rain and contribute to the flooding cycle. Restoration may be impacted by changes to the availability of water supplies and vegetation changes. Glaciers melting increase runoff and floods, result in low flow in summer, and impacting the nearshore. Another person stated that a decrease in snowpack will affect generation of electricity. In addition, Fir Island was noted to be subsiding and that ocean rising could lead to problems of drainage and salt water intrusion for farmers.

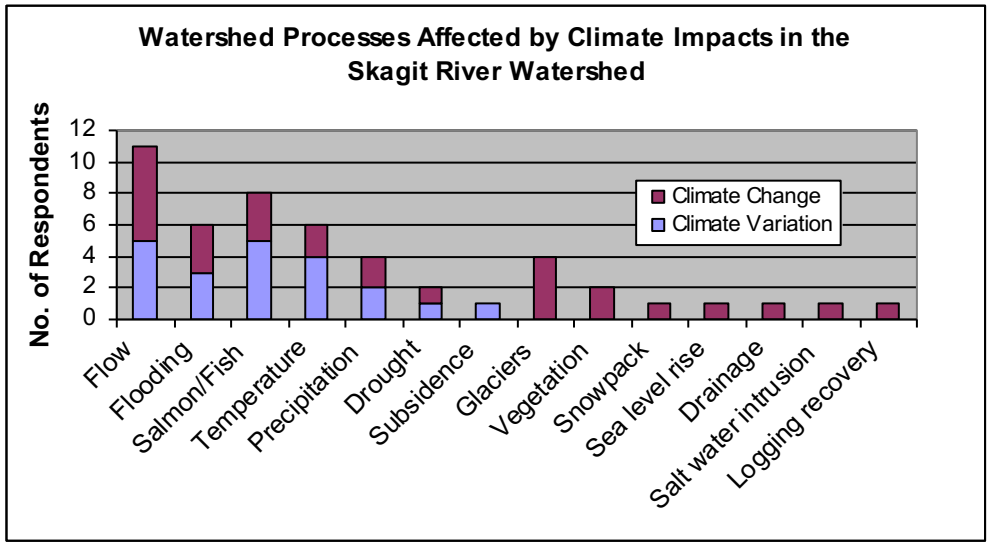

Figure 7 Watershed Processes Affected by Climate Impacts in the Skagit River Watershed

An interviewee stated that delta farmers are aware of sea level rise and soil compaction. Drier conditions were also noted to cause changes to vegetation and streamflow, and may change the lands' ability to recover from logging. Another interviewee stated that flows

would be less during normal low flow (which can happen in the winter as well as the summer) and could cause problems with de-watered redds. It was noted that the Skagit and Baker Rivers are regulated, but that the Cascade and Sauk Rivers are not. The interviewee expressed hope that the flow of the regulated rivers could mitigate changes in flow of the unregulated rivers.

1.2 Patterns of Conflict Affected by Climate Impacts

Many interviewees noted an effect of climate impacts on the presence of conflict; although, some did not recognize any impact or were not sure how to answer the question. Some of the issues of conflict that were raised included flooding, agriculture, water quantity, hydropower and flow for fish during abnormal low flow, tribal salmon harvest, and restoration (Figure 8). Flooding was noted to be an "inflamed" topic, especially regarding the flood control plan, for which one interviewee noted there were "no remedies in sight." The Baker River re-licensing was also an area of conflict regarding flood storage, due to requests for more storage from the County. There was also flood control conflict with salmon issues. Increases in flooding may lead to increases in the desire to protect dikes, which was noted to be happening in the Nooksak River. There is also a conflict with hydropower and flow for fish, especially during abnormal low flow. One interviewee surmised that the Skagit may see greater conflict related to fish runs and the manipulation of flow, similar to those conflicts in the Klamath and Columbia Rivers. Several noted conflict involving agriculture, including increased water demands, needs to change the type of farming (depends on soil, climate, and land use), and effects on economic viability. While one interviewee stated that there is plenty of water, and that water rights were not as big an issue, another noted that climate impacts may eventually affect water allocation and the drying of wells. There is also conflict between tribal and non-tribal harvest. Some "old timer fishermen" perceive that tribes are decreasing the fishery and that tribes may press for changes based on impacts to the fisheries, such as from climate processes. In addition, some people in the community

question why sacrifices are being made locally through restoration for fishing benefits that are gained far away. Conflict may also arise from the need to do more restoration on riparian areas.

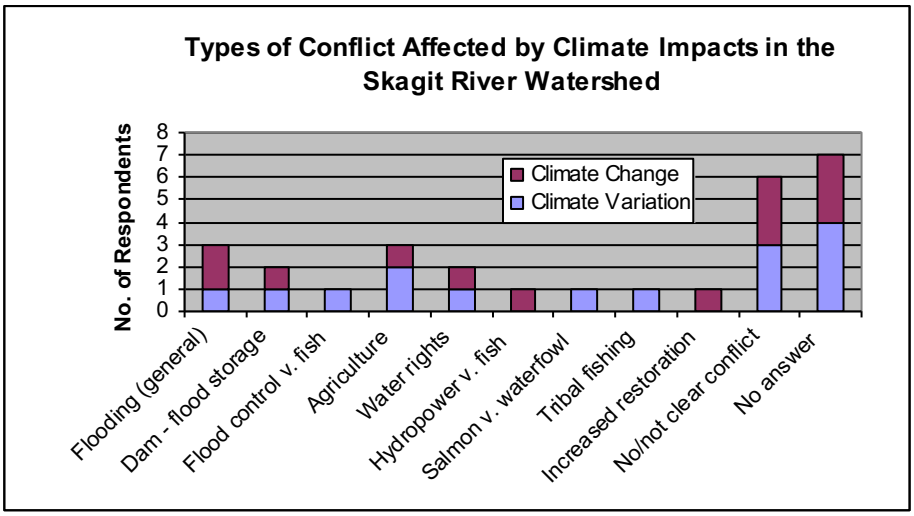

Figure 8 Types of Conflict Affected by Climate Impacts in the Skagit River Watershed

1.3 Climate Affects on Approach to Management

Four interviewees noted that climate variation affected their approach to management (Figure 9). Climate variation was incorporated in salmon recovery goals, instream flow setting, dam operation, and vegetation plantings. No interviewees stated that climate change affected the organization's approach to management. However, information on climate change was incorporated into documentation of at least one initiative. One interviewee would like to see more education to increase the general public awareness of the potential challenges resource conservation faces from climate change. Others provided comments, such as they are "just watching it," or that they were ignoring climate change because the low precision in prediction and lack of tools. Another interviewee noted that their use of climate variation information should bracket climate change impacts. In addition, one interviewee imagines they will incorporate climate change into the management approach in the future. In addition, while one interviewee

stated that climate change does not affect the day to day management of the organization, and it is not discussed at meetings, it is incorporated into project research for salmon habitat that looks at long-term changes.

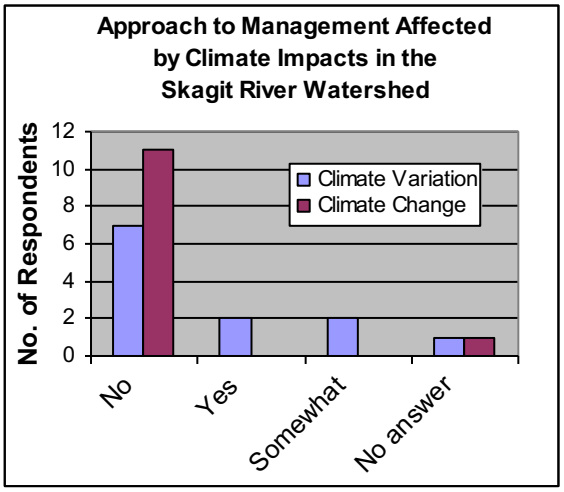

Figure 9 Approach to Management Affected by Climate Impacts in the Skagit River Watershed

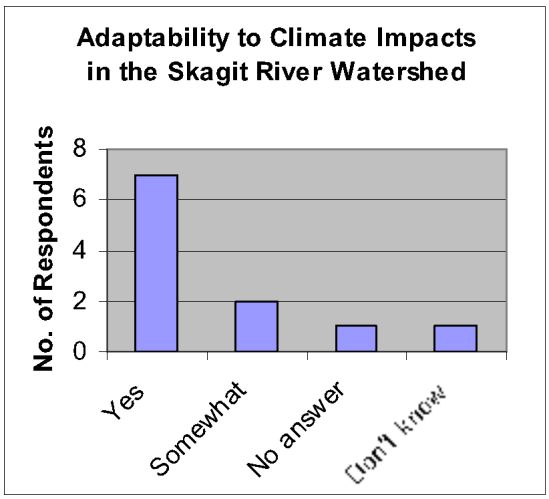

Figure 10 Adaptability to Climate Impacts in the Skagit River Watershed

1.4 Adaptability

Most of the interviewees stated that their organization's decision-making process was potentially flexible or adaptable to climate change and climate variability (Figure 10). Although, flexibility may be influenced by several factors, such as the issues impacted and current politics, as well as whether the impacts were slow and gradual or immediate. In addition, technical barriers to adaptation were noted to be lack of knowledge, belief, relevancy, accuracy, credibility, how compelling the information was, and available guidance.

1.5 Vulnerability

Interviewees noted a range in the level of vulnerability of watershed resources to the impacts of climate variability and climate change (Figure 11). The examples given for highly to moderately vulnerable resources included salmon, broken dikes, and general flooding. People have different views on the resiliency of salmon. One interviewee noted that salmon can withstand a lot, another that many parts of the watershed were insulated to climate change due to refuge areas and buffering, and a third that some species were more resilient than others. Chinook and coho were stated to have a low resilience due to the large amount of time spent in freshwater and impacts from successive storms and low flow events, while pink salmon were more resilient and naturally cyclical. Regarding the former if those events happened enough one "can do all restoration efforts you want and you wouldn't be successful."

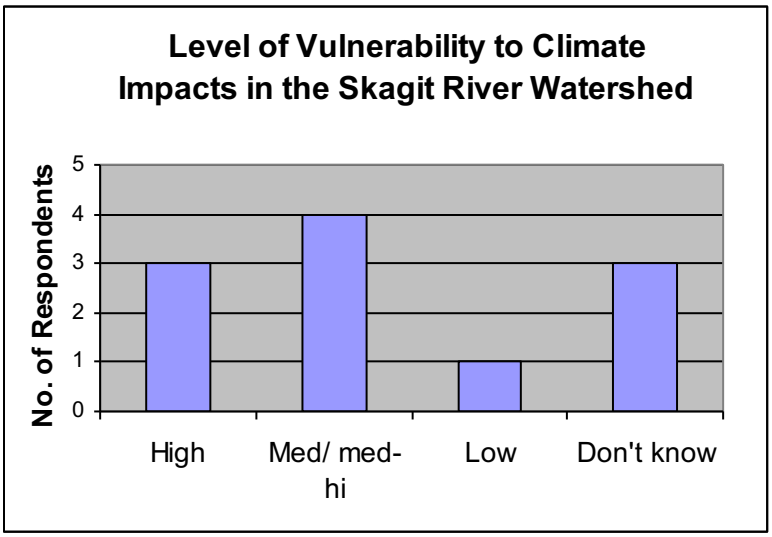

Figure 11 Level of Vulnerability to Climate Impacts in the Skagit River Watershed

CHAPTER 5: RESULTS - TILLAMOOK BAY WATERSHED

DESCRIPTION OF WATERSHED INITIATIVES

1. Tillamook Estuaries Partnership

The Tillamook Estuaries Partnership (TEP) is a National Estuary Project (NEP) dedicated to the conservation and restoration of the five Tillamook County estuaries and the watersheds that sustain them. The NEP is part of the National Estuary Program. This program is administered by the USEPA and aims to protect and restore the health of estuaries, while supporting economic and recreational activities. Tillamook Bay was nominated in 1992 to the National Estuary Program, driven primarily by bacterial contamination. However, four priority problems for the watershed have been identified through this process: water quality, habitat loss and simplification, erosion and sedimentation, and flooding (TBNEP 1999). The latter issue was added after catastrophic floods of 1996 and 1999.

TEP is currently a non-profit organization, but has gone through several evolutions of structure, leadership, staff, and name. TEP originally began as the Tillamook Bay National Estuary Project (TBNEP), which was initiated in 1994 after nomination of the Tillamook Bay in 1992. This group participated in the development of the Tillamook Bay Comprehensive Conservation and Management Plan (CCMP) (TBNEP 1999), under Oregon State University administration. In 1999, upon CCMP approval, the TBNEP shifted from a research and planning group to an implementation organization. The group became known as the Tillamook County Performance Partnership (TCPP), and was administered as a department of Tillamook County. While this structure worked well for awhile, in 2002, the administrative structure changed from a County department to a stand alone non-profit organization. The new board of directors was renamed the Tillamook Estuaries Partnership (TEP). This change occurred so that the group could pursue more diversified and long-term funding, and to increase its autonomy and separate

decision-making from the County. In addition to the name and structural change, this new organization reflected an interest in partnering with neighboring watersheds in order to export lessons learned and technical assistance throughout the North Coast. While the focus remains on the Tillamook Bay watershed, this group works to support activities in watersheds and estuaries throughout Tillamook County.

2. Tillamook Bay Watershed Council

The mission of the Tillamook Bay Watershed Council (TBWC) is to help improve, maintain, and protect watershed health and foster better stewardship and understanding of the Tillamook Bay watershed. In addition, its tasks are to address issues in advance of degradation of the watershed and its resources, and ensure sustainable watershed health. This group was formed and officially designated by the Tillamook County Commissioners in 1998. Its purpose is to address watershed management issues in the Tillamook Bay watershed, improve and enhance watershed health, and to provide a framework for coordination and cooperation among key interests. Some of the activities identified in their workplan (TBWC 2002) include: identifying and addressing priority protection, restoration, and enhancement needs (e.g., improve fish passage and water quality, restore riparian vegetation on bacteria and temperature limited streams); monitoring and evaluating watershed conditions, functions, and efforts to improve watershed health (e.g., monitor bacteria, success of riparian plantings, fish passage, watershed assessment); encouraging and tracking citizen participation; promoting and evaluating citizen learning about watershed resource issues; and building partnerships.

GENERAL EFFECTIVENESS

1. Planning Attributes

Tillamook Estuaries Partnership

Plan Evaluated: Tillamook Bay Comprehensive Conservation and Management Plan (TBNEP 1999)

The work of the TEP is guided by the CCMP, which was developed between 1994-1999 and consists of 63 specific actions over a ten year timeline. The CCMP was primarily organized by five action items; key habitat, water quality (bacteria, temperature), erosion and sedimentation, flooding, and citizen involvement. The plan focused on Oregon Coast coho and other salmonids, but had a general emphasis on ecosystem health which should benefit other species. This plan was approved by the TBNEP Management Committee, Governor of Oregon, and the EPA in 1999, before implementation began.

TEP also engages in yearly planning to address the CCMP action items. Originally workplans were mainly developed through the Director, with some oversight and input from committees. However, TEP established a new workplan development process in order to increase ownership among directors and implementation partners. Workplans were then created through three task forces representing three programs (Environmental Restoration, Education and Outreach, and Research and Monitoring). These groups review project proposals submitted by partners (from watersheds of Tillamook County's five estuaries); discuss and prioritize the projects (based on established criteria including environmental benefit, cost-benefit, and technical and political feasibility); and, recommend the amount of funds that should be allocated as seed money for projects. The Director uses this list and budget recommendations as a basis for a staff workplan and organizational budget, to develop the USEPA grant application.

Plan development was very good with an appropriate level of joint fact finding and scientific input. The plan was developed by the TBNEP Management Conference, which was made up of policy makers, agency managers, citizens, and leading scientists from local, state, and regional institutions. The following four committees were involved in this effort: Policy (local, state and federal leaders), Management (citizen leaders and agency managers, majority who live and work in Tillamook watershed), Scientific and Technical Advisory Committee (scientists, engineers, and planners from local and regional agencies and universities), and Citizens Action Committee (citizen leaders and educators). In addition, the group also hosted public forums to receive additional input. Local and regional agency and academic scientists were involved in four years of scientific and technical studies, gathering existing data and filling gaps in knowledge. In addition, the plan received comment from forty reviewers, and had to be approved by the Oregon Governor and USEPA. It is unclear whether there were any disagreements over the science.

Plan communication was also good, with a clear framework of goals and objectives. The plan has a summary and glossary to make it more understandable. Although, the availability could be improved. It is on the internet, but located on an older version of the initiative's website.

Plan ownership and adaptability seemed generally good, but could be improved. Originally a group of over 120 members committed to implementing the CCMP and an implementation agreement was signed by implementation partners. While there are those who take their role seriously, plan implementation reviews (TCPP 2001a and TEP 2004) showed that not all agencies have made implementation a top priority. In addition, adaptive management was built into the function of the TEP. Each action of the CCMP has one or more measures of success (objectives), which are as much as possible measurable elements, and most have a target date. Each action identifies a coordinating

entity, other partners, completion dates, and plans for monitoring progress. TEP is also engaged in monitoring in partnership with other entities. Projects include volunteer water quality monitoring in support of the TMDL, and a bacteria genetic maker study, and a buffer study. The organization is currently developing a monitoring plan and an environmental report card to track eleven indicators. In addition, implementation of the CCMP was originally tracked using an online reporting system.[32] The online centralized database tracked monitoring objectives, research projects, ecosystem restoration projects, monitoring actions, and monitoring objectives. However, the Tillamook Coastal Watershed Resource Center (TCWRC), who was responsible for the maintenance of this system, currently does not have capacity to keep it updated.

TEP is required to complete quarterly and annual reports for the USEPA. The group also has a biennial review of progress, in addition to NEP biennial review, and makes modifications as necessary. During this process the initiative reviews the goals, priorities, and actions of CCMP. One example of a modification made to the plan is the Community Education Plan, which was developed by the Education Committee to replace the outdated Citizen Involvement section of CCMP. The Development Committee is also working on a TEP Business and Development Plan. However, TEP is still currently battling in general with how to revise the CCMP, and include new issues such as pollution from heavy metals. During implementation review it was also noted that TEP needs to improve reporting on environmental status and trends and more fully implement the monitoring plan.

Tillamook Bay Watershed Council

Much of TBWC is driven by the CCMP, as well as watershed assessments and action plans. However, it also developed its first workplan in 2002 (TBWC 2002). This document was produced using TBWC group process and was driven by the Oregon

[32] http://gisweb.co.tillamook.or.us/mapping/pivot/tillamook.htm

Watershed Enhancement Board (OWEB) grant application. The plan was revised because TBWC only received half the grant money from OWEB. The three top priorities of this plan were education, restoration, and monitoring and assessment. One interviewee noted that work prior to the development of this workplan was "really miscellaneous, and pretty much whatever the coordinator and individual board members wanted to do."

Because much of the work is based on the CCMP, the rankings according to planning criteria would be the same as for TEP. However, this study can provide commentary on the adaptive management criteria. TBWC has undergone self evaluations during 2001 and 2002, and reviews workplan progress once a year. Due to these review processes, TBWC changed its decision-making process, and formed an Administrative Committee to develop bylaws and review the decision-making process. The initiative also formed a Fiscal Accountability Committee, and a Steering committee, which was tasked to develop a Memorandum of Understanding with the Tillamook County Soil and Water Conservation District (TCSWCD) regarding organizational roles and a staff evaluation process. Among other activities, the reviews led to the development of the workplan. TBWC also engages in monitoring the success of riparian plantings and fish passage projects, as well bacteria water quality monitoring, which will be used to prioritize restoration activities. Despite these review processes, it was noted that there is no formal mechanism for adaptive management – the group "tries something, sees how it goes, and adjusts as necessary." However, it was noted that results will not be known for a long time.

2. Implementation Status and Barriers

Both TEP and TBWC have had success in implementing projects. However, TEP has a greater organizational capacity and longer operation time, and therefore more ability to complete projects. Many interviewees stated that the TBWC had been relatively inactive since its formation, but some have noted its recent success in addressing issues.

TEP stated that it has had remarkable success in developing and implementing projects, while building a sustainable nonprofit organization (TEP 2004). The 2001 implementation review (TCPP 2001a) found that of all the action items, almost 50% experienced substantial activity or higher; and, over 75% of the actions received a grade of A-C, or experienced at least moderate activity and on-the-ground progress. The overall strengths were noted to be the creation and development of a GIS database through the TCWRC (as noted above the TCWRC is currently having capacity problems) and a strong education and outreach program. Another great implementation success was retrofitting tide gates to allow fish passage.

