Tillamook Bay National Estuary Project

"Restoring the Balance"

Comprehensive Conservation and Management Plan for Tillamook Bay, Oregon

Garibaldi, Oregon
December 1999

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TBNEP Management Conference

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CHAPTER

1 INTRODUCTION

Tillamook Bay National Estuary Project

In April 1992, Oregon Governor Barbara Roberts nominated Tillamook Bay to the National Estuary Program (NEP). In her nomination, the Governor characterized Tillamook Bay as representative of the bays along the Pacific Northwest coast because it provided a vital resource to the local and regional economies, and supported diverse aquatic resources including anadromous fish, shellfish, and waterfowl.

In supporting the nomination, Oregon Department of Environmental Quality (DEQ) Administrator Fred Hanson underscored three environmental problems facing Tillamook Bay:

- *Bacterial contamination that causes periodic closure of Tillamook Bay shellfish harvest;*
- *Excessive sedimentation that has reduced the volume of the Bay, adversely affected fish and wildlife habitat, and decreased the available area for recreational and commercial boating; and*
- *Declining salmon and trout runs due to degradation of spawning and rearing habitat.*

As the various management plans for Tillamook Bay Watershed are implemented, their results monitored, and additional scientific information gathered, this CCMP will evolve. Like the Bay, the CCMP is living and changing.

Like Governor Roberts, Mr. Hanson also noted the very concerned and active community of Tillamook Bay, and recognized a "history of working together to take action to address its problems."

Governor Roberts and Mr. Hanson promised that if selected for the National Estuary Program, a "…Management Conference will develop a plan for the Bay that will maintain and improve water quality and living resources, while ensuring compatibility with Tillamook County's economically important industries."