The second biennial implementation review was conducted in 2004 (TEP 2004). A grading process was not employed that year, and ongoing implementation cannot be compared in the same fashion. However, TEP noted that the recent implementation priority has been the development of projects that enhance or restore coastal ecosystems. This emphasis gave rise to a number of success stories, such as the restoration of extensive aquatic and terrestrial habitats. TEP considered its "crown jewel" project to be the acquisition of over 350 acres of wetland and levees, which presented an opportunity to restore a large area of inter-tidal wetland habitat. This project has experienced exceptional partner support and collaboration. One interviewee also noted that the CCMP has saved their organization time and effort, and that they receive more money from at least one funding program because of the plan.

Some of the accomplishments of the TBWC include replacing culverts, receiving restoration and enhancement grants, and developing their first workplan. This group has also completed education and outreach projects, which were the main focus of the group for the first several years.

Despite successes, interviewees observed that they have experienced problems with implementation. The barriers were categorized into the following themes: funding and staff resources, confusion and competition among organizations within the watershed, politics and landowner cooperation, initiative structure and capacity, implementing entity participation, permitting, Swiss needle cast[33], and diverse riparian regulations (Figure 12). Also, while both groups appear to be improving their strategic work, both were considered relatively opportunistic. One interviewee noted that the TBWC had previously chosen to do work on worst case scenarios, but recognized that method takes much more money and effort to raise the level of function for an area.

2.1 Funding and Staff Resources

Both watershed initiatives, and four (out of six) additional stakeholders experienced challenges with funding. TEP implementation reviews noted difficulties with funding and personnel. The previous organizational structure inhibited fundraising because of its county government status. In addition, there was a concern that the community continues to perceive the initiative as government supported because it is a NEP. Most of the funding was also derived from public sources and therefore could not be used to raise money or lobby. It also proved more difficult than expected to obtain monies through current state grant contacts for research, monitoring, education/outreach projects.

The TBWC's budget was cut severely by OWEB because the group was too engaged in education and outreach, and was not completing enough on-the-ground projects. In addition, regarding other local stakeholders, one interviewee noted that a general lack of funding and problems with funding structure resulted in a decrease in staff from eight to two within five years. Challenges regarding funding structure have included a change

[33] Swiss needle cast (*Phaeocryptopus gaumannii*) is a pathogen, which affects Douglas Fir trees, and has been found in North American, Europe, and New Zealand. Although, this disease appears to have been around since the 1920's (and debated to be native), a severe epidemic began in Tillamook in the 1990's, and covers approximately 50,000 ha. (http://www.forestpathology.org/dis_swiss.html)

from block grants to money received for specific projects, and difficulty in using matching funds. Some organizations have not been able to implement certain projects because of the lack of federal funding matches. In addition, reporting requirements have proved daunting for various funding sources. Funders have applied more pressure to show visible improvements to fish habitat as an impetus to fund more projects.

Interviewees also noted that some organizations are in competition for the same sources of funding (discussed further below), and that government funds for many of these organizations have decreased or remained stagnant. TEP's 2001 implementation review (TCPP 2001a) stated that Oregon coastal communities traditionally do not have large population bases to lobby state lawmakers for more dollars to be appropriated on problems inherent to the their regions. In addition, Oregon is a rural state with a huge area, and Tillamook County is one of the more depressed counties, therefore the State and County are financially unprepared to assume a significant funding role.

Additional challenges included lacking staff resources to oversee projects and problems retaining staff. Part of the difficulty in CCMP implementation has been attributed to the rural location of the watershed, which is more rural than many NEPs. The constant turnover in staff since the beginning created difficulties in keeping momentum and maintaining institutional knowledge, and led to early disorganization.

2.2 Confusion and Competition Among Groups

Many interviewees also discussed a significant problem over confusion of the role various organizations play, namely the TEP, TBWC, and TBSWCD, as well as a competition for funding noted above. Relations were partially thought to be affected by a jealousy of the TEP's success in getting grants – "top dog is lone dog." The lack of clear definition between the groups, as well as the name changes of TEP, have also caused confusion among the community, and with leadership of the organizations. One

interviewee noted that many people are still not clear if each organization has a value separate from the others. The various groups have attempted to address these issues, and some are optimistic that relations are improving and roles are clarifying. An interviewee noted that this may be due to increased activity of the TBWC. However, it is unclear how this problem will be resolved.

In addition, some members of the community feel that there have been implementation problems with the TEP regarding flooding issues. Interviewees noted that this has resulted from some confusion regarding the function of TEP in dealing with this issue. One of the main problems appears to be a disagreement over whether the TEP should support dredging. An interviewee stated that TEP does not feel the science supports dredging as a valid option to balance environmental protection and minimize flooding. A local taxing district, the Tillamook Bay Habitat and Estuary Improvement District (TBHEID), was formed in 2002 by community members dissatisfied with actions (or lack there of) that various entities in the County have taken to address flooding.

2.3 Politics and Landowner Cooperation

There has also been some difficulty regarding the local political climate, as well as some community resistance. A change in County leadership was noted to have a direct effect upon the direction, focus, and management of the TCPP, now TEP (TCPP 2001). County leadership felt the need to exercise significant control, which was partially justified from a liability standpoint. In addition, the change was seen to shift away from County support of environmentally based decision making and put more emphasis on perceived negative economic impacts of certain CCMP action items, specifically those related to riparian issues and wetland acquisition (TCPP 2001). Some felt this initiative was subject to the whims of local politics, which partially led to the change to non-profit status. However, it seems the political climate and some community resistance continue to affect implementation. Another interviewee described the local political environment

as difficult, and that non-local conservation groups generally steer clear of Tillamook, partially due to the power and wealth of the Tillamook County Creamery Association (TCCA), which represents dairy interests.

In addition, a big challenge to outreach was overcoming long-held beliefs regarding what is "best" for the ecosystem (TCPP 2001). Many generations of loggers, fishers, and dairy farmers manage natural resources in a manner they passionately believe is proper, and scientific studies and new data do not necessarily provide motivation to stop practices which have been passed from generation to generation. An interviewee highlighted the notion of the "hunker theory," which represents some community members views that federal programs come and go, and that the NEP program is just the latest. If they were to "hunker" down and wait for the program to end, they can avoid participating.

2.4 Initiative Structure and Capacity

Both initiatives have had organizational-based challenges. As noted above the organization structure of TEP has evolved significantly since CCMP planning was completed. The evolution was believed to help address problems regarding funding and confusion over leadership within the group and between the group and the County. There have also been challenges with both initiatives regarding the array of different interests represented on the boards, which has caused some difficulties in aligning a common understanding and vision. Beyond a change in organizational structure, TEP has attempted to address many of these issues through board development training, vetting of an agreement among the board to renew their commitment to the mission, and increasing board and community partner involvement through changes in the workplan formation process. Another problem identified for both initiatives was the problem with "too many cooks." At times too many people involved in the process slowed down planning and implementation. In addition, the lack of technical capacity among members also created problems of slowing down the decision-making process or creating problems dealing

with technical projects. The TBWC's consensus-based decision-making process affected implementation as well. This issue was addressed by a change to two-thirds majority vote when the group cannot achieve consensus.

2.5 Implementing Entity Participation

It was also noted that certain CCMP actions have not been implemented because they are not a high priority for some partners; although many agencies and groups also take their implementation role seriously. Many local organizations lack the capacity needed to fully implement their actions in CCMP. For one stakeholder the limiting factor was not the availability of funding, but staff on hand to pursue project grants and consider long term organizational funding. One interviewee also noted a general difficulty in partnering and getting all the players together. Also, incompatible technology among agencies has resulted in challenges for flood control activities.

2.6 Permitting

Permitting was an implementation problem for one initiative and two additional stakeholders. One interviewee noted that this obstacle was created by an overabundance of compartmentalized agencies, with regulations at cross purposes to each other. In addition, in the past TEP has been held responsible for the denial of permit and grant applications to public sources for flood control projects, despite the fact that this group has no authority to control permitting.

2.7 Additional Implementation Problems

Swiss needle cast has created problems regarding the implementation of forest related activities, and has become a driving force on local management leading to clear cut regimes. Another challenge was dealing with the myriad of jurisdictions and strategies addressing the riparian area.

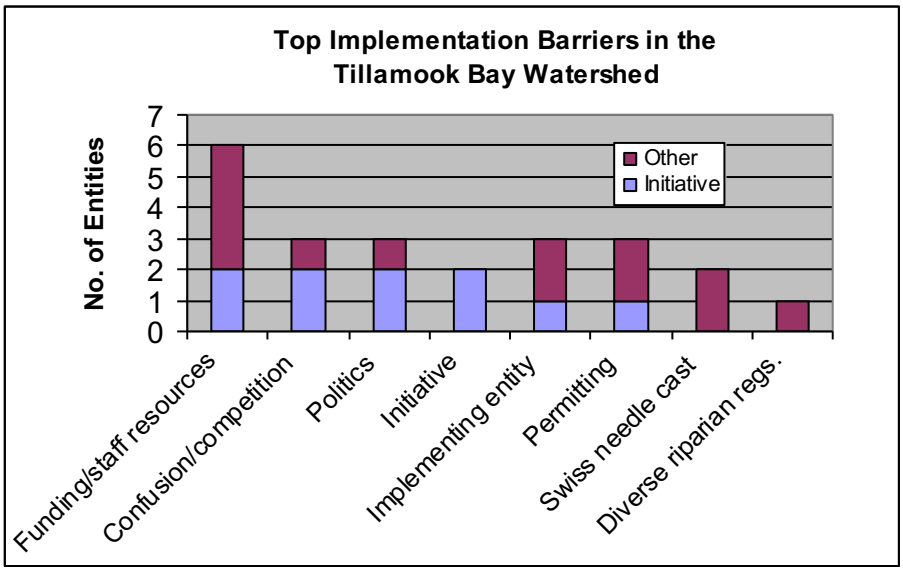

Figure 12 Barriers to Implementation in the Tillamook Bay Watershed

3. Age, Trust, and Leadership

Neither initiative is less than four years old. Although, while the TEP has been around in different iterations since 1994, it has only been a non-profit since 2002. The TBWC was formed in 1998.

Leadership for these two initiatives has been variable. Both groups seem to have a moderate level of leadership. One initiative had low levels of leadership in the past, but has recently seen a substantial increase. The other has had varying levels of leadership over time, but there was optimism of increasing leadership into the future. The latter initiative noted that questions of leadership are timely, and that the group is trying to become more board driven.

Trust was ranked as variable among the two initiatives. Interviewees ranked the level of trust of one initiative from low to moderate and moderately high. Although the

interviewee associated with the latter ranking was unsure if the level of trust is that high within the community, and noted that there is still a level of distrust between competing resource groups (e.g., TCSWCD, TEP, and TBWC). The interviewee who remarked that trust was at a moderate level, stated that the group worked well at one point, but later had a falling out and trust declined. Regarding the other initiative, trust was ranked as high among some members, and variable with others. It was noted that members make decisions on personal relationships with people. If they like someone they are far more likely to approve of projects and issues. When trust is not there, the group's work becomes very dysfunctional. However, an interviewee stated that many members have become more trusting and been able to let go of issues.

EFFECTIVE RESPONSE TO ENVIRONMENTAL VARIATION AND CHANGE

1. Presence of Conflict

There were several issues of conflict in the Tillamook area, including flooding, regulations and private property rights, organizational confusion and competition, resource extraction, and local versus rural versus urban/outsiders. Each issue was discussed by approximately half of the interviewees.

1.1 Flooding

Flooding is a major issue of conflict in the Tillamook, generally due to efforts to balance environmental restoration and flood protection for life and property. An interviewee noted that Tillamook County is unique in that it has the heaviest precipitation in the State, and is always on television due to its flooding problems. The conflict was also presented as two mindsets at odds: "a dominant mindset that favors returning to nature and people moving away and a equally strong mindset to preserve 150 years of establishment . . cleaning out versus filling in, more land and less waterway . . two forces going at each other." Another noted the conflict inherent between the National Flood Insurance

Program (NFIP) and natural resource restoration. There has also been a difference of opinion on what role various organizations should play in flood mitigation. The TBHEID was partially formed to address flooding, as noted above. In addition, a concern was expressed that the County will get sued due to "gross negligence" if they do not address the flooding problem effectively. One interviewee stated that Tillamook Bay and Estuary Feasibility Study[34] led by the County and the USACE to identify and evaluate the problems and opportunities associated with flood damage reduction and ecosystem restoration, was going nowhere due to a lack of palatable options. However, one interviewee noted that the apparent disconnect between environmental and flood decisions appears to be decreasing and that conflicts are becoming fewer.

1.2 Regulations and Private Property Rights

Local regulation of private land, especially the proposed County riparian ordinance, has also been a point of significant conflict and "huge backlash." It was noted that this is "the" conflict within many other counties as well, but the interviewee viewed this conflict in the Tillamook as more perception than reality. An interviewee stated that the ordinance is viewed by some of the community as a civil rights violation, and that Tillamook County Commissioners were removed from office as a response to the County's action regarding the ordinance. Another interviewee noted that more negative actions have resulted since the rural residential zoning designation, and that more protection is instead occurring through voluntary options. These landowners were perceived to care more about water quality than fish.

1.3 Organizational Confusion and Competition

Conflict involving the history and current relationships of the TCSWCD, TEP, and TBWC was discussed previously. There has been confusion over the relative roles that

[34] http://usace.co.tillamook.or.us/default.html

these organizations play, and several have noted issues with competition, distrust, and power struggles.

1.4 Resource Extraction

Another conflict involved timber harvest. The 50/50 initiative[35] has caused controversy and debate over State versus County control over harvest of the Tillamook Forest. In addition, the Bureau of Land Management (BLM) has been involved in litigation regarding its Resource Management Plan, which has limited its ability to fully implement timber sales.

1.5 Outsiders/Urban versus Local

The former harvest issues also related to conflicts regarding local cultural and urban versus rural debates. The Tillamook area is considered a major recreational magnet for people from Portland and beyond. One interviewee noted that the visitors coming from the outside want less development, and a pre-1850 condition. The community is struggling to control its own destiny, local economy, and legacy regarding development and forest management.

2. Integration

2.1 Intra-Horizontal Interplay: Within Organizations and Issues

Both the NEP and Oregon Plan for Salmon and Watersheds (Oregon Plan) have programmatic requirements, which likely have led to increased opportunities for intra-horizontal interplay. The original goal of the TEP's plan was to guide activities by

[35] The 50/50 Initiative (or Measure 34 on the November 2004 Oregon general election ballot) set aside 50% of the Tillamook and Clatsop State Forests to restore native old growth forest structure for the primary purpose of clean water, recreation, and healthy fish and wildlife, while allowing 50% to be sustainably logged to provide revenue to the local county and school systems. This initiative did not pass.

integrating relevant state and federal resource plans into a single, comprehensive resources management strategy and to coordinate all agency workplans.[36] This group appears to have helped coordinate many players and has created several project partnerships. One example resulted in the acquisition of a large property and development of a management plan for wetland restoration, which also addressed community flooding concerns. However, the 2001 implementation review (TCPP 2001) noted that there are a limited number agencies that do not appear to be as coordinated with the TEP's CCMP as originally intended. These agencies are addressing some activities identified as important by TEP; however, actual integration and coordination could be improved. Although it should be noted that many other entities are highly engaged in CCMP implementation.

TBWC has also helped to form partnerships and integrate work in the watershed. One example was the development of a comprehensive subbasin fish passage project with ODFW, Tillamook County, private landowners, and others on Vaughn Creek. This group has also been involved in a Native Tree Cooperative with TCSWCD, BLM, Camp Tillamook, and other nearby watershed councils. In addition, TBWC volunteers coordinate bacteria monitoring with TEP. While the activities of TBWC have been limited, TBWC seems to further engage a few players that are only active at the partner level with TEP, but are not actually on the board of directors.

Despite these partnerships and cooperation, many interviewees seemed to imply that interplay could be improved. One particular project was noted by several interviewees as one of the first collaborative projects for many players in the watershed. This project

[36] These plans and programs included TMDLs, SB1010, Shellfish Management Plan, Oregon Plan for Salmon and Watersheds, North Coast Basin Strategic Plan, TCSWCD annual and long term work plans, ODFW habitat restoration plans, ODF Forest Management and Habitat Conservation Plans, Tillamook County Comprehensive Plan and public health plans, Tillamook County Flood Mitigation Plan, Economic Development Council Ecosystem Industry Development Plan, Oregon Coastal Zone Management Plan and CZMA 6217, Project Study Plan, and Tillamook Bay Feasibility Study.

involved a restoration effort, which included the cooperation of TBWC, TEP, ODFW, ODF, and BLM.

2.2 Inter-Horizontal Interplay: Between Organizations and Issues

There are formal linkages between the TEP and TBWC. The TEP staff is a member of the TBWC, and TBWC is a partner of the TEP. In addition, there are several common members between these two initiatives (Figure 13). The TBWC also attempts to coordinate their workplan formation with the TEP, and consults the CCMP when targeting restoration areas. Support from TEP in the past biennium has helped the TBWC keep staff, deal with internal issues, and move forward on projects. However, despite the sharing of members, there has been a history of complaints regarding a lack of coordination and communication among these groups. Although, there is some perception that coordination is starting to improve, partially due to necessity imposed by scarce funding and resources. The drying up of funding was noted as at "cataclysmic event" in its affect on the work of many groups.

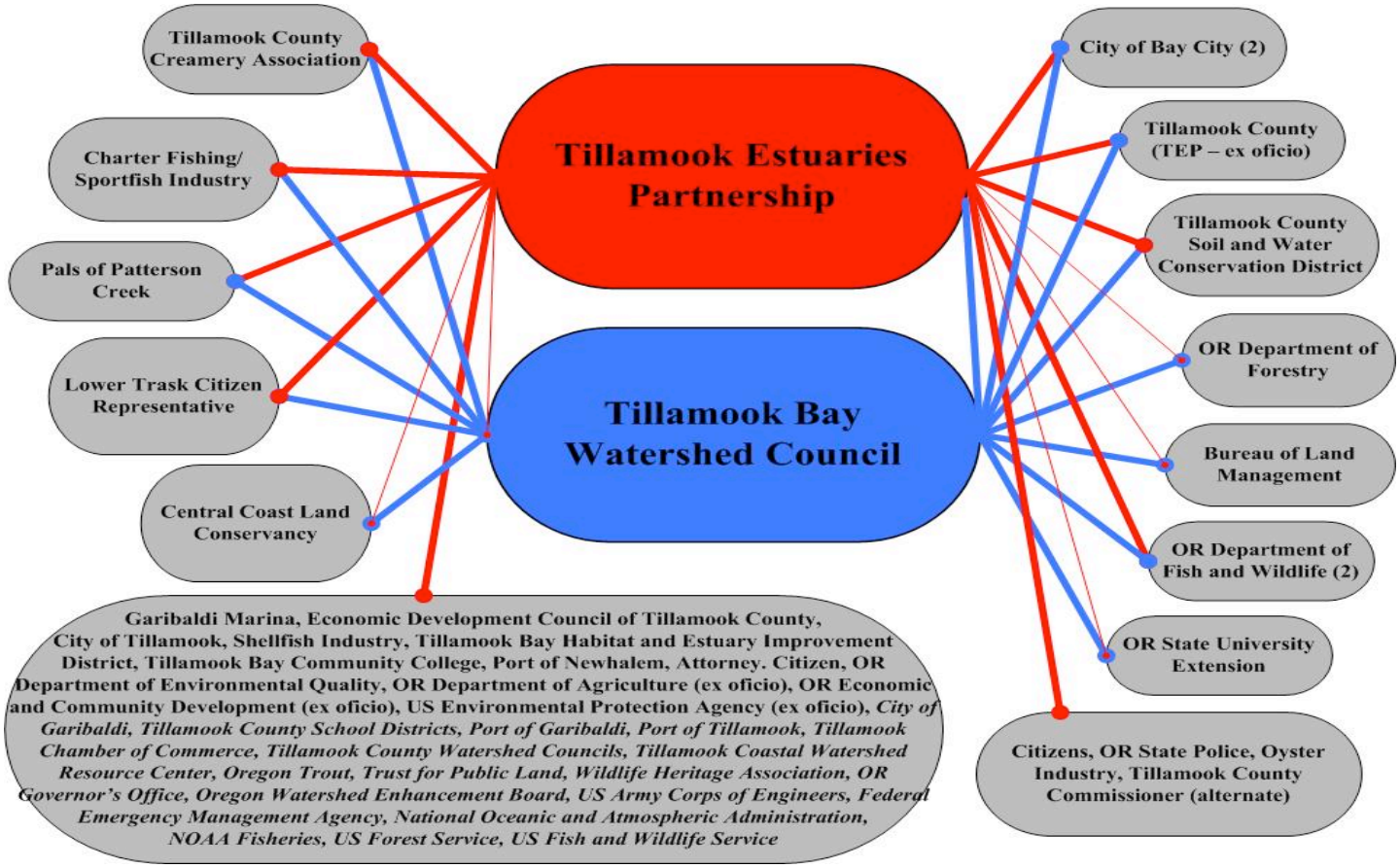

Figure 13 Diagram Showing Common Membership for Tillamook Bay Watershed Initiatives

Bold lines indicate stakeholder is a member of the Board of Directors (or equivalent), or lead agency. Thin lines (or italics) indicate stakeholder is a partner, or general member. If more than one person is the contact for both initiatives, the number of contacts is noted in parenthesis

2.3 Vertical Interplay

Both the TEP and TBWC are integrated with the Oregon Plan for Salmon and Watersheds, a statewide strategy to address salmon recovery and watershed health. The Oregon Plan implements its strategy and coordinates agencies and organizations using Core, Implementation, Outreach, Monitoring, Independent Multidisciplinary Science, and Regional teams. There are four regional teams for the State, which are designed to provide a link between Oregon Plan policy development and implementation. One of several guiding principles of the Oregon Plan is coordination and communication vertically within agencies, and horizontally between agencies and other entities. The Regional Teams, with help from the Core Team and OWEB, are tasked to develop regional objectives through a biennial workplan, and assist local groups, such as watershed councils, form strategies to meet these objectives. In addition, as noted above, the TEP's plan integrates many other state and federal resource plans. While these mechanisms exist, their strength and effectiveness could not be determined by this study.

Bidwell (2003) noted that there is "not clear connection between watershed councils and the federal Evolutionary Significant Unit (ESU) based recovery process."

2.4 Watershed Integration

Perceptions of the level of watershed integration were variable, from not integrated, fair/moderate, to well-integrated (Figure 14). One interviewee stated that in some ways integration was good and others stated it was extremely poor. It was noted that there is no nearshore component to planning, and another stated that the problems are more with the estuary, than the bay and ocean. Some examples were given of successful integration, which included prioritizing culvert work, and a cooperative nursery, as noted above. Several interviewees were also optimistic that integration is improving, that community buy-in and agency support are growing, and that the CCMP has been helpful with integration.

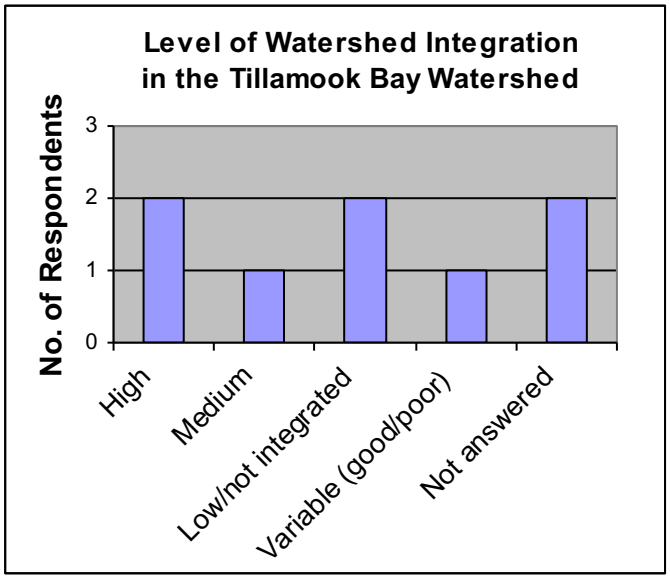

Figure 14 Level of Watershed Integration in the Tillamook Bay Watershed

One interviewee stated that the early research phase of the CCMP "did a good job in looking from ridge top to estuary," but that there has not been the same level of integration when it comes to actual implementation on the ground. Also, some forest landowners were noted to be good stewards, but in general private property has not been well addressed. Barriers to further integration were recognized as particular opposing people and groups, as well as diverse land use policies, regulations, and political jurisdictions. Bureaucracy also appears to inhibit collaboration, and it is perceived that private industry, as well as entities acting anonymously, can accomplish restoration tasks much faster. An interviewee noted that the "industry will give up immediately if the federal government is involved."

CLIMATE IMPACTS

1. Stakeholder Perceptions of Sensitivity, Adaptability, and Vulnerability

1.1 Climate Impacts on Watershed Processes

The most common impacts on watershed resources from climate variation related to flooding, fish, and precipitation or storms, although other impacts were discussed (Figure 15). The timing and variation of huge flood events and debris flows were noted as significant elements to the formation of the system. Another person noted that El Niño led to generally dry conditions and fire, while La Niña led to more flooding.

One interviewee stated that as a child the rains used to come in September, and now do not come until October or November. The rainfall previously averaged 90 inches and now averages only 80 inches. In the past there were good storms, good salmon survival in streams and ocean, and good returns. Then fourteen years of drought began in 1980, along with poor ocean conditions, decreases in fish populations, and decreases in tree growth. The interviewee suspected that previously when the rains came in September, the high flows did not affect salmon spawning because the overall water level was higher – and this was attributed to El Niño.

It was also speculated that Swiss needle cast is less severe during mild climate. Upwelling was noted by one interviewee to drive everything and impact the estuary, and two people spoke of El Niño and relations to changes in fish migration in the ocean (e.g., tuna and predators). People seemed relatively better able to speak about climate variation than change in the Tillamook. One interviewee noted that sea level rise may increase flooding, and put more pressure on the community to manage the river. Sea level rise was also attributed to losing beaches.

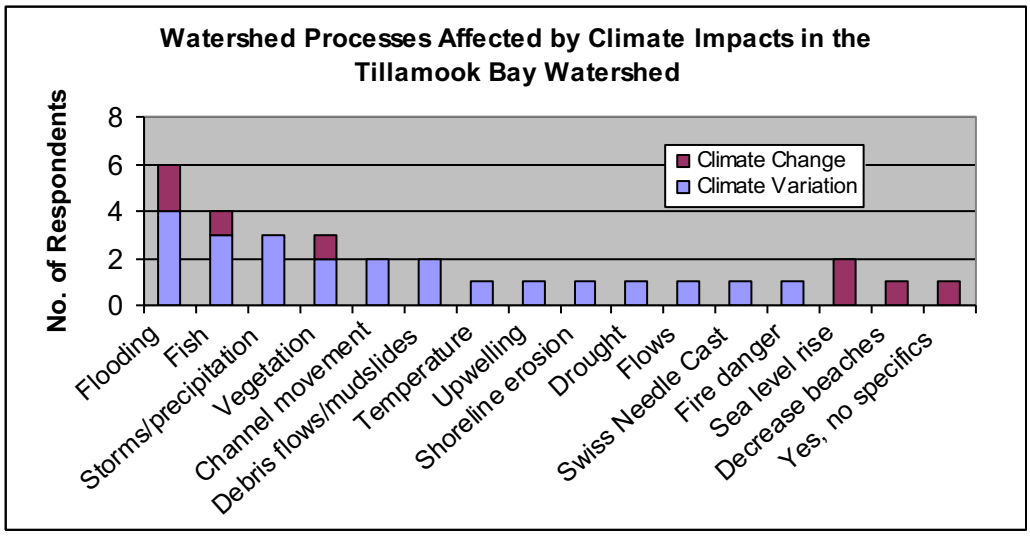

Figure 15 Watershed Processes Affected by Climate Impacts in the Tillamook Bay Watershed

1.2 Climate Impacts on Conflict

Many interviewees noted that climate impacts affected patterns of conflict, although some were not able to comment on this connection. Conflict may come from flooding, water rights, general resource scarcity, more regulations, and Swiss needle cast (Figure 16). Flooding is considered a huge issue, involving significant tension and some traumatic feelings among the community. Although, another interviewee noted that there is also a struggle with complacency, and that "it is too bad cycles are not closer together within recent memory." One person also stated the possibility of water rights being shut off, but did not see this issue as a high degree of conflict.

Regarding climate change, some people recognized effects on conflict, but had difficulty articulating and quantifying potential conflicts. One person noted that the Tillamook area would be the last to be affected by climate change, because of its location and size. "World-wide events affect us last . . we watch the rest of the world deforest themselves and know that we are the last frontier. On a world-wide basis we will be the last because we are so nature-based that we are subtlety affected all the time." Another interviewee

noted that power struggles and conflict will always be present because of the nature of people, and that some issues become the focus and help to foster the inevitable continuation of conflict.

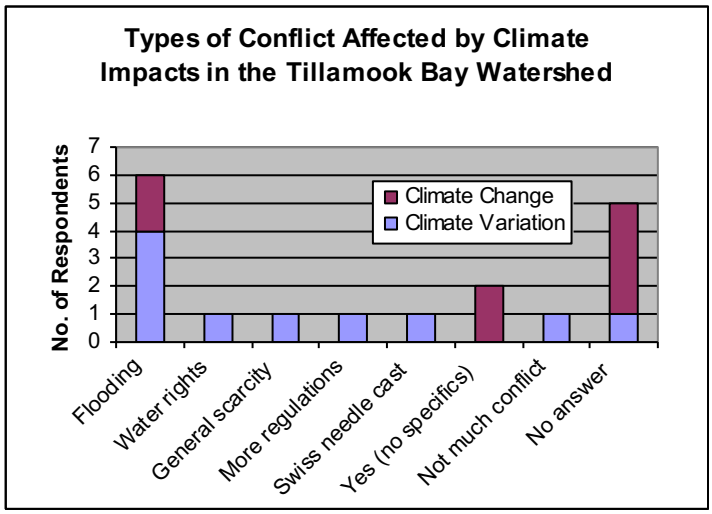

Figure 16 Types of Conflict Affected by Climate Impacts in the Tillamook Bay Watershed

1.3 Climate Impacts on Approach to Management

Approaches to management were generally not formally affected by climate variation and change (Figure 17). However, people noted being informally aware of flooding conditions, and watching for El Niño and La Niña. Two people discussed the use of forecasts. One group obtained winter predictions on October 1st for every flood season, and used this information, along with tidal data, for project implementation. In addition, it was noted that climate information was used in developing the County's Hazard Mitigation Plan and flood hazard overlay. Only one interviewee noted that climate change affects their approach to management, but it appeared as though climate change was only informally considered.

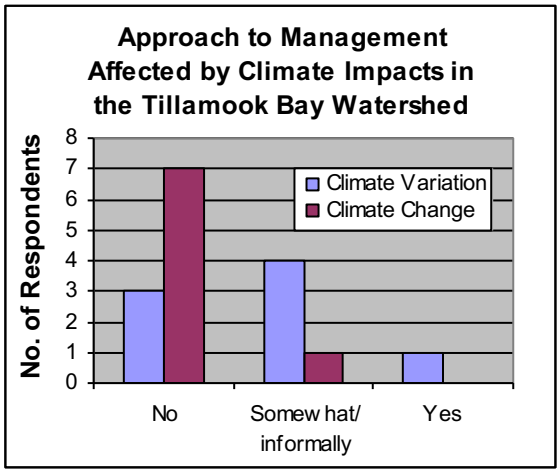

Figure 17 Approach to Management Affected by Climate Impacts in the Tillamook Bay Watershed

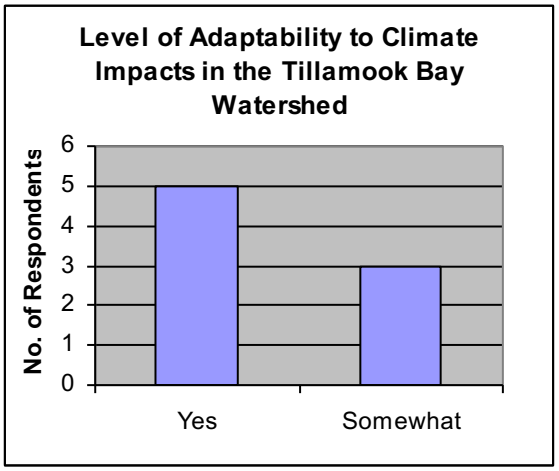

Figure 18 Adaptability to Climate Impacts in the Tillamook Bay Watershed

1.4 Adaptability

Most people reported that their decision-making processes were potentially flexible or adaptable to climate variation and climate change (Figure 18). Some noted that the degree of flexibility depended on political will and long-term versus short-term changes. Another noted that they have less flexibility when working in tidal areas. Other barriers included the accuracy of forecasts, availability of site specific information, lack of technical capacity, funding, and credibility. One interviewee noted that personal relationships are most important for credibility and incorporating new information for one initiative. Members of this group generally do not have formal education and training, do not value information from journal articles, and are suspicious of those who are educated and not from the local community. Trust is very important component in accepting information. Another interviewee noted that politics affects more of what they do than science.

1.5 Vulnerability

Most responses indicated that watershed resources are moderately to highly vulnerable, generally as a result of flooding (Figure 19). Some of the reasons for vulnerability included boundaries and constraints on the environment due to development, lack of capacity to handle large floods (e.g., 500 year event), reliance on a road system for land management, and the potential for increased violations of water quality standards. An interviewee noted that increased flooding will cause water quality issues, and that "climate change could put the whole town out of business . . (because they) couldn't comply with regulations." Others discussed a moderate vulnerability or decrease in vulnerability because of the increased ability to respond to flood events, the quick growth of vegetation, and accessibility to tidegate technology. The tidegate manufacturer is located in the area, which was reported to greatly reduce implementation costs.

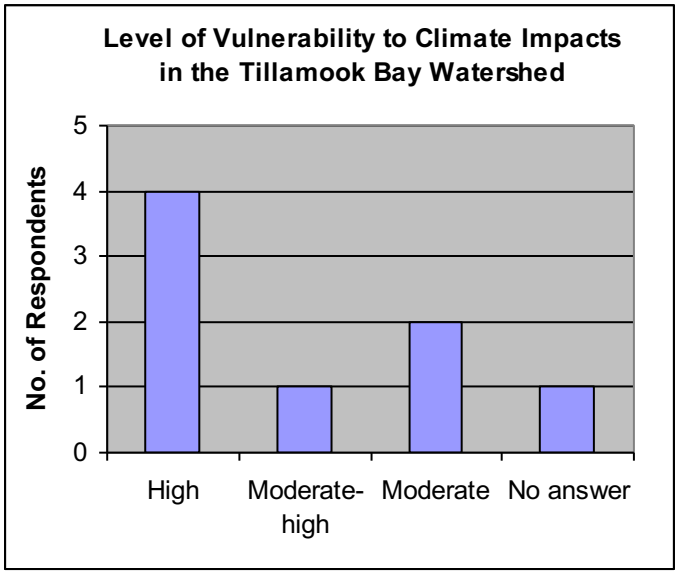

Figure 19 Level of Vulnerability to Climate Impacts in the Tillamook Bay Watershed

CHAPTER 6: DISCUSSION

While their level of effectiveness may differ, the watershed initiatives evaluated by this study have generally been valuable efforts and present good venues to address climate impacts. The following discussions compare some of the basic strengths and potential constraints on the effectiveness of initiatives in both the Skagit River and Tillamook Bay watersheds. As noted previously, the goal of this information is to shed light on attributes potentially affecting the ability of these initiatives to adapt to climate impacts; however, the results also provide a basic understanding of how these groups are functioning on the ground. The discussions will then be followed by reflections on the sensitivity, adaptability, and vulnerability of watershed resources to climate impacts. This information can be used to help develop strategies for improving the incorporation of climate information in watershed-based planning and implementation.

WATERSHED ISSUES ADDRESSED BY INITIATIVES

It is important to know the general focus of the watershed initiatives in order to understand how best to support their efforts, and to tailor information to their needs. There are many similar issues in the Skagit and Tillamook watersheds, including declining salmon populations, water quality concerns (e.g., fecal coliform, temperature, dissolved oxygen), and closures of locally important shellfish beds. In addition, the initiatives in each watershed have some overlapping interests. In the Skagit, the SCMRC and SCEA are both concerned with shellfish bed closures and failing septic tanks, and the SCMRC and SWC are both interested in the nearshore habitat restoration. TEP is also concerned with the same issues as the TBWC.

However, there are also some differences between the watersheds. While both watersheds focus on salmonids, the SCMRC in the Skagit also addresses bottomfish and forage fish. In addition, water quantity (instream and out-of-stream needs) was addressed

by the SWPU in the Skagit, but there does not seem to be a community focus on this issue in the Tillamook; although, water quantity is addressed at the state level. Documents have highlighted that there are some concerns with low flow in the watershed (TCPP 2001a and 2001b). In addition, Oregon Department of Water Resources (ODWR) and ODFW have established instream flow water rights in the Tillamook basin and listed some portions of the watershed as high priority for flow restoration[37]. However, this issue may not be addressed because water rights are not as great an issue in the Tillamook, or because Washington State's Watershed Planning Act (ESHB 2514) specifically allocates state funding for community-based water quantity planning.

In addition, the initiatives studied in the Skagit do not directly address flooding as the TEP does in the Tillamook; although, there are efforts led by Skagit County and USACE. And, none of the watershed initiatives comprehensively addressed salmon recovery (e.g., habitat plus harvest, hydropower, and hatcheries); although, other watersheds in the Puget Sound are addressing salmon recovery at the watershed level and salmon recovery is being addressed by at the regional level in Oregon.

WATERSHED INITIATIVE STRENGTHS

1. Filling the Void: Improving Watershed Characterization and Strategic Action

Almost all of the initiatives have addressed watershed issues, which either previously lacked attention or coordination and a strategic approach. The SWC was perceived to have improved the quality of salmonid habitat protection and restoration projects, and increased coordination of research, planning, and on-the-ground projects. This group has engaged many of the important stakeholders and developed a high quality method for identifying and prioritizing salmon habitat projects. While the SCEA is still a young organization attempting to formulate its strategy, it has served an important role in

[37] http://www1.wrd.state.or.us/pdfs/OPSW_Priorities01.pdf

coordinating the IRC and WAP updating process. The WAP reviews have shown that many of the recommendations have and are being implemented. The SCMRC has filled the role of addressing marine and nearshore resources at a local level more comprehensively than previous efforts. Many of these prior efforts appeared to only be addressed at state levels. Through work with partners and engaging local stakeholders, the SCMRC has made strategic recommendations for bottomfish recovery and nearshore habitat protection and restoration, among other projects. While the SWPU is currently defunct, they made significant progress in laying the groundwork for WDOE to establish an instream flow rule and implementation plan. In addition, it is possible that the group will reconvene after the final rule-making by WDOE to complete the management plan.

The TEP (and its former iterations) also made significant strides in characterizing the important issues of the Tillamook watershed, as well as recommending and implementing strategic actions to address watershed issues in a more comprehensive manner. The TEP has facilitated important wetlands acquisitions, addressed fish passage issues, improved riparian areas, and led education and monitoring efforts. Of all the other initiatives, the TBWC seemed to be struggling the most to find and fill its role in the watershed. However, many people were optimistic regarding the potential value of this organization, especially in regards to engaging the community through education and on-the-ground projects.

2. Good Planning Development and Communication

Many of these initiatives were able to fill their roles noted above due to investments in good planning. Using planning evaluation criteria from Huntington and Sommarstrom (2000), plan development (use of joint fact finding and scientific input) and plan communication (goals and objectives clearly stated, understandable by non-technical participants) for all initiatives were relatively strong. Most were able to create a relatively solid technical plan with input from many of the appropriate stakeholders.

However, community input (beyond initiative members) was somewhat limited for two initiatives in the Skagit, and accessibility to documentation could have also been improved for some of the initiatives.

WATERSHED INITIATIVE CONSTRAINTS

While the initiatives have been successful with many projects and partnerships, every initiative discussed constraints, which have affected their efforts. This section will highlight constraints common to both watersheds, and then discuss constraints that may be more specific to one watershed.