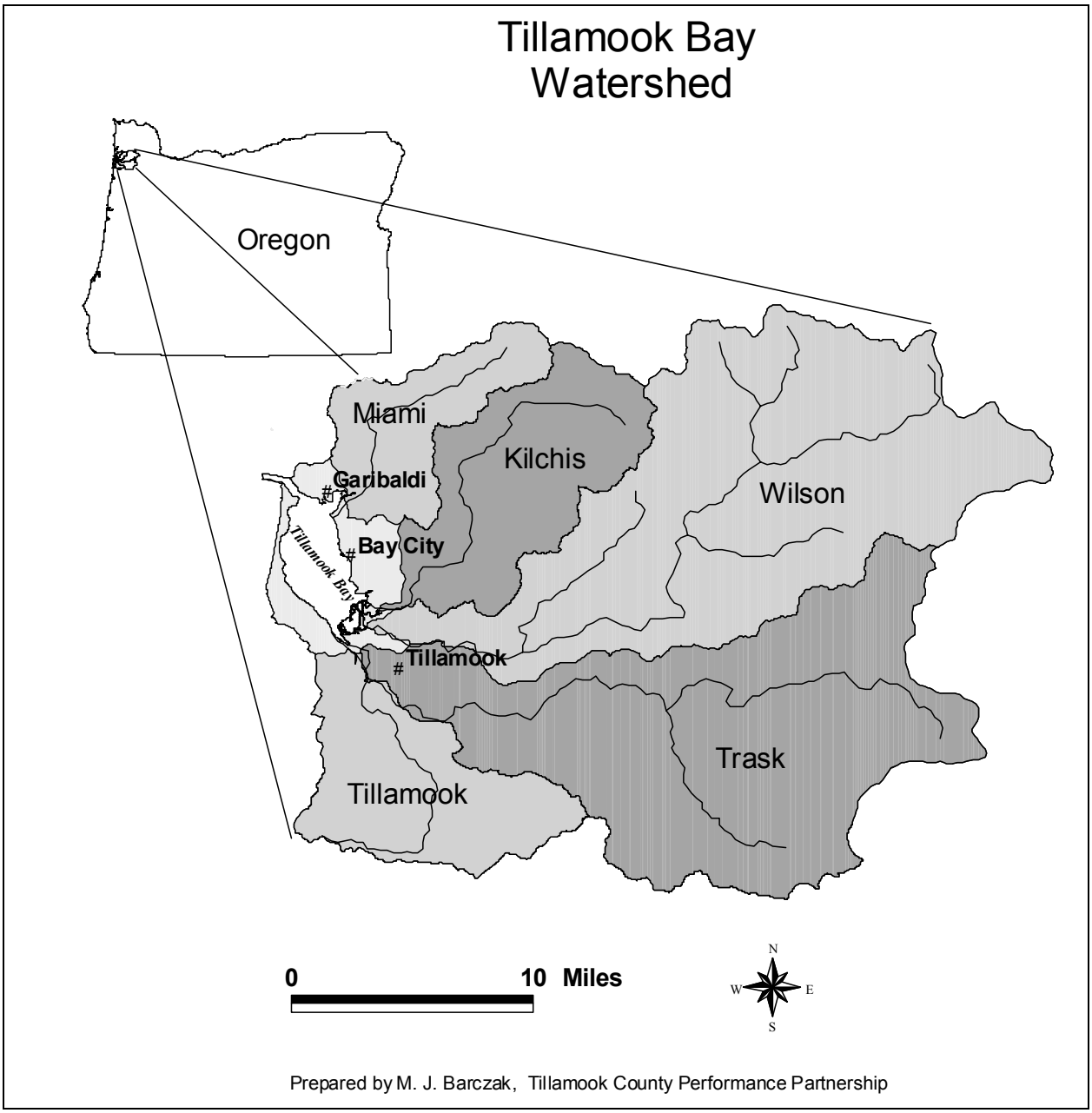

Figure 1-1. Map of the Tillamook Bay Watershed in Tillamook County, Oregon. It includes the watersheds of five rivers: the Miami, Kilchis, Wilson, Trask and Tillamook.

Tillamook Bay's nomination was approved, and seven years later, this Comprehensive Conservation and Management Plan (CCMP) fulfills the commitments made in 1992. It represents the collaborative work of the many citizens, managers, scientists, educators, and political leaders who supported the project over these years. The CCMP sets forth a 10-year action plan to coordinate resources, strengthen commitments, and rededicate our resolve to protect and enhance Tillamook Bay's natural resources.

About the TBNEP

In 1987, Congress established the National Estuary Program (NEP) as part of the Clean Water Act. The NEP's mission is to protect and restore the health of estuaries while supporting economic and recreational activities. The U.S. EPA administers the program. In 1994, TBNEP joined 27 other National Estuary Projects around the United States in developing and implementing science-based, community-supported management plans. To achieve program objectives and to complete a credible management plan, the TBNEP organized a Management Conference made up of policy makers, agency managers, citizens, and leading scientists from local, state, and regional institutions. The Management Conference established four committees to provide vital links in a cooperative effort to solve the environmental problems confronting the Tillamook Bay Watershed and its people.

Policy Committee

Composed of local, state, and federal leaders, the Policy Committee provided overall direction and set priorities for the program, defined Management Committee membership, and selected the Project Director.

Management Committee

Citizen leaders and agency managers, the majority of whom live and work in the Tillamook Bay Watershed, comprised the Management Committee. This group refined the definitions of Watershed problems and developed strategies to solve them. They also oversaw scientific characterization of the resources, completed action plans for the CCMP, and developed institutions and programs to implement the plan.

The Scientific and Technical Advisory Committee (STAC)

Represented by scientists, engineers, and planners from local and regional agencies and universities, the TBNEP STAC guided the environmental characterization of the Watershed and oversaw relevant activities. It provided research recommendations, reviewed findings and results, and worked to clarify sources of problems and identify practical solutions. The STAC steered Geographic Information Systems (GIS) and modeling efforts, and helped outline the monitoring strategy to track management effectiveness.

The Citizen Action Committee (CAC)

Drawn from citizen leaders and educators, the CAC worked to inform the public and develop strategies to involve all citizens in the decision-making process. The Committee oversaw the production of newsletters, videos, posters, and signs. It helped develop relevant educational programs and

conducted many public meetings and forums to solicit public input and support the consensus process. The CAC worked to educate citizens, to listen to their problems and ideas, and to provide them with the tools and information to make good decisions.

Management, Science, and Citizen Wisdom

The committees in the Management Conference worked together to integrate good management, sound science, and solid community support into the final CCMP. The entire CCMP development process took about five years and countless hours of meetings and discussions.

The TBNEP began in 1994 with three priority problems. After considering new scientific information and intervening events, including the Flood of 1996, the Management Committee rewrote the priority problems and added a fourth: flooding.