1. Planning and Implementation Issues Affecting Both Watersheds

1.1 Plan Ownership: Reliance on Voluntary Actions

Due to their voluntary nature, watershed initiatives tend to lack authority and rely not only on willing cooperators, but also on others to actually implement their recommendations. While most initiatives had successfully engaged many important stakeholders who take their role seriously, full plan ownership and participation in implementation was a pervasive problem. The SWPU had the most significant problems with plan ownership (as defined by Huntington and Sommarstrom 2000), due to lack of agreement on instream flow recommendations. The plans of the SWC, SCEA, and TEP appeared to have a good basic level of ownership in that they have engaged many important stakeholders in planning and implementation. However, the ownership of the plans could be improved among several important stakeholders, in order to increase their success. In general, it was too early in the process to evaluate the SCMRC because their Blueprint restoration plan was recently released and their bottomfish plan was awaiting response from the co-managers at the time of this research. Problems with participation generally stemmed from several factors, including the general learning curve associated

with partnering, private landowners' lack of willingness, and implementing entities' lack of willingness, funding, staff resources, or prioritization.

Landowners were reluctant to conduct restoration or studies on their property, often due to concerns over property rights and values, liability (e.g., removing dikes), and fear of having to change land use practices. One interviewee in the Tillamook noted that new scientific studies do not necessarily provide motivation to change these practices. In addition, new regulations (the riparian ordinance is discussed below) seem to have affected landowner cooperation. A portion of this landowner reticence involved the agricultural community, which seemed particularly strong in both watersheds. For example, the Skagit agricultural community was influential in getting HB 1418 passed in 2003, which involved an exemption of tide gates and flood gates statewide from fish-passage requirements. Also, one interviewee noted that non-local conservation groups generally do not engage in activities in the Tillamook, partially because they do not want to confront the power and wealth of the TCCA. In addition, interviewees in both watersheds discussed a lack of concern or incentive to participate in environmental efforts. This was labeled as the "hunker" (or the "cause of the day") theory, which symbolizes a stakeholder hunkering down and being able to avoid participation because environmental programs and laws are thought to come and go. This finding corresponded with Bidwell (2003), who stated that "threat of regulation is currently insufficient to promote high levels of participation (among the general public) in watershed councils (in Oregon)."

Despite this concern, it seems in both watersheds there has been cooperative success with landowners and implementing entities, and a lot of work has been done. Although landowner and implementing agency cooperation may be a pervasive challenge, the history of environmental management and increasing popularity of collaborative decision-making seems to tell us that it is possible (and maybe likely) that cooperation

would be equally or more problematic through regulatory-based efforts. One interviewee noted in the Tillamook that more beneficial activities have been done under voluntary riparian programs than through the riparian ordinance due to landowner backlash. Although, others may maintain that the perception of fairness for riparian ordinances in other areas or at other times may be improved and, if properly implemented, provide long-term benefits. Riparian ordinances are discussed in more detail below.

1.2 Adaptive Management

Adaptive management is considered a particularly important element in improving the ability to incorporate climate information, and this potential constraint should be seriously considered. Plan adaptability (also evaluated using Huntington and Sommarstrom 2000) and adaptive management, while incorporated into most of the initiatives, may not be sufficient to ensure maximum effectiveness. Adaptive management may be compromised by occasional lack of clear mechanisms to update plans and the ability to conduct the necessary monitoring, such as validation monitoring.[38] Each of the initiatives incorporated some level of adaptive management into its work, including recognition in documents of the need to incorporate new information, support of monitoring efforts, and instances of organization evaluation and change. However, while most of the initiatives have annual workplans and strategic approaches that consider new projects and priorities, it seemed that none has actually made updates to their original planning documents. This could be a test of the true strength of their adaptive management program, but also could be due to the continued appropriateness of the document (i.e., it was a high quality product and the issues have not changed or it has not been long enough to evaluate the need to revise the document). One initiative directly discussed difficulties in updating their plan, and a lacked a model to follow.

[38] Implementation, effectiveness, and validation monitoring definitions used by the SWC are provided on page 26.

In addition, while all initiatives have some level of monitoring associated with adaptive management, the efforts were sometimes lacking in comprehensiveness. For example, the SWC seemed to have a relatively comprehensive and consistent implementation and effectiveness monitoring, but they do not engage in validation monitoring. In addition, while the SCMRC monitors success of oyster and Spartina projects, it does not appear to have a monitoring strategy for their Blueprint restoration plan. While TEP attempts to engage in effectiveness monitoring, their program does not currently address a wide array of parameters. They are rectifying this by developing a set of environmental indicators to monitor their success in a more holistic manner. Some initiatives noted that monitoring was difficult due to a lack of funding. In addition, initiatives may correctly perceive that validation monitoring should be conducted by larger scale entities, such as state agencies or regional organizations. Statewide and regional monitoring is already occurring at some level, but it was outside the scope of this study to determine how clearly it may tie into the work of these organizations.

1.3 Funding and Resources

Funding appeared to be one of the most significant barriers to implementation for initiatives and stakeholders. However, funding problems varied. The NEP seems to place more emphasis on programmatic funding, as opposed to project funding and the SRFB has the opposite funding pattern. In addition, in the Skagit, stakeholders had difficulty addressing the funding guidelines, which required certain documentation to justify projects. It was difficult to provide this information either because the monitoring was not being done (i.e., validation monitoring) or because it was too difficult to show the tangible product (i.e., results of education). Landsman (2000) also reported that the SFRB was perceived by some interviewees as time consuming and tedious, and that it may keep smaller groups from applying; although, a few interviewees noted that the process facilitated improved communication between local organizations.

It is unclear if this issue was a problem for funding programs in the Tillamook because the issue was not raised. Securing matching funds was also discussed as a problem in the Tillamook and not discussed in the Skagit, which could mean that it is easier to attain matching funds, or not as much of a concern. However, there did appear to be more competition for funding in the Tillamook. This could be due to more organizations with similar roles or a more general lack of funding directed at the watershed or in Oregon. In Oregon, government funds for many of these organizations were noted to have decreased or remained stagnant while requests and competition have increased. The TEP (2001) implementation report also stated that Oregon coastal communities traditionally do not have large population bases to lobby state lawmakers for more dollars to be appropriated on problems inherent to their regions.

While funding was listed as a problem by all initiatives, and the nation has experienced federal and state budgetary challenges over the last few years, it is likely that funding will always be listed as a relatively high implementation barrier. Funding was also listed as inadequate for watershed efforts in studies conducted on the Washington's ESHB 2514 groups (Klug 2001) and Oregon's watershed councils (Bidwell 2003). It seems that watershed initiatives would always be able to identify more projects than can be financially supported. This statement is not meant to diminish this concern, but just to put it in perspective. Pervasive problems with funding can lead to increased justification for further allocations; however, funding is likely to be an inevitable and eternal challenge.

1.4 Agreeing to Disagree

Consensus-based decision making created some difficulties for initiatives in each watershed, by either slowing down the process or not allowing the initiative to deal with certain issues. The initiatives have addressed this issue of consensus in different ways. The TBWC addressed this issue by changing their bylaws to majority voting when

consensus could not be reached. One interviewee also stated that the TEP "gave up diversity to get something accomplished;" however, this opinion was not verified. In the Skagit, an interviewee noted that the SWC attempts to address this decision-making issue by only allowing organizations (not individuals) to join, because it is perceived that one individual can hold up the process. The SWPU confronted the difficulty of reaching consensus by temporarily disbanding, because they could not reach agreement regarding instream flow recommendations and were running out of funding.

Like the funding barrier noted above, challenges with consensus are likely to remain an obstacle at some level due to diverse interests, agendas, and mandates among stakeholders. While consensus may limit the work done by some initiatives, it is difficult to say whether the most important issues (or more minor issues) are being avoided and not addressed. Although, lack of consensus to address comprehensive multi-stakeholder salmonid recovery planning in the Skagit could be perceived as a significant issue regarding this topic. However, the co-managers are confronting recovery planning and therefore, there is not a complete void in this work. It may be practical that watershed initiatives use various methods to avoid paralysis by consensus, but these groups need to be mindful that they do not jeopardize some of the original objectives of collaborative planning (e.g., increased community buy-in).

1.5 Stakeholder Complexity

Issues were raised regarding implementation barriers and conflict due to stakeholder complexity. This concept was discussed more in the Skagit. In this watershed difficulties arose when projects involved multiple landowners. Another challenge was working with smaller acreages due to limited resources. Conflict was also driven by varying missions, agendas, and jurisdictions, and some strongly guarded interests. Complex landownership was only mentioned as a barrier to implementation by one interviewee in the Tillamook, in reference to diverse riparian jurisdictions and

regulations. However, another general reference to stakeholder complexity was made in reference to incompatible technology among agencies, which has resulted in challenges for flood control activities. While stakeholder complexity did not seem as significant from questions on implementation and conflict in the Tillamook, when interviewees were asked about watershed integration many discussed the complexity of jurisdictions and varying interests as a barrier.

2. Implementation Issues Specific to the Skagit

2.1 Lack of Knowledge

There has been a relatively significant amount of research and characterization completed in both watersheds. However, a lack of knowledge seemed to be a greater concern in the Skagit. Comments generally addressed the need for a better understanding of the nearshore environment. Nearshore research and restoration were perceived to be less advanced than watershed science and restoration. The initiatives in the Tillamook do not work in the nearshore areas and therefore may not experience this hurdle. Stakeholders in the Tillamook may also feel that they have spent a enough time on studies and characterizations to accomplish many tasks, or they may be more overwhelmed by other challenges than a lack of knowledge, which is sure to exist at some level.

3. Implementation Issues Specific to the Tillamook

3.1 Too Many Cooks . . . Yet Limited Technical Capacity and Variable Strength in Leadership

Initiatives in the Tillamook also had some problems with too many people bogging down decision-making processes. As noted above, this difficulty was partly due to challenges with consensus. However, this issue also seemed to result from a lack of technical capacity, which created challenges implementing projects and during planning discussions. Issues with staff capacity in the Tillamook also appeared to be a problem.

This was partly attributed to its rural location. While much of the Skagit is considered a rural watershed, capacity did not appear as significant a problem. This could be due its location between two urban areas (Seattle and Vancouver) and along the I-5 corridor. It is possible that the Skagit also attracts more attention and technical expertise on a state and regional scale due to such aspects as its size, amount of protected lands, and the significance of its salmon runs and other wildlife populations (e.g., bald eagles). Local stakeholders such as the tribes and Seattle City Light seem to provide significant technical expertise and additional financial investment.

There was also more concern regarding leadership in the Tillamook initiatives than in the Skagit. In general, leadership problems seemed to rest with the general board members and not the facilitators (e.g., TEP Executive Director and TBWC Chair). Of course, leadership was originally high in order to see through the development of the CCMP; however, it appeared to have waned in phases during the implementation years. There is a general optimism that leadership is increasing for both initiatives.

3.2 Opportunistic versus Strategic

Initiatives generally were perceived as more opportunistic in the Tillamook, and somewhat more strategic in the Skagit. However, the work of the initiatives in the Tillamook were still considered to be aligned with their planning documents, and at least one initiative stated that the work was becoming more strategic. This may result from challenges with technical capacity and leadership in the Tillamook noted above. Bidwell (2003) noted that leadership was an important factor in driving the completion of action plans for surveyed watershed councils in Oregon. Bidwell also found that many watershed council efforts were more opportunity driven, and often based on social priorities over ecological priorities. The conclusion was that the Oregon Plan was not providing incentives for action planning, despite the original vision to do so.

One interviewee in the Tillamook noted that it was not difficult to understand what they had to get done in the watershed. Some funding requirements were also discussed in the Skagit as helping an initiative move from opportunistic to strategic. Although, stakeholders also stated that some of their projects in the past and some currently are funding-driven as opposed strategic actions. It is difficult to say if the Oregon Plan and NEP were less influential than the Washington watershed programs in providing incentives for strategic implementation. Bidwell did note that the watershed councils that completed action plans may have been driven by internal pressure (e.g., to resolve conflict), as opposed to external pressure, such as funding requirements.

3.3 Organizational Confusion and Competition

Initiatives in the Tillamook have also experienced difficulties relating to organizational flux, confusion, and competition. Theses issues mainly concern the historical and current relationships of the TCSWCD, TEP, and TBWC. There has been confusion over the relative roles that these organizations play, and several interviewees noted the presence of competition, distrust, and power struggles. These organizations are aware of this handicap and there was some optimism that these issues are and will continue to improve. In addition, the TEP also underwent difficulties with their structure over the years. Their prior affiliation as department of the County created challenges with fundraising and confusion over leadership. However, TEP separated from the County and became a non-profit to address these issues.

3.4 Additional Implementation Issues in the Tillamook

Swiss needle cast and permitting were both considered relatively significant barriers in the Tillamook. The former has created problems for forest related activities, and has become a driving force on management leading to clear cut regimes. Permitting has also created difficulties by delaying projects, and jeopardizing time-restricted grants. Timber harvesting and permits were not raised as an issue in the Skagit through this study.

CONFLICT AND TRUST

Conflict and variable levels of trust were present in both watersheds. For example, one person noted that the "Skagit is more volatile and political than anywhere." This statement is impossible to qualify, of course, but worthy to note. Conflict can not only inhibit effectiveness and adaptability, but also affect strategies for forming partnerships in watersheds to address climate impacts.

In general, trust seemed to be high among some members, and mixed among others and the community. The perceived reasons for this included, some guarded interests, few aligned missions, general disagreements, and high levels of trust among agencies, but mixed trust among citizens and non-agency groups.

However, general trust in these watersheds may be further defined by evaluating conflicts within the community. Common conflicts in both the Skagit and Tillamook were threats to land ownership and property rights, general county politics, flooding, and local versus urban/outsiders. In addition, stakeholder complexity, tribal issues, and water rights were discussed in the Skagit and organizational confusion and competition in the Tillamook. These categories are not necessarily mutually exclusive. For example, stakeholder complexity likely involves elements of the other categories. However, since interviewees were not always specific and issues overlap, responses were grouped to ease evaluation. In the Skagit the conflicts discussed most often were threats to land ownership and property rights, stakeholder complexity, and tribes versus county. In the Tillamook there was a fairly equal balance of issues discussed. Stakeholder complexity and organizational confusion and competition were already discussed in relation to implementation, and therefore will not be addressed again.

1. Threats to Land Ownership and Property Rights – Salmon Recovery, Riparian Regulations, and Development

Threats to land ownership and property rights were a significant topic in both watersheds, and generally revolved around riparian regulations, salmon recovery, and development. Concerns regarding the former two are closely related since riparian ordinances are partially developed to help protect salmon habitat; however, these regulations are also meant to serve more general functions of wildlife habitat conservation and water quality protection. Riparian ordinances were debated as too strict or not protective enough. In the Skagit, one interviewee noted that "buffer" is a dirty word, and in the Tillamook another labeled this as "the" conflict within counties. Both sides appeared to be debating the scientific rationale behind the buffer width. Some farmers have demanded a better quantification of habitat acreage needed to support salmon recovery on a watershed scale. This issue seemed to have significantly affected elections of County Commissioners, and interviewees stated that Commissioners were "un-elected" or removed from office due to this issue in both counties.

The latest compliance order given by the Western Washington Growth Management Hearing Board (WWGMHB 2005) found Skagit County in continuing non-compliance due to inadequacy of the County's monitoring and adaptive management program. WWGMHB gave the County until July 2005 to achieve compliance. In the Tillamook, attempts to develop a riparian ordinance to meet state growth management regulations have been tabled. A primary reason for this action is the result of Measure 37[39], which was approved by voters during the November 2004 elections. This measure provides compensation for land owners from restrictions caused by land use regulations, and states that the government attempting to enact the regulation can choose to "remove, modify, or not apply" the regulation.

[39] http://www.oregon.gov/LCD/measure37.shtml

As noted previously, one interviewee in the Tillamook stated that more conservation efforts were occurring through volunteer measures than through the riparian ordinance efforts, and that the rural residential zoning designation resulted in more negative actions against the environment. In the Tillamook, advice was also given that protection of fish and, often water quality concerns, do not motivate landowners to conserve riparian areas. In fact, fish are avoided in discussions initiated by this interviewee. However, landowners have responded favorably to the advantages riparian areas can provide in keeping logs out of fields and retaining sediment. Also, some farmers have responded to discussions of clean water for their children and grandchildren. In addition to property rights issues, landowners were uneasy in changing their land practices and expressed concern with the potential growth and spread of invasive vegetation, and problems maintaining floodplain fencing.

In the Skagit, the debates were often couched in terms of farmers versus fish. The SWC wrote in its newsletter that "on its own, the Council has not yet been able to garner significant support and participation from agricultural landowners and if we are unable to change that over the next few years we will be greatly impeded in what we are able to accomplish (SWC 2002)." Landowners in the Skagit have also historically confronted other land conservation efforts, including the designation of the North Cascades National Park (which did not involve private property). An interviewee discussed a distrust on the part of small landowners and farmers regarding various conservation efforts, and stated that there is also a mistrust of the federal government.

In addition to threats from land conservation, landowners feel threatened by land development in the Skagit. The agricultural base was characterized by one interviewee as not robust and under a lot of pressure from expanding municipalities and general development, especially along the I-5 corridor. This interviewee noted that the

commonly held characterization of farmers versus fish is actually misperceived, and that it is really farmers versus development and fish versus development.

2. General County Politics

Interviewees in both watersheds remarked on the political climate of the Counties. There are strong agricultural and natural resources interests in both areas. In the Skagit, the County Commissioners are perceived to strongly support farmers. There has been conflict regarding the development and enforcement of regulations in the Skagit, as well as how the County will accommodate or prepare for future population growth. In the Tillamook, there was conflict in the past between the TEP and the County Commissioners, when the group was a department of the County.

3. Flooding

Flooding created conflict in both watersheds, although in the Skagit more people discussed other issues. The general debate was the balance between environmental restoration and flood protection for life and property. In the Tillamook, there was also conflict regarding the organizational roles regarding flood mitigation. For example, there have been different visions of TEP's role (flooding is a component of the CCMP), which appears to revolve around dredging debates. In addition, some in the Tillamook seem especially concerned that the County may get sued for "gross negligence," if certain actions are not taken. In addition, one interviewee stated that the Tillamook Bay and Estuary Feasibility Study, which was tasked to identify and evaluate the problems and opportunities associated with flood damage reduction and ecosystem restoration, was going nowhere due to a lack of palatable options. However, one interviewee noted that the apparent disconnect between environmental and flood decisions appears to be decreasing and that conflicts are becoming fewer. In the Skagit, there were also debates between the County and PSE regarding flood storage in FERC re-licensing of the Baker River project.

4. Local Versus Outsiders/Urban

This issue was discussed more often in the Tillamook, and generally involved debates over resource extraction and development. One example presented in the Tillamook was the 50/50 Initiative, which caused controversy and debate over State versus County control of the Tillamook Forest harvest. This is partially related to local cultural and urban versus rural conflicts. The Tillamook area is a major recreational magnet and "playground" for people from Portland and beyond. One interviewee noted that visitors coming from the outside want less development, and a pre-1850 condition. It seemed the community is struggling to control its own destiny, local economy, and legacy regarding development and forest management. An urban versus rural conflict was also noted in the Skagit. Again, there was a perception that outsiders are attempting to control the legacy of the County through conservation measures.

5. Additional Conflict in the Skagit

5.1 Tribes

Tribal relations are a significant issue in the Skagit. Major conflict was noted between the tribes and the County, and often seemed centered on salmon protection. While many interviewees spoke generally about tribal-county relations, there are several tribes in the area and this relationship is not reflective of all the tribes. For example, one interviewee stated that the Upper Skagit Tribe broke off from the Skagit River System Cooperative (currently represents Swinomish and Sauk-Suiattle tribes) due to differences in opinions regarding economic development and the County. There was also conflict regarding tribes and fishing. The Boldt decision resulted in significant contention and antipathy towards the tribes, and there are strongly held beliefs by some in the community that tribal fishing is decreasing fish populations. There does not seem to be any tribal activity or participation in the Tillamook area.

5.2 Water Rights

Water quantity and water rights conflicts also appear to be issues in the Skagit, but not in the Tillamook. The SWPU could not come to agreement on instream flows for the Samish River. This rule is currently being developed by WDOE and will be finalized after the Skagit rule amendment. The 2001 Skagit rule is currently under litigation, and as result is being amended. Speculation about water quantity issues in the Tillamook was presented earlier in this section.

WATERSHED AND INITIATIVE INTEGRATION

This study considered various types of integration in the watersheds. Mechanisms to support intra- and inter-horizontal interplay, and vertical interplay were identified. Then stakeholder efforts and perceptions were evaluated to determine the potential effectiveness of these mechanisms. While it was generally outside the scope of this study to further assess vertical interplay beyond identifying its mechanisms, some information shed light on the potential effectiveness of this level of interplay as well.

1. Identification of Interplay Mechanisms, and Evaluation of Their Effectiveness Through Stakeholder Activities and Perceptions

The state and federal laws and programs supporting these initiatives were significant forces for the existence of interplay mechanisms, because of requirements and guidelines for stakeholder participation and due to the integration of initiative efforts into statewide strategies. It is likely that initiatives not supported by state and federal watershed programs would be more lacking in these mechanisms. In general, integration may be benefited because all initiatives provided relatively good mechanisms for intra-horizontal interplay, or coordination within initiatives and issues, and for vertical interplay, or coordination across-scales (e.g., local versus state/regional planning). In addition, the

Tillamook initiatives also had mechanisms for inter-horizontal interplay, or coordination between initiatives and issues. However, the mechanisms for inter-horizontal interplay within the Skagit seemed the weakest.

2. Vertical interplay

Despite these mechanisms in the watersheds, there was some concern regarding their effectiveness. For example, the vertical mechanisms provided by two initiatives in the Skagit may be compromised. The WAC 400-12 process was only able to cover one quarter of the Puget Sound watershed, and is currently active in an even smaller number of watersheds. It is possible that decreased use of this watershed planning and implementation tool may weaken vertical interplay due to greater emphasis on the more recent ESHB 2514 process, which many watersheds are using to address water quality. In addition, as mentioned previously the Skagit River is currently the only watershed in the Puget Sound that has opted to not form a planning group to comprehensively address salmonid recovery. Although, the co-managers are addressing this issue discussions are still ensuing regarding how they will take advantage of the mechanism to incorporate local watershed information into regional recovery planning. One study (Landsman 2000) reported from interviews aimed at evaluating Washington's SRFB that most interviewees were not satisfied with state-level coordination of the salmon recovery program. This lack of coordination was potentially attributed to power struggles, inefficiency, and mistrust. Although, interviewees stated that SFRB had increased communication levels between local and statewide stakeholders. Evaluations of efforts in Oregon revealed the need to further identify restoration priorities at the basin scale using watershed assessments (OWEB 2005). However, this study was not able to provide adequate detail on the effectiveness of vertical interplay in the Tillamook.

3. Horizontal Interplay

In general, the perception was that planning for the entire watershed ranged from low to highly integrated in the Tillamook and was generally low to not well integrated in the Skagit. There was an indication that integration was improving in both watersheds. However, more people seemed to feel this way in the Skagit, especially regarding nearshore issues. It was also noted in both watersheds that integration during the research stage was much easier than during the implementation stage, and that the former will not necessarily result in the latter. These perceptions were partially reflective of both intra- and inter-horizontal interplay.

The initiatives had good mechanisms for intra-horizontal interplay, and seemed relatively effective in coordinating many important stakeholders. Some interviewees noted that the SWC and creation of the CCMP has helped further integration in the Skagit and Tillamook, respectively. All the initiatives seem to at least have helped stakeholders know one another better, and there has been partnering in both watersheds; however, it appears that has been more partnering with a wider array of stakeholders for on-the-ground projects in the Skagit. This may be related to the fact that Tillamook interviewees discussed jurisdictional issues as top barriers to watershed integration, while this topic was not specifically mentioned in the Skagit. Instead, the USFS and SCL seem to be looking at the watershed more comprehensively in the Skagit than traditionally occurs from these types of entities. In the Tillamook, there have also been examples of stakeholders reaching beyond their jurisdictions. For example, BLM has addressed issues such as culverts outside of their boundaries. However, there was a general perception that more traditional jurisdictional issues exist in the Tillamook watershed. Although not expressly recognized by this question, it is likely the jurisdictional issues would still be a challenge in the Skagit.

Stakeholders in the Tillamook may perceive a greater level of integration because of more formal mechanisms for inter-horizontal interplay, namely that TEP staff are on the TBWC and the TBWC is a designated TEP partner. In addition, watershed work in the Skagit was more compartmentalized than in the Tillamook. Each initiative in the Skagit works on a relatively focused issue, which was generally guided by its associated funding mechanism (e.g., WAC 400-12, ESHB 2514, ESHB 2496, NWSC). In general, the initiatives limited formal coordinating mechanisms. Although, they did share some common members and initiatives have presented their work at each other's meetings.

However, the trend for compartmentalization among initiatives in the Skagit might not necessarily occur in other watersheds in Washington. For example, ESHB 2514 authorized the consideration of water quality and habitat (in addition to water quantity and instream flow) and WAC 400-12 authorized water quality (in addition to water quality). The SWPU decided to not address these efforts because they did not want to be redundant with the already established activities. Original efforts for the WAC 400-12 process thought it would be too much to do both planning elements, and the SWPU under the ESHB 2514 process did not want to be redundant with the SWC. So it seems these state and regional based efforts may potentially make inter-horizontal interplay more challenging, but do not necessarily do so. For example, there are some organizations that are the Lead Entity for both the ESHB 2496 and ESHB 2514 process.

Although, a study of ESHB 2514 groups (Klug 2001) also points to a likely deficiency in clear policy objectives, which link the water quantity planning with the state salmon recovery efforts, despite a statutory history and intent to do so. The main hurdles to link these efforts identified in this study were issues with scale, competing organizations, and ESA rule requirements (e.g., legal, organizational, and geographic barriers). Salmon planning is more regional, and water quantity planning is more local. Also, in many watersheds the organizations developed separately to deal with these programs and may

have different operating rules and norms, and it is difficult to determine how or if they should be hierarchically arranged. In addition, many water quantity planning efforts do not directly address ESA planning; although, some saw it as a mechanism to confront the issue. It might be said that the Oregon Plan provides less opportunity for compartmentalization because of its focus on general watershed health, in addition to salmonid recovery.

While watershed integration was perceived at higher levels overall than in the Skagit, there were a range of perspectives in the Tillamook. This may be partially due to problems of inter-horizontal interplay, as reflected in confusion and competition between the initiatives and the TCSWCD, who is also on the board of both initiatives. Despite this shared membership the historical perception is that communication is lacking between these organizations. In addition, the jurisdictional barriers noted above likely lead to these perceptions.

This research shows that it may be difficult to rely on common members for coordination. In both watersheds, interviewees noted that it is often difficult for members to take their organizational "hat" off and on. This may have two effects: inhibit members from reaching a common vision due to the diverse agendas of their affiliate organization (e.g., industry, agency), and/or inhibit the ability of common members among initiatives to also represent each initiative. The initiatives are trying methods to address the former issue of establishing a common vision. In addition, it could also be the case in some circumstances that common membership has increased actual coordination of these groups more than perceived.

In environmental management, there is a very strong argument for planning at watershed scales and across jurisdictional lines because watershed resources also cross these lines (e.g., salmon and water quality). However, the value of pushing to cross jurisdictional

lines during implementation should be considered with more care than assuming it is always necessary and beneficial. In one of the watersheds, a particular project was noted by several interviewees as an important step in collaboration for many players in the watershed. One interviewee stated that the success of this project was somewhat misperceived and that it would have happened with or without the collaboration. Of course, this partnering could have laid the groundwork for future efforts that may require collaboration. In addition, some interviewees noted that there are sometimes disincentives to work together on projects. Industry or agencies often can do work more quickly alone because they do not have to deal with many layers of regulations and requirements. It was noted in the Tillamook that "industry will give up immediately if the feds are involved." It appears that many other watersheds are having difficulties in achieving a high level of watershed integration. OWEB (2005) noted a "need to incorporate the landscape perspective into implementation of the Oregon Plan. The functioning of whole watersheds and salmon populations is understood if one looks at the condition of all land ownerships over a long enough time period to discern human impact against background fluctuations in climate, ocean conditions, and natural disturbance regimes." (OWEB 2005)

4. Furthering Watershed Integration

There will always be conflicting issues and individuals who will block integration, but one of the more important elements to consider is the role of the lead institutions. It seems that the biggest challenge for watershed integration in the Skagit is the lack of a local facilitator to address issues comprehensively. One interviewee noted that the County often assumes this role; however, is seems unlikely that the County will fill this role in the near future. Interviewees noted that the County has not taken a role in salmon recovery planning and are still grappling with GMA and SMP updating. In addition, in general the current watershed initiatives are unlikely candidates because of their focus on a narrower range of issues and due to their limited interactions. Another significant

barrier regarding watershed integration may be the relationship between the County and some tribal groups. The Options Strategy (SWC and SCOG 2003) conducted interviews which highlighted a need for someone in the community to build trust and bridge varying interests, but no one was identified.

In the Tillamook, the TEP seems to be the most likely candidate to continue furthering watershed integration. However, it appears that the TEP still needs to resolve legacy issues regarding negative relationships between the TBWC and TCSWCD stemming from perceptions of competition and miscommunication. Many have noted that these relationships seem to be improving. In addition, although the ODF is considered a TEP partner, the agency is not on the Board of Directors. It is unclear whether this absence may impede integration at some level.

CLIMATE IMPACTS

Questions regarding climate impacts were incorporated into interviews to begin to determine several elements including: a general awareness of climate impacts; local resources, processes, and conflicts affected by climate; and perceptions of adaptability and vulnerability. This part of the study was very limited and was aimed at providing some background and context for future work on climate issues in these two watersheds.

Most interviewees in the Skagit and Tillamook were relatively aware of climate impacts on watershed resources, but the level of understanding varied. Many people also noted an effect of these impacts on the presence of conflict; although, some did not recognize any impact or weren't sure how to answer the question. In addition, climate variation affected only a few interviewees' approach to management, some more formally than others. However, climate change was reportedly considered by one, although it did not seem to actually affect management. While a few people noted that climate did not factor into their approach to management, climate information was incorporated or referenced

in some of the documents they produced (See Appendix VI). Information on climate variability was used in the Skagit for developing instream flow settings, Chinook recovery goals, dam operations, and for restoration planting. In the Tillamook, climate variation information was used for flood mitigation projects (forecasts from NOAA Climate Prediction Center), while others noted a general awareness of climate variation in their planning. Many interviewees seemed interested in learning more about how watershed resources may be impacted by climate variation and change. Although, it should be noted that at least one interviewee in each watershed questioned the validity of climate change, and another noted that climate change is not always specifically discussed as such, but that discussions do occur about the inundation of areas.

1. Climate Impacts on Watershed Resources

Almost everyone mentioned impacts to flow, flooding, or precipitation, and several discussed fish or temperature in both watersheds regarding climate variation and change. People seemed somewhat more able to speak about climate variation than change in the Tillamook; although, in both watersheds there was difficulty separating their responses regarding the two, which is understandable given the overlap in effects. In addition, some issues were discussed that are more directly relevant to one watershed than the other. People in the Skagit discussed the potential effects of decreasing glaciers and snowpack on the reduction of flow, and the resulting impacts on nearshore environments and the production of electricity. Interviewees in the Tillamook spoke of Swiss needle cast and upwelling. While many people discussed climate impacts on salmon, one interviewee also noted that the sensitivity depends on the species being considered, and that due to the time spent in freshwater, Chinook and coho are not as resilient as pink salmon, which are also naturally cyclical.

2. Climate Impacts on Conflict

Flooding seemed to present the most issues with conflict in both watersheds potentially impacted by climate. The major concerns were how to balance threat to life and property with environmental protection (e.g., salmon habitat). Interviewees in the Tillamook stressed the significant tension and remaining traumatic feelings regarding flooding. Additional conflict noted in the Skagit regarding salmon included: hydropower operations, tribal harvest, waterfowl conservation, and concern of the need for more restoration. People also saw potential conflict with agriculture in the Skagit, stemming from increased water demands, conflict over water rights, and concern over agriculture's general viability. Tillamook interviews did not specifically mention agriculture, which could be due to less of a concern over its general viability and water rights, and/or because a concern for agriculture was indirectly included in discussions of flooding.

3. Perceptions of Adaptability

Most people in both watersheds perceived that the decision-making processes of their organizations are flexible or adaptable to climate impacts to a certain level. Also, as noted above in discussions regarding planning processes, many initiatives have mechanisms for adaptive management, although most also could be made stronger. Almost every interviewee listed potential barriers of adaptability to climate impacts, which included lack of understanding and technical capacity, the size of the event, long-term versus short-term impacts, overcoming individuals' beliefs, politics, and the power of the County Commissioners or top decision-makers. A few more comments were added in the Tillamook: one organization's flexibility was limited when working in tidal areas versus non-tidal areas, another noted difficulties with funding, and a third stated that some people in the organization do not value information from journal articles, and are suspicious of people with an education or who are not from the local community.

Another significant comment was made that it might be dangerous for management to change their practices and confront climate change, due to uncertainty in the science.

In addition, many people in both watersheds also remarked on the quality of the climate information, including the need for it to be compelling, relevant, accurate, credible, and site-specific. Interviewees also noted elements, which help adaptation. An interviewee in the Tillamook noted that the area has a natural adaptation to climate impacts because of how of fast the vegetation grows. In addition, an interviewee in the Tillamook stated that they are better able to adapt to flooding now than eight years ago due to mitigation efforts, and another noted that their geographic proximity to the tidegate manufacture (tidegates were used in the mitigation efforts) also greatly enhanced their ability to address the problem. Regarding salmon in the Skagit, one interviewee stated that dam operations provide a buffering effect from climate impacts. However, only the mainstem Skagit and Baker Rivers have regulated flow, and the Cascade and Sauk Rivers do not.

4. Perceptions of Vulnerability

Interviewees perceived the vulnerability fairly balanced between moderately and highly vulnerable in both watersheds. The major issue of vulnerability related to flooding in both watersheds. Interviewees in the Skagit noted that they are not prepared for a 100-year flood. As noted above, in the Tillamook vulnerability seemed to decrease in recent years; however, many still regard the area as vulnerable. Additional topics of vulnerability were discussed in the Tillamook, including a reliance on fishing, a reliance on the road system to manage lands, and concerns with water quality. "Climate change could put the whole town out of business," due to potential violations of water quality regulations. People in the Skagit also discussed the vulnerability of salmon, which was thought to be modified by dam operations and dependent on which species were considered, as noted above.

5. Additional Climate Indicators Evaluated

It was outside the scope of this study to comprehensively consider the potential vulnerabilities of these watersheds, beyond highlighting stakeholder perceptions. However, there are tools to assess vulnerability to help focus efforts within a watershed and to potentially prioritize between watersheds that may be more greatly affected by climate impacts. Whitely Binder (2002) presents one basic method of capturing preliminary information, which may help begin to characterize watershed vulnerabilities.

This study uses Whitely Binder's application as a demonstration tool by capturing limited data to highlight potential vulnerabilities to climate impacts in both watersheds (Appendix IV). Additional data could be relatively easily retrieved during future studies to conduct a more comprehensive application of this tool. In addition, there may be other, more appropriate methods of vulnerability assessment for these watersheds. However, based on the demonstration use of this tool, some additional potential vulnerabilities to consider are the presence of TMDLs and protection of instream flows in both watersheds. Another concern highlighted by this application was the projected population growth in the Skagit, which could likely to lead to more water demand, increased conflicts, and generally more constraints on the system, potentially increasing vulnerability.

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

Over the last decade, citizens, governments, industries, non-profits, and other affected stakeholders have been increasing human and financial investment in watershed initiatives and watershed planning around the nation. It is necessary to better understand and improve these efforts to maximize their goals to adequately protect our environment and human welfare, and to maximize these investments of time, money, and social capital.

Climate impacts may be important drivers in many watersheds, and should be assessed to determine appropriate methods to reduce the vulnerability of watershed resources and thereby increase the effectiveness of watershed efforts. The work of watershed initiatives and other stakeholders in the Skagit River and Tillamook Bay watersheds provides important opportunities to begin to address these issues. The initiatives and their partners are playing a valuable role in addressing watershed resource issues that were either previously unaddressed or addressed in a limited way. While these initiatives have made impressive progress and achievements, it is necessary to highlight elements that may impact their effectiveness, and their potential ability to address climate impacts. This study presents preliminary information to develop a strategy to assist these watershed efforts with the incorporation of climate information into their planning and implementation.

In completing this research, data was collected on watershed initiative planning, implementation, integration, and other attributes to provide an understanding of the basic nature of initiatives. In addition, potential barriers were identified, which may affect the ability of these groups to adapt to climate impacts. A summary of the strengths and potential constraints on effectiveness is provided below (Table 3). The recommendations for a preliminary strategy to address climate impacts in these watersheds are presented.

Finally, general lessons learned and questions posed from this analysis regarding basic watershed planning insights are discussed.

Table 3 Strengths and Constraints of Watershed Initiatives in the Skagit River and Tillamook Bay Watersheds

Study Elements	Both watersheds	Skagit River Watershed	Tillamook Bay Watershed
Planning attributes (+)	Generally good: 1. Plan Development, 2. Plan Communication, 3. Plan Ownership 4. Adaptive management mechanisms; however, see limitations below		
(-)	1. Plan Ownership limited among some players 2. Strength of adaptive management mechanisms not always clear 3. More effectiveness and validation monitoring needed	For some plans: 1. Plan Development - community input somewhat limited 2. Plan Communication -accessibility somewhat limited	
Implementation barriers	1. Landowner willingness 2. Implementing entity willingness/ability 3. Funding 4. Consensus-based decision making 5. Stakeholder complexity	1. Lack of knowledge of nearshore environment	1. Limited technical capacity, due partially to rural location 2. Organization competition and confusion 3. Swiss needle cast
Trust and leadership	1. Trust variable	1. Leadership generally good	1. Leadership variable
Conflict	1. Threats to land ownership and property rights (e.g., CAO) 2. General county politics 3. Flooding 4. Local versus outsiders/urban	1. Threats from development 2. Tribal relations 3. Water rights	1. 50/50 Initiative
Integration	1. Integration seen as improving; barriers - individuals 2. Easier to implement during research and planning than implementation 3. Mechanisms for intra-horizontal and vertical interplay	1. Perceived as generally low level of integration at watershed level; barriers – litigation, development v. fish, staff turnover, local regulations, local capacity 2. SWC helped 3. Concern with vertical mechanisms of two initiatives 4. Lack formal mechanisms for inter-horizontal interplay: issues compartmentalized 5. Lack a local facilitator to address issues comprehensively	1. Perceptions varied between not well and highly integrated at watershed level; barriers – diverse regulations and jurisdictions 2. CCMP helped 3. Mechanisms for inter-horizontal interplay; still considered uncoordinated 4. Jurisdictional issues 5. TEP good facilitator to improve integration, but need to resolve legacy issues of competition and confusion with other organizations

STRENGTHS AND POTENTIAL CONSTRAINTS OF WATERSHED INITIATIVES

Watershed initiatives in the Skagit River and Tillamook Bay watersheds have played an important role by addressing issues, which either previously lacked attention or coordination and a strategic approach. They have also made good investments in watershed plans, and engaged many important stakeholders. However, these initiatives face challenges, which may or have already impacted their effectiveness. Potential constraints to effectiveness, included a lack of complete plan ownership, needs to strengthen adaptive management mechanisms, implementation barriers, variable levels of trust and leadership, conflicts, and variable levels of interplay. While both watersheds confront many similar issues, there are also constraints specific to each watershed that need to be considered.

WATERSHED INTEGRATION

While the goal of watershed planning is to address issues at the watershed scale, this integration may be challenged by the practicalities of working with diverse and complex stakeholders and concerns, and the legacy of our historic management boundaries (e.g., counties). Since climate is an important driver for hydrological and other processes that operate across the entire watershed, it is important to determine what mechanisms there are to address impacts at this scale, and evaluate their potential effectiveness. Neither watersheds were perceived as especially well integrated; although, the Tillamook seemed generally more so. It appears less likely that watershed integration will be improved at a comprehensive scale (e.g., water quality, water quantity, salmon recovery) in the Skagit River watershed. The largest barrier seems to be the current lack of a local facilitator, partially due to the compartmentalization of watershed issues, the limited focus of initiatives, and a lack of willingness among some stakeholders. While efforts in the Tillamook Bay watershed appear better positioned to improve watershed integration,

there are also difficult barriers to overcome. Stakeholders will likely need to resolve some inter-organizational issues that have historically resulted in competition and confusion between the local groups.