- *The interaction of human activities with dynamic natural systems has increased the magnitude, frequency, and impacts of flood events. These events affect water quality, cause erosion, imperil fish and aquatic wildlife, destroy property, and threaten life.*

The Management Committee developed the CCMP, which contains action plans for all four problems, against the backdrop of other planning efforts. As a comprehensive management plan, the CCMP incorporates many Clean Water Act-related components of these other plans, and establishes a process to continue to coordinate all agency workplans. Other concerns (*e.g.,* social and economic) are only addressed here in the context of the Clean Water Act. Specific resource management plans relevant to Tillamook Bay and Northwestern Oregon include:

- ***The Oregon Plan for Salmon and Watersheds (OPSW)*** mission is to restore our native fish populations X and the aquatic systems that support them X to productive and sustainable levels that will provide substantial environmental, cultural, and economic benefits. This sweeping plan relies on the cooperation of private citizens, industry, and all of Oregon's resource agencies. Watershed councils and the development of watershed assessments are critical to the success of the OPSW. Several watershed assessments have been completed in the County with the assistance of the TBNEP.
- ***The Tillamook County Flood Hazard Mitigation Plan*** was developed after severe flooding in 1996. It recommends strategies to reduce the occurrence of X and damage caused by X major flood events.
- ***The Tillamook County Comprehensive Plan*** and the implementing Land Use and Land Division Ordinances were prepared and adopted by Tillamook County in compliance with *Oregon's Statewide*

Planning Goals and Guidelines, statutes, and administrative rules. The Comprehensive Plan and implementing ordinances provide findings, policies and regulations that protect resource lands and manage growth in Tillamook County.

- ***The Oregon Northwest State Forest Management Plan*** provides a long-range vision of the state forests and proposes an approach called "structure based management" which diversifies forest stands and habitat types. *The Western Oregon State Forests Habitat Conservation Plan* is being developed in conjunction with the State's Northwest Forest Management Plan to provide long range strategies for the management of endangered and threatened animal species in state forests.
- ***Total Maximum Daily Loads (TMDLs)*** are water quality plans/regulations that DEQ writes for water bodies which do not meet the Clean Water Act water quality standards. Currently, DEQ is writing several TMDLs for Tillamook County.
- ***Oregon Senate Bill 1010 (SB 1010)*** mandates area water quality management plans for agricultural regions. Because the Tillamook Bay Watershed is viewed as a high priority area, the local advisory committee is already designing the North Coast Basin SB 1010 Plan.
- ***The President's Northwest Forest Plan*** provides a long-range vision of federal forest lands in the Pacific Northwest. It includes standards and guidelines emphasizing sustainable forest practices which provide for the long term health of Northwest forest ecosystems.

Chapter 3, Management Framework, provides more information on these plans, policies and programs. Citizens, stakeholders, and agency representatives on the Management Committee X and corresponding committees of other groups and agencies X worked to integrate these efforts into a coordinated CCMP that spans all agencies working in the Watershed. However, genuine cooperation requires more than a document; it also requires a well-managed implementation process.

The Tillamook County Performance Partnership succeeds the existing structure of the TBNEP, and assumes responsibility for CCMP implement-ation. Led by the NEP and a consortium of stakeholders, this new County department will continue to bring together all relevant federal, state, and local agencies, and watershed councils into a committee structure that makes collaborative decisions over resource management strategies and priorities. See Chapter 8, Implementation and Finance.

CCMP Development Process

Over the past four years, the Management Conference worked to integrate recent scientific findings, refine citizen input, and coordinate agency mandates into a comprehensive management plan. The formal CCMP development process boiled down citizen input to 63 Management Committee actions to solve the four priority problems in the Watershed and strengthen citizen involvement in the effort.

In year three of the program, the TBNEP invited citizens to recommend actions and strategies to address the priority problems. Under leadership of the CAC, TBNEP received over 200 recommended citizen actions to solve local problems. By July 1997, CAC refined the list to 25 high priority citizen actions, listed on Page 1-14, and submitted the list to the Management Committee for consideration and review.

By soliciting public input early, CCMP development followed a "bottom-up" approach to environmental management. Although the process endured some bumps and frustrations along the way, the TBNEP emphasis on citizen involvement led the way for watershed councils and supported the voluntary approach of the Oregon Plan for Salmon and Watersheds (OPSW). Both the CCMP and the OPSW share a vision of responsible and knowledgeable citizens solving their own environmental problems.

The Management Committee organized subcommittees to address each of the four priority problems: key habitat, water quality, sedimentation, and flooding. These subcommittees responded to original citizen recommendations and organized actions to correspond to agency programs and mandates.

At the same time, the TBNEP conducted more than four years of scientific and technical studies. Under STAC leadership, staff gathered existing technical information while academic and agency scientists worked to fill gaps in the knowledge base. The initial characterization identified about 250 miles of salmon core areas and identified key habitats and living resources in the estuary. Other studies mapped roads, landslides, and vegetation in the upper Watershed. Later scientific findings provided additional informa-tion about the sources and loading rates of bacteria and sediments to the estuary. The resulting information, summarized in the *TBNEP Environmental Characterization Report* (TBNEP 1998), provides a solid framework for scientific analysis and policy decisions, and simplifies public access to land use information. To ensure public access, these data are available via the World Wide Web and on Geographic Information Systems (GIS) layers at the Tillamook Coastal Watershed Resource Center. The CCMP commits to further developing information