RECOMMENDATIONS FOR ADDRESSING CLIMATE IMPACTS

As noted previously, much of the information in this study can be used to generate a better basic understanding of the focus and effectiveness of watershed initiatives in the Skagit River and Tillamook Bay watersheds. However, the aim of this research is to provide preliminary information to better assist groups, who want to work in these watersheds to improve the use of climate information and decrease the vulnerability of watershed resources to climate impacts. The following recommendations will help to develop this strategy:

1. The Watersheds and Stakeholders: Vulnerability and Adaptability

    - These watersheds are significant places to work because they support important resources that will likely be affected by climate impacts at varying levels. This research showed that while many interviewees were aware of several different types of impacts, especially from climate variation, most did not incorporate climate information into their management and an apparent void existed to assist these groups. In addition, interviewees perceived their watershed resources as moderately to highly vulnerable to climate impacts, with flooding being the most often cited reason (salmon and water quality were also discussed). In addition, a basic evaluation of potential additional vulnerabilities included the presence of TMDLs, and the protection of instream flows in both watersheds, as well as population growth in Skagit County. Also, studies in the Skagit River have recorded retreating glaciers, which lead to alterations in hydrologic flows

(NCGCP 2005). Portions of these effects will be buffered through flow regulation by the dams; however, not all rivers in the basin are regulated.

- While many perceived barriers were discussed, most groups first stated a potential flexibility in decision-making to climate impacts. Many of the barriers were not surprising, although those involving decision-making of upper level management and elected official should be closely regarded. In addition, there may be some skepticism to overcome within certain members of the community regarding climate change. In addition, climate research groups should be cognizant of their "outsider" and "academic" status among certain stakeholders. One interviewee noted that some community members do not appreciate information from journal articles, but do trust the initiative leaders regarding the introduction of new information. Partnerships with local information providers, such as Oregon State University Extension, Washington State University Extension, and Western Washington University should be considered to help minimize potential "outsider" status. In addition, initiative and organizational leaders should be consulted regarding the best strategies for conveying information to the membership, as well as stakeholders who are top level decision-makers. Many of the interviewees themselves appeared receptive to increasing their understanding of climate impacts.

2. <u>The Watershed Initiatives</u>

- The initiatives studied in these watersheds provide excellent opportunities to address watershed issues that would likely experience climate impacts and would benefit from the incorporation of climate information. In addition, because these groups engage a wide diversity of stakeholders, they are good venues to interact with important players in the watershed.

- Each initiative addresses certain priority issues, which could become the focus of climate research. For example, the top priority species of concern for the SWC is Skagit Chinook, and the top target area for their efforts is the estuary. In addition, the major landscape processes and disturbances of concern to the initiative are hydrology (e.g., peak and low flows), sediment (e.g., supply and routing), riparian (e.g., forest conditions), floodplain modification, isolated habitat, and water quality (e.g., fecal coliform, temperature, dissolved oxygen, turbidity). Therefore, the SWC would likely benefit from acquiring a better understanding of climate impacts on these processes, and specifically impacts on estuarine habitat and salmon productivity. The information for each initiative is outlined in the Discussion section, and further information is provided on the basic elements of the initiatives in the Results section and Appendix V.

- It may prove helpful to solicit advice on these and other watersheds from agency liaisons that have both a regional and intimate perspective on watershed issues. Such advisors may include watershed liaisons from PSAT, WDFW, and Shared Strategy in the Washington and ODFW and OWEB in Oregon.

3. Constraints and Conflicts

- However, before determining who and how to work with initiatives and stakeholders, it is necessary to understand the planning, implementation, and integration constraints and opportunities that may affect their adaptability. In addition, it is also important to be aware of the surrounding conflicts. For example, salmon recovery is a contentious issue in the Skagit. While the SWC attempts to remain a neutral party by focusing on voluntary efforts and avoiding policy discussions, there are still variable levels of trust between members and with the community. Information on constraints and conflicts are outlined in Table 3, as well as discussed in the preceding chapters. Conflict is especially

important to understand if climate research groups wish to remain neutral parties. This is a desirous position because there are many issues and stakeholders that would benefit from information on climate impacts within these watersheds.

4. Looking Outside the Watershed Initiatives

- Research on watershed initiatives is just one way to explore opportunities for addressing climate impacts on watershed resources. However, these groups are often very focused on certain problems and therefore other strategies should also be considered. Flooding is a significant issue of concern and conflict, for example, and one that interviewees perceived could be further exacerbated by climate impacts in both the Skagit and the Tillamook. None of the watershed initiatives address flooding directly in the Skagit. Therefore, stakeholders addressing flooding should be assessed. This would include those involved in the Skagit River Flood Prevention and Salmon Restoration Project, led by Skagit County and USACE. The County is also involved in several other flood management and stormwater planning projects. It would be beneficial to consult other issues beyond flooding, which interviewees perceived as impacted by climate variation and change.

- Another strategy for addressing watershed issues is to consider engaging common members of initiatives as one method to address issues more comprehensively. These stakeholders could meet as a joint task force or ad hoc working group that addresses climate impacts. See Figures 5 and 13 for a diagram of common members.

- In addition to the watershed scale, climate impacts should also be addressed at a regional basin scale, such as the ESU or water quality planning basin levels. Significant players at these levels include Shared Strategy and PSAT in Puget

Sound. In addition, the State of Oregon and ODFW are leading the Coastal Coho Project and ODA leads the North Coast Water Quality Management Area.

- Two organizations are also directly engaged in climate research in the Skagit River watershed: Earthwatch[40] and North Cascades Glacier Project.

BASIC WATERSHED PLANNING INSIGHTS

A few basic insights into general watershed planning issues and probes for further questioning are also highlighted by this study. This information seemed interesting to note and will hopefully add to the complex understanding of watershed planning and implementation, as it actually occurs on-the-ground.

- Some interviewees noted that funding requirements have increased strategic planning and implementation, which provides evidence of successful policy implementation.

- Interviewees cited challenges with consensus-based decision making, including difficulties in planning projects and resulting in the avoidance of certain issues. Responses to these issues involved instating voting or composition structures that some could debate move initiatives away from the original purpose of collaborative decision-making; however, the efforts may be realistic resolutions to achieving a necessary baseline of productivity.

- Initiatives may not be able to rely on overlap in common membership, but may need more formal mechanisms of coordination. Initiatives in both watersheds stated problems with coordination and integration, despite several common

[40] http://www.earthwatch.org/conservation/skagit.html

members. This challenge likely occurs because members find it hard to take their affiliated organization's "hat off and on." While coordination may be greater than perceived, initiatives should consider alternative mechanisms, which facilitate coordination. In addition to formally designated initiative representatives attending meetings, occasional joint meetings or ad-hoc working groups could be formed to increase opportunities for coordination and collaboration.

- Several interviewees from one watershed highlighted the significance of a first time collaboration involving the implementation of an on-the-ground project. However, it was noted by another interviewee that this project would have happened without the collaboration, and that partnering on projects often creates significant delays, which can affect the willingness of some landowners. This circumstance brings into question the true value that community groups and funders place on partnering on-the-ground. Is partnering more important during the planning stage then implementation? Should initiatives be considered unsuccessful if the partnering is not significant during implementation? Or, does partnering during implementation have more long-term value than some stakeholders realize and contribute to social capital building, which may prove beneficial later?

- While many watershed planning programs support mechanisms for horizontal and vertical interplay, how effective are these in actuality? Does the strategy used by the Oregon Plan for Salmon and Watersheds realize more comprehensive watershed planning than the suite of Washington's watershed planning efforts (e.g., ESHB 2514, ESHB 2496, WAC 400-12)? Is comprehensive watershed planning truly more effective than more piecemeal approaches?

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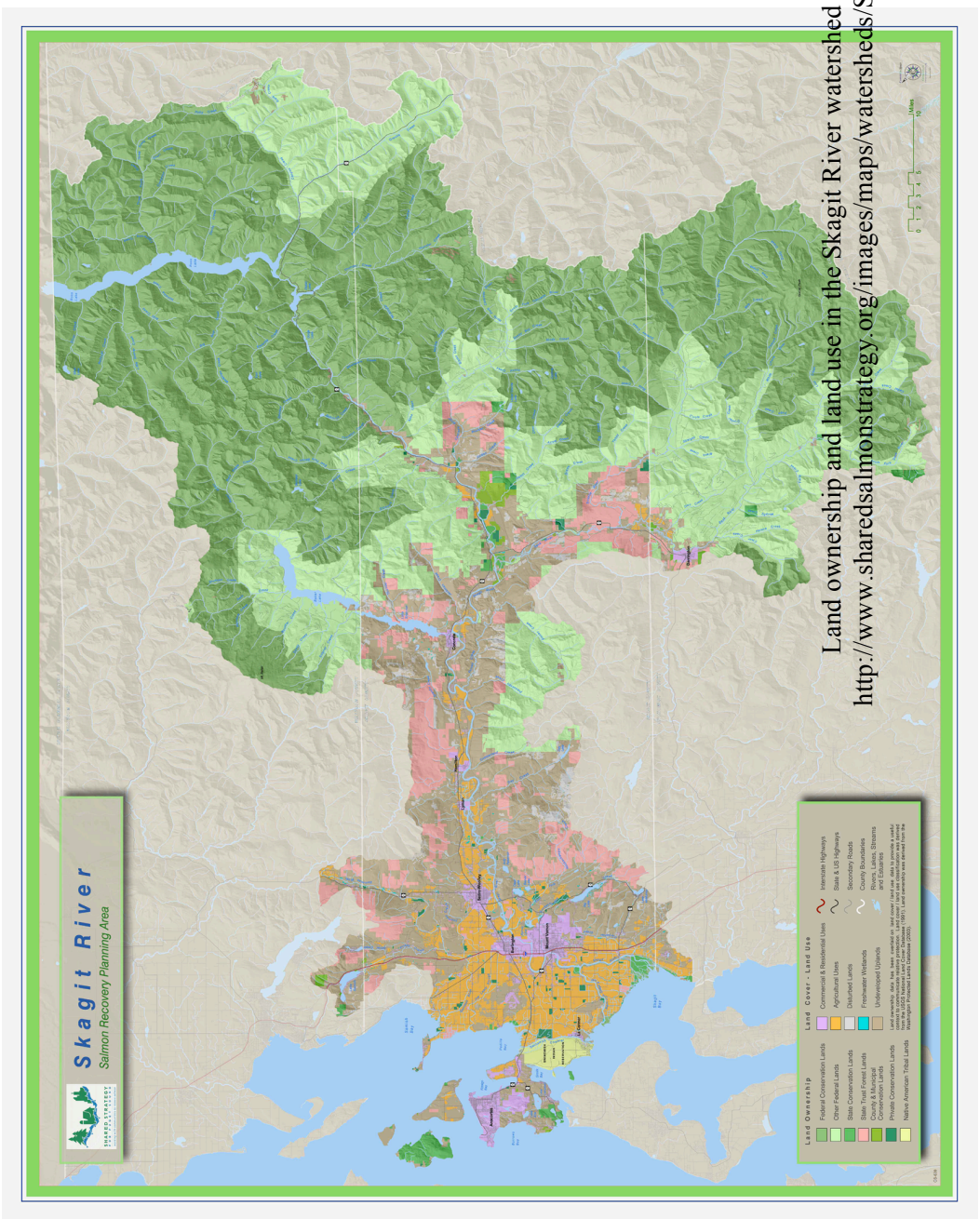
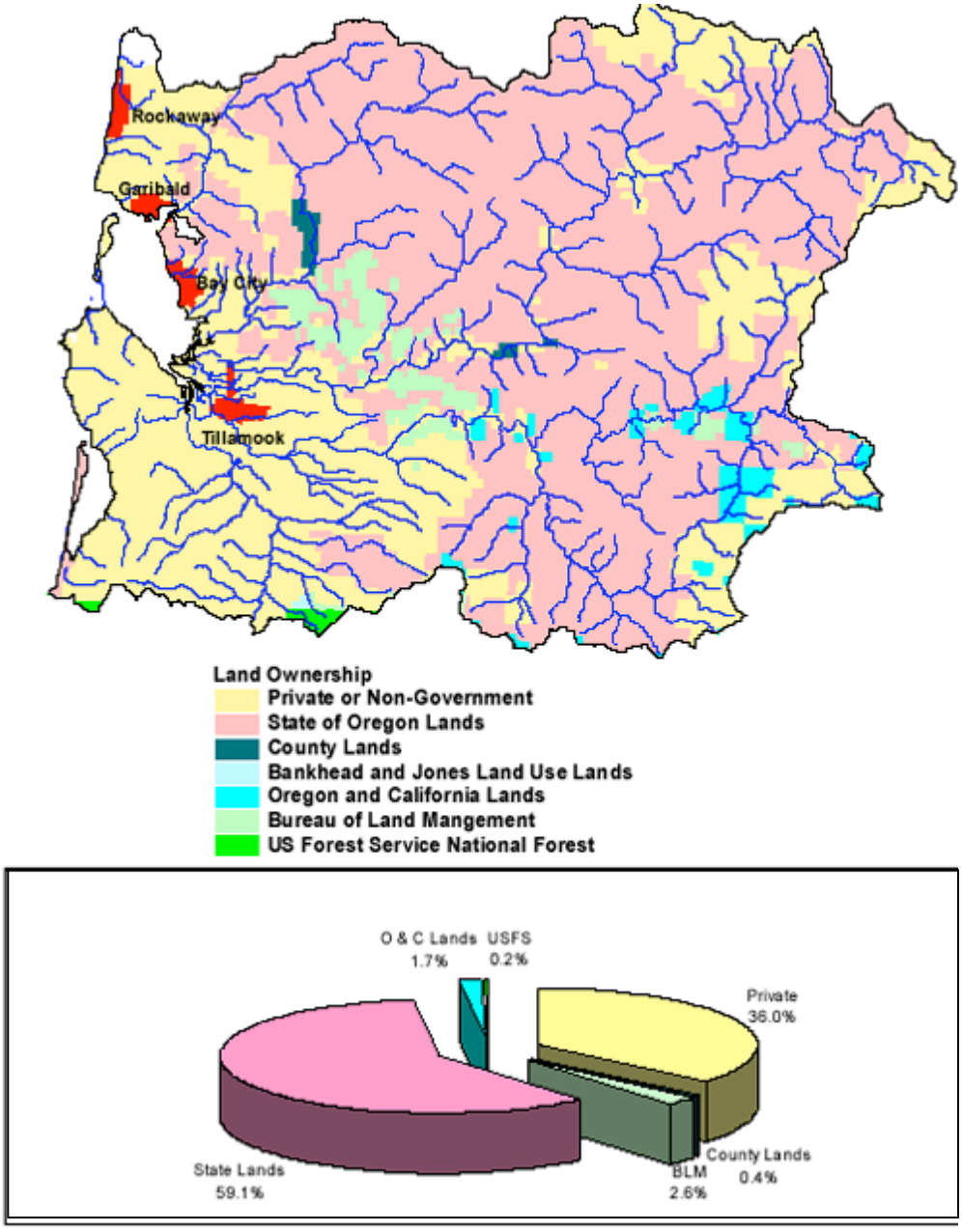
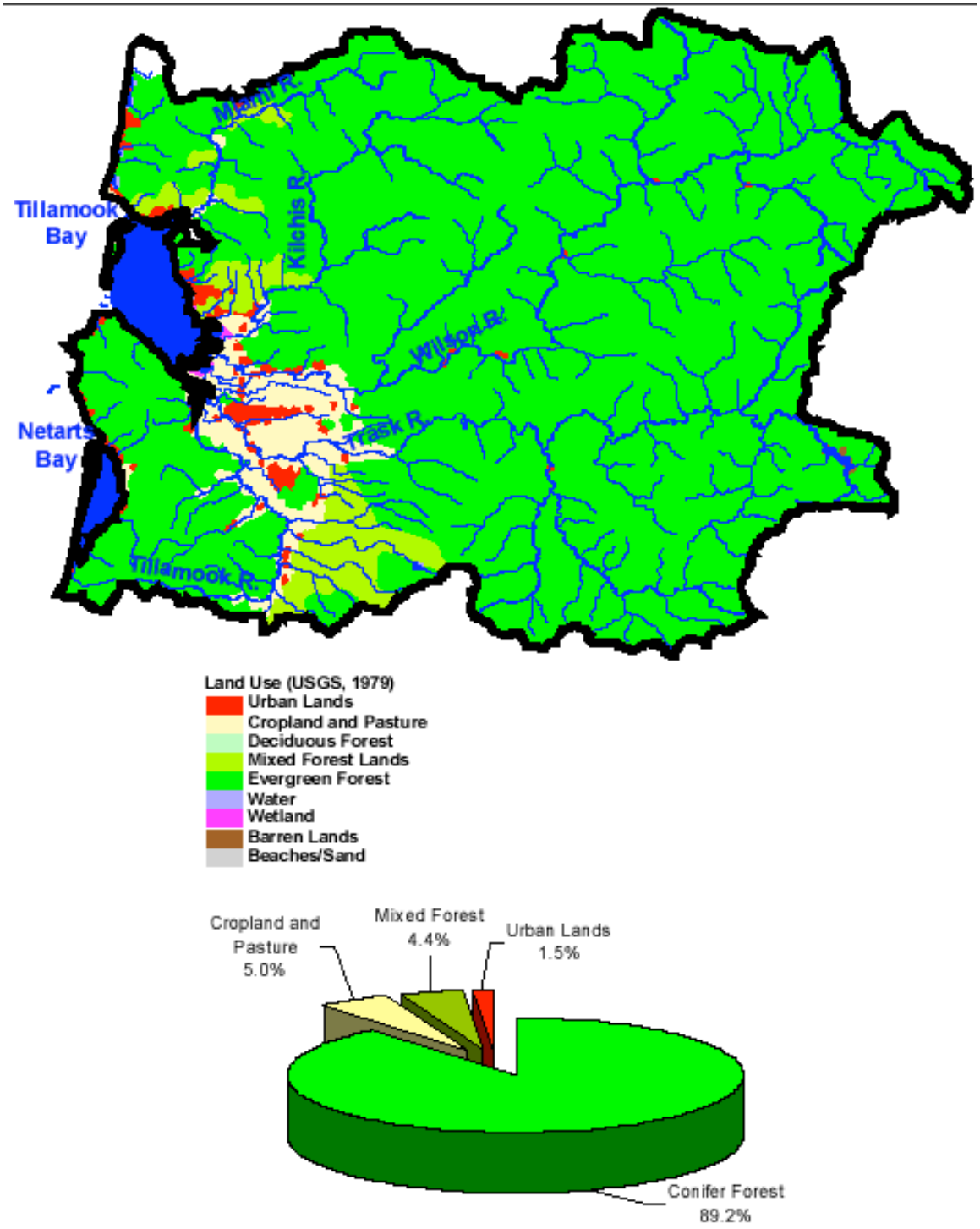
APPENDIX I – WATERSHED MAPS



Land ownership and land use in the Skagit River watershed (Available at http://www.sharedsalmonstrategy.org/images/maps/watersheds/Skagit_SRPA.pdf)



Land ownership in the Tillamook Bay watershed (ODEQ 2001)



Land use in the Tillamook Bay watershed (ODEQ 2001)

APPENDIX II – RESEARCH QUESTIONNAIRE

STRUCTURE, FUNCTION, AND FORMATION

1. What is the purpose and scope of the organization? What are the principal watershed issues addressed? What are the organization's goals? What are the most important tasks done? What area does your planning or management cover?
2. How did this group come into existence? What are the major forces that led to its inception, as well as those currently driving and supporting, these efforts, if different (e.g., federal and state laws, local initiatives, etc.)? Was guidance provided for planning and implementation?
3. What authority does your organization have? From where does the authority originate?
4. How is the organization structured? What is the composition and of the decision-making body, sub-committees, workgroup, membership, etc.? What are the roles of these groups?
5. How are decisions made? What is the source of decision-making rules?
6. How would you rank the level of leadership within the group?

PLANNING

7. Have plans been produced to guide watershed efforts? Are these still consulted?
8. Who participated in the development of the assessment and planning documentation? Who has supported the plan?
9. Was the plan based on joint fact finding between local and scientific/technical advisors? How was scientific/technical information incorporated? Are there disagreements on the science used?
10. Was there any history of related planning efforts in the watershed before formation of your organization?

IMPLEMENTATION AND ADAPTIVE CAPACITY

11. How is implementation being addressed? Are specific actions and priorities documented which guide implementation? Is implementation different than planning?
12. Who is advocating or supporting the implementation plan? Who is actually involved in implementation on-the-ground?
13. Does your organization practice adaptive management? Is monitoring conducted to assess the impacts of efforts on watershed conditions? Is organizational self-evaluation conducted? Are there mechanisms to adjust plans, group processes, or projects? Are there barriers or challenges to adaptive management?
14. How would you rate the progress of implementation? Are there any barriers to successful implementation?

15. Do you expect the current watershed planning efforts to continue? Are there any barriers to continuation? Is funding likely to limit the work done?

INTEGRATION WITH FEDERAL, STATE, AND LOCAL REGULATIONS AND ENTITIES

16. Who are the major federal, state, and local stakeholders and organizations involved? How are they involved?
17. What other major federal, state, and local laws and programs are most relevant to planning and implementation efforts? How are they integrated?
18. What other watershed planning efforts are you involved in? How are you involved?
19. Is this organization nested within regional or state efforts?
20. Do you believe planning is well integrated for the entire watershed, including the uplands, estuary, and the near-shore? Do you believe planning for these geographic features should be more integrated? If so, how would you improve integration? Are there rationales against or barriers preventing integration?

ISSUES AND PATTERNS OF CONFLICT/COOPERATION

21. What are the major issues of conflict within the watershed?
22. How would you rank the level of trust within the group?

SENSITIVITY, ADAPTABILITY, AND VULNERABILITY TO CLIMATE IMPACTS

23. How do you perceive climate variation (e.g., El Niño/Southern Oscillation -- cool-wet/warm-dry, Pacific Decadal Oscillation) affects:
    a. Watershed processes?
    b. Patterns of conflict?
    c. Your organization's approach to management?

    If you see a connection, please be specific.
24. How do you perceive climate change affects:
    a. Watershed processes?
    b. Patterns of conflict?
    c. Your organization's approach to management?

    If you see a connection, please be specific.
25. Is your decision-making process flexible or adaptable to climate change and climate variability? What are the major barriers you face to adaptation?
26. Given your response capability, how vulnerable are the watershed resources (of concern to you) to the impacts of climate variability and change? *(e.g., Watershed resources are highly vulnerable when a climate event exceeds the response capabilities, and adaptation is not successful.)*

APPENDIX III – DESCRIPTION OF WATERSHED PROGRAMS

National Estuary Program (NEP)

The U.S. Congress established this program in 1987, under the Clean Water Act Section 320, which was further amended in 2000 (Estuary Restoration Act). NEP is administrated by the USEPA and the goal of the program is to improve the quality of estuaries of national importance. The program is aimed at protecting public water supplies, shellfish, fish, and wildlife populations, recreational activities, and water quality from point and nonpoint sources of pollution. Estuaries must be nominated by a state governor. Upon approval, each program is required to develop and implement a Comprehensive Conservation and Management Plan (CCMP), which addresses all elements of environmental protection for the estuary, including water quality, habitat, living resources, and land use. The CCMP is meant to be a scientifically-based, community endorsed document, which develops priorities for action, research, and funding to guide future management decisions. The NEP states that the group forming the plan (the "management conference") should include federal, state, regional, and local government representatives, as well as affected industries, public and private educational institutions, and the general public. CCMPs must also undergo public review and be approved by the Governor and USEPA. Beyond the CCMP, the NEP requires specific reporting documentation including, quarterly interim and final progress and expenditure reports, and program evaluations. There are currently 28 programs around the country that are at least partially supported by the NEP. There are three programs in the Pacific Northwest: Tillamook Bay, Puget Sound, and the Lower Columbia River Estuary. For more information see http://www.epa.gov/nep/.

Oregon Plan for Salmon and Watersheds (Oregon Plan or OSPW)

The Oregon Legislature and Governor established the Oregon Coastal Salmon Recovery Initiative (CSRI; SB 924, HB 3700) in 1997, which became known as the Oregon Plan. This legislation was initially a response to the potential listing of Oregon Coast coho, then broadened to include steelhead salmon in 1998 (Steelhead Supplement). In 1999, the plan was again expanded to include various watershed health and salmon recovery efforts, all salmonid bearing streams in the state, and water quality activities (e.g., TMDLs) and became known as the Oregon Plan for Salmon and Watersheds. The Oregon Plan now represents both the Salmon Recovery Initiative (formerly CSRI) and Healthy Streams Partnership (SB 1010, Chapter 263), which addresses water quality. The mission of this plan is to "(restore) our native fish populations and the aquatic systems that support them to productive and sustainable levels that will provide substantial environmental, cultural, and economic benefits." The basic strategy used by this plan is to motivate and guide landowners and other private citizens, community organizations, interest groups, and all levels of government to address factors that

contribute to declining fish populations and watershed health. These efforts are often led by Watershed Councils and Soil and Water Conservation Districts. The key elements of this program are voluntary restoration, coordinated state, federal, and tribal actions, monitoring, and strong scientific oversight.

The Oregon Plan has developed "teams" made up of agencies and organizations to help advance the program and include: Core, Implementation, Outreach, Monitoring, Independent Multidisciplinary Science, and Regional. There are four regional teams for the state, which are designed to provide a link between OSPW policy development and implementation. The seven primary agencies with "core" OPSW responsibilities that provide the base for the Regional Teams include the Departments of Agriculture, Forestry, Environmental Quality, Water Resources, Fish and Wildlife, the Division of State Lands, and the Oregon Watershed Enhancement Board. One of several guiding principles of these agencies is coordination and communication vertically within agencies, and horizontally between agencies and other OPSW entities. The Regional Teams, with help from the Core Team and Oregon Watershed Enhancement Board, are tasked to develop regional objectives through a biennial workplan, and assist local groups with forming strategies to meet these objectives.

As discussed above, Watershed Councils are responsible for leading local efforts to implement the OPSW in improving water quality and fish and wildlife habitat. A Watershed Council is a "locally organized, voluntary, non-regulatory group established to assess the condition of their watershed and build a work plan to implement enhancement and protection activities within their watershed" (State of Oregon 1997). In order to be eligible for state funding, formation must be approved by a local government. In addition, the two primary guidelines are that the group must be locally based and voluntary, as noted above, and represent a balance of interested an affected persons within the watershed. One of the few requirements of Councils is to produce a watershed assessment, which provides the scientific basis for developing a Watershed Action Plan. Funding for work of the councils is partially provided by OWEB, which derives its money from state lottery and federal funds. While the OPSW included more expansive efforts, Watershed Councils were also supported by previous state legislation. In 1993, the Watershed Health Program (HB 2215, SB 81) provided funding and coordination of activities. Since that legislation, approximately 95 watershed councils have formed in Oregon. Fore more information see http://www.oregon-plan.org/ and http://www.oregon.gov/OWEB/index.shtml.

Washington's Salmon Recovery Act (SRA)

The Salmon Recovery Act (ESHB 2496, RCW 77.85) was enacted by the Washington Legislature in 1998. One goal of this bill was to support coordination of local projects to protect and restore salmonid habitat, facilitated by Lead Entities in each WRIA (can also

represent a portion of a WRIA or multiple WRIAs). These groups receive technical and financial assistance from WDFW and the WSCC to evaluate local limiting factors of wild salmon recovery, and develop prioritized lists of scientifically-based projects addressing the limiting factors. Project sponsors submit projects to the formally designated Lead Entity, who in turn review and prioritize project funding requests for submission to the Salmon Recovery Funding Board. This group was established by the Washington State legislature in 1999 under the Salmon Recovery Funding Act (SESSSB 5595). SRFB considers statewide planning efforts when, such as the Salmonid Stock Inventory (SASSI), the Salmon and Steelhead Habitat Inventory and Assessment Project (SSHIAP), and Limiting Factors Analysis, when making funding decisions. The additional aim of assessments and strategies developed by Lead Entities is to contribute to the habitat element of regional salmon recovery plans.

Lead Entities are generally made up of a technical committee or advisory group, composed of local technical experts, and a citizen committee, composed of local, state, federal and tribal government representatives, community groups, environmental and fisheries groups, conservation districts, industry, regional fisheries enhancement groups, and local citizens. Currently, there are 26 Lead Entities representing 66% of the state, and five regional organization engaged in developing ESU-level recovery planning, including the Lower Columbia Fish Recovery Board, the Snake River Salmon Recovery Board, Puget Sound Shared Strategy, the Yakima Sub-basin Fish and Wildlife Planning Board, and the Upper Columbia Salmon Recovery Board. Regional recovery plans will address habitat, harvest, hatchery, and hydropower activities. Lead Entities also participate in the Lead Entity Advisory Group, a nine-person group which provides a forum to discuss lead entity issues statewide and an opportunity to improve communication among local and state organizations.

The SRA was also set up to coordinate state efforts in salmon recovery and created the Governor's Salmon Recovery Office, whose role is to coordinate and produce a statewide salmon strategy, WDFW Salmon Habitat Restoration and Screening Program, the Science Review Panel, the Interagency Review Team, and the WSCC's Limiting Factors Analysis. The Statewide Strategy for Salmon Recovery addresses initiatives related to the "Four H's" (habitat, harvest, hatcheries, and hydropower), coordinating state agency activities, monitoring of state and local progress, and early actions to address areas of severe decline. For more information see http://www.iac.wa.gov/srfb/leadentities.htm and http://www.governor.wa.gov/gsro/.

Washington's Watershed Planning Act (WPA)

In 1998, the Washington Legislature also enacted the Watershed Planning Act (Chapter 90.82 RCW, ESHB 2514). This bill provided funding and structure for local communities to participate in voluntary collaborative decision-making regarding water

related issues at the watershed scale, or Water Resource Inventory Area (WRIA). This strategy was initiated because many past efforts to manage these resources through statewide planning and implementation were considered unsuccessful, and often "failed to account for local variability in socioeconomic, political, and natural resources conditions" (WDOE 2003b). Participating Local Planning Units in each WRIA are required to develop a watershed management plan, which at least must address water quantity (e.g., determining current and future instream and out-of-stream needs), but also could address water quality, fish habitat, and instream flows. The WPA set up certain guidelines and restrictions for forming Planning Units. In order to become formalized, "initiating governments" needed to participate with unanimous consent. These included all counties and the largest city or town within the WRIA, as well as the water supply utility obtaining the largest quantity of water from the WRIA. In addition, these entities must invite all tribes with reservation lands within the WRIA to become an initiating government, although they are not required to participate. There were no further specific composition requirements; however, the Planning Unit must include representation of a wide range of water resource interests. Plans must be approved by consensus of all members of the unit (the definition of consensus is determined by the Unit), then approved by each county in the WRIA, or else the process is terminated. WDOE has the authorization to set instream flows where Units have failed to do so. In addition, state and federal agencies may participate as a member of the Planning Unit, or through technical assistance. Each unit is also assigned a WDOE Watershed Planning Lead, who provides guidance and acts as a liaison with participating state agencies. In some WRIAs, Planning Units are also 2496 Lead Entities, while in others they remain separate.

Currently 37 Planning Units representing 45 out of 62 WRIAs are participating in this planning process, and twelve units (18 watersheds) have completed their plans. In addition, six plans have been approved by County governments and one has moved to implementation. However, the planning process has stopped for four units, who could not reach consensus. Instream flow agreements and recommendations have also been finalized and submitted to WDOE. These instream flows will be the first set since 1985, with the exception of the Skagit River basin instream flow rule, which was adopted in 2001, but is currently being amended. WDOE and WDFW have also developed an action plan, which prioritizes watersheds for instream flow development and creates a timeline to ensure rules are adopted for watersheds without Planning Units, or if Units were unsuccessful. For more information see http://www.ecy.wa.gov/watershed/.

Chapter 400-12 WAC – Watershed Action Planning

In 1987, the Puget Sound Water Quality Management Plan (PSWQMP) was developed under state regulation (Chapter 400-12 WAC, 90.7 RCW) to address pollution for the

twelve Puget Sound Counties. This plan was developed by the Puget Sound Water Quality Authority (PSWQA) to coordinate state, federal, local, and tribal governments to address environmental and public health issues. In 1991, the PSWQMP was approved as the Comprehensive Conservation and Management Plan for the Puget Sound National Estuary Program. Then in 1996, under the Puget Sound Water Quality Protection Act (RCW 90.71), the PSWQA was replaced with the Puget Sound Action Team, which is currently responsible for implementing the PSWQMP and guided by the concurrently established Puget Sound Council. This plan was most recently updated in 2000. Portions of the plan are also incorporated into the statewide Water Quality Management Plan to Control Nonpoint Source Pollution, published in 2000.

One of the elements of the original PSWQMP was to lay a foundation of support for local watershed groups. The purpose of these groups was to develop Watershed Action Plans (WAPs), which were primarily intended to address water quality, but could also consider issues such as habitat, flooding, and water quantity. All twelve Puget Sound counties were directed to develop committees, which would identify and rank their watersheds for protection and clean-up. Local watershed management committees would then be formed to develop and implement WAPs, which had to be approved by WDOE. Membership of these management committees was to be composed of planning and implementation entities for each non-point source category, and include the participation of local governments, special purpose districts, tribes, watershed residents, affected parties, and appropriate state and federal agencies.

This process was also directed to coordinate with other state and federal agency programs. Lead entities for the WAPs were responsible for continuing implementation coordination and providing progress reports to WDOE, which currently administers this program. WODE provides technical assistance and funding through the Centennial Clean Water Fund. This program is also overseen by PSAT. In addition, the committee were required to develop long-term water quality assessment and monitoring programs to help evaluate the effectiveness of WAPs. This local monitoring was intended to be incorporated with the regional Puget Sound Ambient Monitoring Program, led by the PSAT. Every five years the lead entity is required to reconvene a watershed ranking committee to re-evaluate the priority watersheds based on the results of implementation or new information. Approximately 44 WAPs were produced, addressing about a quarter of the Sound. Since the PSWQMP was developed other watershed planning approaches have been instated, which may be used to address water quality instead of the WAC 400-12 process (e.g., ESHB 2514). WDOE will work with counties that do not have a plan to address non-point source pollution through any one of the approaches. For more information see http://www.psat.wa.gov/Publications/workplan_03/wp03/16_ws.htm.

Northwest Straits Commission (NWSC) and Marine Resources Committees (MRCs)

The Northwest Straits Marine Conservation Initiative was authorized by Congress in 1998. This initiative was developed out of a commission led by U.S. Senator Patty Murray and U.S. Congressman Jack Metcalf to provide a local alternative to a federally

proposed Northwest Straits Marine Sanctuary. The Northwest Straits Commission was formed to oversee the protection and restoration of marine resources in the Straits, through the creation of Marine Resource Committees (MRCs) in the seven North Sound counties. The membership of each MRC should be citizen-based, and consist of representatives from the scientific community, local and tribal governments, and economic, recreational and conservation interests. In addition, the MRCs must focus on a set of eight performance benchmarks for improving marine resources, and measuring their progress. The NWSC guides these efforts, and helps coordinate with other state agencies. For more information see http://www.nwstraits.org/.

APPENDIX IV – NOMINAL CHARACTERISTICS FOR EVALUATING WATERSHED SENSITIVITY, ADAPTABILITY, AND VULNERABILITY

The following information was compiled to provide preliminary information on the potential sensitivity, adaptability, and vulnerability of watershed resources in the Skagit River and Tillamook Bay watersheds. The indicators listed below were identified by Whitely Binder (2000) as a nominal combination of characteristics needed to begin to determine vulnerability. Information provided in the right column indicates the combination of characteristics that may leave watersheds most vulnerable. Due to the limited nature of this study, information was only noted if it could be readily found in documentation reviewed for other portions of this study or from additional documentation found on the internet. A more complete investigation of these indicators would need to be conducted to fully address and confirm this information. Note that some responses apply to the County and not the watershed, due to difficulty in obtaining information on a watershed basis.

Indicator Category		**Skagit River Watershed**	**Tillamook Bay Watershed**	**Most Vulnerable Combination**
Climate and Hydrology	**Type of Basin** (Rain, transient, snow)	[41]Most low-elevation forested drainages in Samish and western Skagit dominated by autumn and winter rainfall floods; high elevation drainages in eastern Skagit typically dominated by spring snowmelt floods; lowland Skagit/Samish generally rain dominated	Mostly rain-dominated; can snow in upland areas; rain-on-snow events are rare;	Transient basin or lower elevation snow dominant basin

[41] SWC 1998

	Annual Precipitation (inches) (Total Basin, Lower Basin, Upper Basin)	[42]Lowlands – avg < 80; mountains >140 [43]Samish Lowlands – 35 Lake Samish – 68 Mountains – 90 Anacortes – 26.2 Sedro Woolley - 45.84 (1931-1998)	[44]Lower – 80-125 Upper – 125-200 [45]Spruce zone (below 450ft) – 78-118 Hemlock zone (450ft-subalpine) – 142 avg	Lower average annual precipitation or large disparities between upper and lower basin precipitation values, which forces greater reliance on upper level precipitation
	Average Temperatures (°F) (Summer and Winter – Total Basin Avg, Summer - Lower Basin Avg and Max, Winter – Upper Basin Avg and Min)	WRIA 3 Winter 36/46 (avg min/max) Summer 52/62 WRIA 4 Winter 13/36 Summer 45/70 [46]Samish Winter 34/40 Summer 60/73	[47]County – 50.4/59.3/41.6 (avg/mean max/mean min) Spruce zone (lower) at Astoria – 51/40/70 (avg/Jan min/July max) Hemlock zone (upper) at Valsetz – 50/30/78 –	Higher basin-wide summer temperatures and/or winter temperatures nearing freezing in the primary watershed catchment area(s)
Water Use	**Population** (Current, Projected, Annual Growth Rate, % Change)	[48]Skagit County 2003 – 106,700 OFM med range projections 2015 – 135,717 2025 – 164,797 (2025 County target 149,080) Avg annual growth rate 1990-2000→2.8% OFM med ~10-15K or ~9-11% every 5 years (2005-2025)	[49]Tillamook County 2003 – 24,900 2025 – 30,094 2040 – 32,146 Avg annual growth rate 2000-03 → .8% 2000-2040 → .38-.96% Percent change 1990-97 - 10.3%	High projected population growth rate relative to current population

[42] WSCC 2003
[43] Duke Engineering &Services Inc. et al. 2002
[44] ODEQ 2001
[45] TBNEP 1999
[46] SWMC and SCDPCD 1995
[47] TBNEP 1999
[48] Skagit County 2003b
[49] http://www.oregon.gov/DAS/OEA/demographic.shtml

	Water Use by Source (%) (Surface Water, Groundwater)	[50]Urban systems primarily SW and rural systems GW/wells 2000 Peak day capacity 48 MGD UGA (Anacortes and SCPUD Judy Reserv.) 9.2 MGD non-UGA plus Hamilton, Lyman, and Concrete [51]Samish – groundwater supplies 80% demand; often strongly connected to surface water		Watershed population largely dependent on surface water

[50] Economic and Engineering Services, Inc. 2000
[51] Duke Engineering &Services Inc. et al. 2002

	Major Water Storage Systems (Dams/Aquifer Storage and Recovery Sites, AF Storage, Ratio of Total Storage to Annual Streamflow)	*Primarily hydropower* SCL's dams Ross-1.435M AF, Diablo-89K AF, Gorge-8,500 AF PSE's Baker dams Upper-274K AF Lower-146K AF *Consumptive* Judy Reservoir 4,500 AF Recharge to aquifers ~600K AF/yr or 530 MGD (w/ 20% capture ~90 MGD additionally available); most high yield aquifers associated w/ Skagit River; [52]Mean annual streamflow (cfs) Mt. Vernon – 16,660 Newhalem - 4,480	[53]Total reservoir rights 22,999 AF (20K - Barney Reservoir serves Tualatin River communities) TWCC's Skookum Lake Reservoir – 1,000AF Cape Meare Dam – 200AF Cole Creek Reservoir – 8AF; [54]Mean flow – 2,164 cfs	Little carryover storage capacity for managing floods as well as droughts
Regulatory Character-istics	**Overview of Surface and Groundwater Rights (af or cfs)** (Claims, Applications, Estimated Actual Usage, Annual Allocation)	Some uncertainty [55]Samish certificates/permits SW – 420 GW – 108 (by volume 60%); Samish Number of invalidated claims; up to ½ SW may be unpermitted	[56]GW – 51.8 cfs SW – 217 cfs (does not include instream rights)	Uncertainty over the use status of surface and/or groundwater rights

[52] SWC 2004
[53] http://apps.wrd.state.or.us/apps/wr/wrinfo/wrinfo.php?search_type=FindStream
[54] TBNEP 1999
[55] Duke Engineering &Services Inc. et al. 2002
[56] http://apps.wrd.state.or.us/apps/wr/wrinfo/wrinfo.php?search_type=FindStream

	Instream Flows (INSF) (INSF set?, Avg. #days/% below INSF, Stream Closures, Comments	[57]2001 Skagit instream rule (Chapter 173-503 WAC) – allocations currently being amended [58]Samish instream rule (Chapter 173-503A WAC) under development; both have proposed closures; both expected to be finalized by Summer 2005	[59]Some instream water rights established by ODWR [60]Miami – 1.0/8.9/56.2% min/avg/max monthly average below instream right, may experience low flow issues; [61]Trask – river overcommitted, but does not run dry, indicates many rights not exercised; [62]Wilson – .2/16.5/56.3% min/avg/max may experience low flow issues; [63]Tillamook Bay tribs designated ODWR/ODFW flow restoration priorities for salmon	Instream flow restrictions present
	TMDL (y/n, description)	[64]Lower Skagit River fecal coliform and temperature TMDLs	[65]Temperature and bacteria TMDLs	Total Maximum Daily Load restrictions

[57] http://www.ecy.wa.gov/programs/wr/instream-flows/skagitbasin.html
[58] http://www.ecy.wa.gov/programs/wr/instream-flows/samishbasin.html
[59] http://apps.wrd.state.or.us/apps/wr/wrinfo/wrinfo.php?search_type=FindStream
[60] TCPP 2001b
[61] TBNEP 1998c
[62] TCPP 2001c
[63] http://rainbow.dfw.state.or.us/nrimp/information/streamflow/01northcoast/01sum.pdf
[64] WDOE 2000a and WDOE 2004a
[65] ODEQ 2001

Watershed Planning	**Major Planning Challenges Sensitive to Climate** (y/n, description)	Yes (e.g., flooding, salmon recovery, water rights, dam operations)	Yes (e.g., flooding, salmon recovery)	Same as indicator title
	Perceived Level of Adaptation Flexibility (Description)	Moderate to high (interviewees perception from this study); however, several potential barriers to adaptation were listed and perception could change with more perfect information	Moderate to high (interviewees perception from this study); however, several potential barriers to adaptation were listed and perception could change with more perfect information	Little or uncertain perceived adaptation flexibility

APPENDIX V – BASIC INFORMATION FOR WATERSHED INITIATIVES

Stakeholder	Skagit Watershed Council
Mission	To understand, protect and restore the production and productivity of healthy ecosystems in order to support sustainable fisheries
Activities	Supports and endorses voluntary restoration and protection of natural landscape processes that formed and sustained the habitats to which salmon stocks (as well as other native aquatic and riparian dependent species) are adapted; engage in collaboration, technical assistance, and education
Focus	Top priority target species is wild Skagit Chinook, specifically five of the six populations (lower Skagit, upper Skagit, lower Sauk, upper Sauk, and upper Cascade - threatened ESA and depressed Washington's 2003 SASSI/SaSI); second-tier priority target species are bull trout, Suiattle Chinook (threatened ESA), and Skagit winter steelhead populations (depressed SASSI/SaSI), and third-tier priority species are all other anadromous salmonids; addresses all of WRIAs 3 and 4 below the mainstem Skagit dams
Formation and structure	Non-profit formed in 1997; ESHB 2496 Lead Entity designated in 1998; 40 members; membership is open, although only organizations can join (not individuals) and they must support the goals of the Council; members represent a wide range of interests, including local municipalities, timber industry, recreational groups, conservation nonprofits, academic institutions, utilities, agricultural organizations, tribes, and county, state, and federal governments; Administration (BOD), Restoration and Protection (and its sub-committees Restoration Project Review, Protection, Feasibility, Monitoring, and Combination Project Review), and Project Review and Project Prioritization; Research Committee being formed; 3 staff: full-time President/Chair, full-time Technical Coordinator, and ¾ time Administrative Assistant; decision-making by consensus at monthly Board meetings
Laws and programs guiding action	Washington State Salmon Recovery Planning Act (ESHB 2496); Seattle City Light's (SCL) ESA Early Action Program – funds projects supported by SWC
Funding	Skagit County, Seattle City Light, Washington Department of Fish and Wildlife, Salmon Recovery Funding Board, The Nature Conservancy, U.S. Forest Service, The Trust for Public Land
Major organization documents	Habitat Protection and Restoration Strategy (SWC 1998), Strategy Application (SWC 2000), Strategic Approach (SWC 2004d and 2005), Draft Monitoring Strategy (SWC 2004c), Salmon and Steelhead Habitat Limiting Factors WRIAs 3 and 4 (WSCC 2003)
Comments	Does not address issues of harvest, hatcheries, or hydropower; generally focused on voluntary actions and does not deal with regulatory or mandatory actions
Website	http://www.skagitwatershed.org

Stakeholder	Skagit Conservation Environmental Alliance
Mission	To bring people together in the spirit of cooperation to protect, conserve, and enhance the natural ecosystems in the Skagit Watersheds
Activities	Promote alliance-building and foster collaboration; encourage and support research, demonstration projects, and education programs; encourage grassroots projects through dissemination of information, promoting activities, and establishing grants fund; acquire and manage land for community outdoor education and research; provide resources, programs, and funds that support mission of SCD; facilitate and coordinate activities of the Implementation Review Committee (IRC), who evaluate the status and results of Samish, Padilla, and Nookachamps WAC 400-12 Watershed Action Plans (WAPs); IRC recommend revisions, monitor implementation, provide public outreach and education, evaluate need to re-rank watersheds, promote continued coordination among lead entities, and provide motivation to implement recommendations
Focus	Work encompasses all watersheds within Skagit County; consider water, soil, and related natural resources, but generally focus on water quality and non-point source pollution; also involved in shellfish protection and geoduck gardening projects
Formation and structure	Non-profit formed in 2003; 9 member Board of Directors, ~60 members; Executive, Nominating, Business, and Watershed Stewardship Committees; Executive Director and part-time staff assistant; IRC membership includes interested agencies, special interest groups, and citizen representatives involved in planning of the WAPs; IRC members encouraged to participate as a member of the SCEA; SCEA decision-making generally by consensus (and Robert's Rules of Order if necessary); IRC administrative decision-making by majority vote and substantive decision-making first by consensus and then by majority vote
Laws and programs guiding action	Washington State Chapter 400-12 WAC - Local Planning and Management of Nonpoint Source Pollution
Funding	Puget Sound Action Team, The Russell Family Foundation, fundraisers
Major organization documents	Samish Watershed Action Plan (SWMC et al. 1995), Padilla Watershed Action Plan (PB/BVWMC et al. 1995), Nookachamps Watershed Action Plan (NWMC et al. 1995); 1999 and 2004 Status Reports (IRC 1999 and 2004)
Comments	Formation of SCEA one of the action tasks of each WAP; based on Chesapeake Bay Alliance; IRC originally coordinated by SCPDS, then sub-contracted to the SCD in 1996, and then coordinated by SCEA; IRC's first WAP review in 1999; second review began in 2003 and still ongoing
Website	http://www.skagitconservationeducationalliance.org

Stakeholder	Skagit County Marine Resources Committee
Mission	To discuss marine related issues and determine action items to enhance and protect local marine habitat
Activities	Support public participation and education; facilitate restoration; select candidate marine protection areas for rocky reef bottomfish habitat; re-establish the native Olympia oyster; remove Spartina; inventory beaches for signs of forage fish habitat; remove derelict fishing gear; develop nearshore restoration projects; and enhance the Pacific oyster
Focus	Emphasis on nearshore and voluntary projects in the North Bays of Skagit County; Northwest Straits Commission's Benchmarks for Performance
Formation and structure	Established in 1999 by Skagit County Resolution #17433; Committee members appointed by the Skagit County Board of Commissioners every four years; members represent a broad range of partner groups from throughout County; Commercial fishing and marinas currently not represented; one member selected by consensus to serve on the Northwest Straits Commission; Bottomfish Project Technical Review Team only formal committees; one coordinator, located at Skagit County Planning and Development Services; meets monthly and decision-making conducted through consensus
Laws and programs guiding action	Northwest Straits Commission, Skagit County
Funding	Northwest Straits Commission
Major organization documents	Rocky Reef Bottomfish Recovery in Skagit County (SCMRC 2002); Samish Island Rapid Shoreline Inventory (PPS 2002); March Point Rapid Shoreline Inventory (PPS 2001); Restoration of the Olympia Oyster in North Puget Sound: Will Olympia Oysters Thrive in Fidalgo Bay? (SCMRC 2003); Skagit Estuary Restoration Assessment (PPS et al. 2000); Northern Skagit County Bays and Shoreline Habitat Conservation and Restoration Blueprint (PPS 2004)
Website	http://www.skagitcounty.net/Common/Asp/Default.asp?d=PublicWorksMRC&c=General&p=smrcmain.htm

Stakeholder	Samish Watershed Planning Unit
Mission	To address water quantity and instream flows for the Samish River
Activities	Determining and setting instream flows; meeting instream flow needs; meeting current out-of-stream needs; meeting future out-of-stream needs; developing strategies for increasing water supplies
Focus	Samish River (in WRIA 3); Samish originally intended to be used as "test case" for other watersheds in WRIAs 3 and 4; chose not to work on habitat and water quality components due to cost, time, and desire to minimize redundancy with groups like the SWC
Formation and structure	Formed in 1999 as a result of the availability of funding from the Watershed Management Act (ESHB 2514); each Initiating Government (Skagit County, City of Mount Vernon, City of Anacortes, Swinomish Indian Tribe, Sauk-Suiattle Indian Tribe, SCPUD) and Interest Caucus (Environment, Recreation, Agriculture, Commercial fishing, Economic, Unaffiliated watershed representative, Washington State, Federal Government) had one representative and one alternate; Planning Team, made up of all Initiating Governments and Interest Caucuses, was responsible for policy decisions; Steering Committee, made up of Initiating Governments, addressed administrative and process issues; Technical Team, made up of Initiating Governments and consultants, focused on data acquisition; decision-making first attempted using consensus, if unsuccessful, then consensus by Initiating Governments, and majority vote by Caucuses; Skagit Council of Governments lead agency; consultants hired to conduct the technical assessments and facilitate meetings
Laws and programs guiding action	Washington State Watershed Planning Act (ESHB 2514)
Funding	Washington Department of Ecology
Major organization documents	Draft Samish River Watershed Management Plan (Duke Engineering & Services, Inc. et al. 2003); Level 1 and Level 2 Technical Assessments (Duke Engineering & Services, Inc 2002)
Comments	Currently defunct; completed studies on the Samish and a Draft Samish River Watershed Management Plan; however, could not reach consensus on the inclusion of instream flow recommendations during 2003; conceded the development of instream flows to WDOE; WDOE working with WDFW, Upper Skagit Indian Tribe, Swinomish Indian Tribal Community, and Sauk-Suiattle Indian Tribe on proposed rule (Chapter 173-503A); instream flow adopted through separate process in 2001 for the Skagit River (Chapter 173-503 WAC); Skagit rule currently being amended due to litigation
Website	http://www.ecy.wa.gov/watershed/34.html

Stakeholder	Tillamook Estuaries Partnership
Mission	Dedicated to the conservation and restoration of the five Tillamook County estuaries and the watersheds that sustain them
Activities	Responsible for leading, supporting, and tracking implementation of the Tillamook Bay Comprehensive Conservation and Management Plan (CCMP); enhance water quality to meet state and federal standards; restore native salmonid populations; reduce frequency and impacts of catastrophic flooding; and encourage stewardship among residents and visitors; accomplishes these goals through implementing targeted resource enhancement projects, further characterizing estuaries and watersheds, and educating citizens and visitors about natural resources and the importance of stewardship; also provide financial and technical assistance to support environmental restoration and enhancement projects
Focus	Focus on Tillamook Bay, but supports activities in watersheds and estuaries throughout Tillamook County; 4 priority problems - water quality, habitat loss and simplification, erosion and sedimentation, and flooding
Formation and structure	Gone through evolutions of structure and name; 1992 – nominated to National Estuary Program; 1994 - Tillamook Bay National Estuary Project (TBNEP) officially convened to develop the CCMP under OSU administration; 1999 - TBNEP shifted to an implementation organization, the Tillamook County Performance Partnership (TCPP), which was administered as Tillamook County department; 2002 - became stand alone non-profit organization, the Tillamook Estuaries Partnership (TEP); TEP currently directed by a 20 seat Board of Directors, comprised of industry, government, non-profits, special districts, and individuals representing the community at large; decision-making based on majority vote; 3 programs - Habitat Enhancement, Research and Monitoring, Education; 4 committees made up of board, community partners and staff - Development, Education, Grant Review, and Finance Committee (plus task forces - Environmental Restoration, Education and Outreach, and Research and Monitoring); 5 staff
Laws and programs guiding action	National Estuary Program, administered by U.S. Environmental Protection Agency
Funding	Environmental Protection Agency – base grant
Major organization documents	Tillamook Bay Comprehensive Conservation and Management Plan (TBNEP 1999), Kilchis Watershed Analysis (TBNEP 1998a), Trask Watershed Assessment (TBNEP 1998c), Trask Action Plan (TBWC 1999(, Miami River Watershed Assessment (TCPP 2001b), Wilson River Final Watershed Assessment (TCPP 2001c)
Comments	28 National Estuary Projects throughout the country; one of the smallest NEPs
Website	http://www.godseyandassoc.com/tep/

Stakeholder	Tillamook Bay Watershed Council
Mission	Help to improve, maintain, and protect watershed health and foster better stewardship and understanding of the Tillamook Bay Watershed. Deal with issues in advance of degradation of the watershed and it's resources, and ensure sustainable watershed health
Focus	Tillamook Bay Watershed
Activities	Address watershed management issues in the watershed, improve and enhance watershed health, and provide a framework for coordination and cooperation among key interests; identify and address priority protection, restoration, and enhancement needs (e.g., improve fish passage and water quality, restore riparian vegetation on bacteria and temperature limited streams); monitor and evaluate watershed conditions, functions, and efforts to improve watershed health (e.g., monitor bacteria, success of riparian plantings, fish passage, watershed assessment); encourage and track citizen participation; promote and evaluate citizen learning about watershed resource issues; and build partnerships
Formation and structure	Formed in 1998, and officially designated by Tillamook County Commissioners; committees - Fish Passage, Work Plan, Riparian, Administrative, Steering, and Fiscal Accountability; members originally selected by the Commissioners; many people and representatives involved at first, but many fell out over time; 1 coordinator, in the past shared coordinator with nearby watershed councils; decision-making 2/3 vote when consensus can't be reached
Laws and programs guiding action	Oregon Plan for Salmon and Watersheds; Tillamook Bay Comprehensive Conservation and Management Plan
Funding	OWEB, TEP, ODFW
Major organization documents	Tillamook Bay Comprehensive Conservation and Management Plan (TBNEP 1999), Kilchis Watershed Analysis (TBNEP 1998a), Trask Watershed Assessment (TBNEP 1998c), Trask Action Plan (TBWC 1999(, Miami River Watershed Assessment (TCPP 2001b), Wilson River Final Watershed Assessment (TCPP 2001c)
Website	http://gisweb.co.tillamook.or.us/tcwrc/councils/tbay/

APPENDIX VI - EXCERPTS FROM WATERSHED DOCUMENTS, WHICH INCORPORATED CLIMATE VARIATION AND/OR CLIMATE CHANGE INFORMATION

Skagit River Watershed	
Duke Engineering & Services, Inc. et al. (2003)	Discussed ENSO and PDO, with focus on the latter; meteorological data from Samish River Basin analyzed and compared to regionally identified natural climate variability measured by PDO phases; noted that record used for water allocation studies should cover both PDO phases; cited Mote et al., 1999.
SWC (1998)	Briefly discussed climate as a independent watershed control on habitat conditions.
SWC (2004a)	Discussed effects of subsidence and relative sea level rise on restoration options and drainage at Fir Island Delta; on local scale has subsided up to 4 ft. over the last century (1.22 m) due to soil compaction and oxidation resulting from land drainage; on regional scale entire delta subsiding due to consolidation of sedimentary deposits consolidate and regional faulting; average subsidence of 9.6 in (244 mm) between 1956-2002, or approximately 0.21 in. (5.3 mm) total subsidence per year; includes regional subsidence (approximately 0.024 in./yr, or 0.6 mm/year); cites IPCC (1995) estimates of sea-level rise due to long term climate change (previous century 0.04-0.09 in./yr (1.0 – 2.5 mm/yr), next century range from 0.08-0.34 in./yr (2.0 – 8.6 mm/yr); eustatic sea-level rise plus regional subsidence rate - 0.10 in./yr (2.6 mm/yr) or a relative rise of the high and low tide elevations of 0.25 ft (0.07 m) over 30 years; created map of estimated 30 year elevation; over the next 30 years the area of farmland on Fir Island most likely to be adversely affected by drainage problems is expected to increase from about 700 to 1,400 acres due to continued land subsidence and sea-level rise.
SCMRC (2002)	Briefly mentions impacts of natural weather cycles (El Niño, PDO) on declines in Eastern Pacific fish stocks; other factors were natural cycles of predator-prey relationships and human activities of harvest and development.
Connor and Pflug (2004)	Study looked at changes in distribution and density of pink, chum, and Chinook to determine response to SCL flow management measures; escapement values increased in all of the northern Puget Sound rivers evaluated, indicating that pink salmon populations increased regionally in response to favorable changes in ocean productivity, climate, or other large-scale factors; however, the increase in pink salmon spawner abundance within the study area was far greater than the increases within other areas, which suggests local environmental factors, including the flow improvement measures, were largely responsible.

SCDPW (2004a)	Goal of monitoring to determine if the trends in water quality caused by local activities or by regional conditions such as changes in climate; will compare trends at stations inside and outside of the agricultural areas and monitoring climate conditions.
SCDEM (2003)	Briefly discussed El Niño and La Niña effects on local storm patterns.
WDOE (2004a)	General discussion of climate effects on stream temperatures; model used to determine loading capacity for effective shade; partially determined based on predictions of water temperatures under typical and extreme flow and climate conditions.
Tillamook Bay Watershed	
TCPP (2001b)	For estuaries experiencing a rising sea-level, restored tidal marshes can serve as long-term sediment sinks, keeping pace with the changing sea-level.
TBNEP (1998b)	Briefly discusses climate variation and change effects on runoff patterns and rising sea levels, which in turn impacts flooding; need for flexible flood mitigation strategies; one of most significant locations on Oregon coast because sea level rising at a rate of about 2 millimeters per year.
USFWS, USEPA, and USACE (2002) * One interviewee noted that this strategy was not adopted	Discussed regional precipitation and climate past and future trends, and impacts on flooding and salmon population viability; wet and cool and dry and warms periods; fluctuation between annual and 5-year-average water year precipitation appears to be increasing in recent years, as compared to the moderate changes that occurred up to 1945; may have implications on moisture stress and plant growth rates for vegetation basin-wide, including upland forests, lowland agricultural areas, and revegetation efforts associated with floodplain restoration; coastal uplift is relatively less in the Tillamook Bay area of the Oregon coast and this area is therefore being inundated by a rising sea level faster than other coastal areas, by about 2-millimeters per year; sea-level rise, coupled with subsidence of the land mass in the Tillamook area, results in the area being submerged at an estimated rate of about 2 millimeters per year, or 8 inches in 100 years; for a typical intertidal mudflat slope in Tillamook Bay of one foot vertical to 250 feet horizontal marsh vegetation could retreat inland up to 170 feet; if tidal channels have levees at their banks, there is no room for tidal vegetation zones to retreat; sediment accumulation and higher tides from sea level rise will lead to increased channel deposition in the tidally influenced reaches of the rivers; flood control improvement projects constructed in the estuary will provide increasingly fewer benefits over time, because the relative rise in sea level was not accounted for in the original design of this infrastructure; warmer winters from global warming leading to increased chance for winter rain and rain-on-snow events, plus renewed harvest in the Tillamook State Forest may cause changes in flooding