resources and other tools that support more informed decision-making by citizens and agencies alike.
After evaluating the scientific-technical information, incorporating citizen input, and reviewing agency authorities, the TBNEP developed a draft CCMP by September 1998. Following a citizen "Listening Post" meeting in October of 1998 and more Management Committee discussion, the CCMP was refined further. TBNEP staff received comments from state and federal agencies through March 10, 1999, and again from the public through April 23, 1999. The final CCMP includes technical revisions, specifications and criteria, and policy recommendations as a result of input from about 40 reviewers. See Appendix P. To focus activities on high-priority actions, the Management Committee ranked individual actions based on environmental benefit and benefit/cost ratios. See Appendix C.

As a result of the environmental characterization phase, TBNEP developed a rich Geographical Information Systems (GIS) database. In spring 1998, TBNEP collaborated with Economic Development Council of Tillamook County (EDCTC), Tillamook County Soil and Water Conservation District (SWCD), and Tillamook Bay Community College (TBCC) to establish the Tillamook Coastal Watershed Resource Center (TCWRC). The TBNEP transferred the GIS database to the TCWRC.

The TCWRC and watershed councils are new institutions that will facilitate citizen involvement with CCMP implementation. With support from the Performance Partnership, they will provide public access to habitat maps and geographic information, train citizens in watershed assessment, and support community-based decision-making based on good science and public consensus. In 1998, citizens enrolled in a watershed assessment class at the center and conducted an assessment of the Trask River, one of the first citizen assessments to use the Governor's Watershed Enhancement Board Watershed Assessment Manual. The recently-formed Tillamook Bay Watershed Council is implementing the action plan developed as part of that effort.

The CCMP encourages all agencies with regulatory responsibilities to more effectively enforce current laws and mandates. For example, the County and cities will protect habitat through stronger enforcement of existing land use laws. They will adopt local ordinances to protect riparian areas and better manage stormwater runoff. At the state level, Oregon Department of Agriculture promises stronger enforcement of pollution prevention and control measures (PCMs) for agriculture and increased inspections of livestock operations. Oregon Department of Environmental Quality will enforce the Clean Water Act through the Total Maximum Daily Loads and other processes. Oregon Department of Forestry will oversee tough enforcement of the Forest Practices Act.

These and other mandates put a heavy burden on state, county and city governments, which often lack resources to fulfill all their responsibilities.

This Document and the TBNEP Action Plan

Chapter 2, State of the Bay, describes the Bay and Watershed, and the four priority problems:

- key habitat,
- water quality,
- erosion and sedimentation, and
- flooding.

Goals and measurable objectives to chart our progress as we implement this Comprehensive Conservation and Management Plan are included for each problem.

Chapter 3, Management Framework, details the policies and programs relevant to this plan.

The TBNEP Action Plan X described in Chapters 4 through 7 X addresses the four priority problems with coordinated goals, objectives, and 63 specific actions. Citizen Involvement gets special attention in Chapter 9, with eight additional actions to ensure and strengthen public involvement. Each action details the steps required to complete the action; identifies coordinating entities, other partners, and completion dates; estimates costs; acknowledges regulatory issues; and plans for monitoring progress toward the CCMP goals and objectives. The actions are cross-referenced with one another, as well as the Oregon Plan for Salmon and Watersheds and other applicable programs and plans. Possible funding sources for each action are listed in Table 8-1 (Chapter 8, Implementation and Finance).

As a comprehensive management plan, the CCMP incorporates many good ideas from at least a dozen relevant resource management plans that focus on some part of the Tillamook Bay environment. Although not all are specifically referenced, the CCMP includes goals and objectives from all these plans and integrates them in a comprehensive, basin-wide vision for performance-based management.

The CCMP includes several types of actions to achieve immediate and long-term goals. It calls for on-the-ground projects to upgrade roads, enhance habitat, reconnect rivers and sloughs, and improve farm practices. The plan also recommends more effective enforcement of environmental laws and ordinances, and outlines actions to build local capacity for better enforcement and education. Other actions define additional needs for continued research and monitoring to track progress in achieving stated objectives. By integrating on-the-ground projects, stronger enforcement, institutional development, and monitoring efforts, the CCMP presents a comprehensive framework that combines local, state, and federal

initiatives into a coordinated management plan for the Tillamook Bay Watershed.

The Priority Problems

The TBNEP began in 1994 with three priority problems: water quality, sedimentation, and habitat. After considering new scientific information and intervening events, including the Flood of 1996, the Management Committee rewrote the priority problems to more accurately reflect the current state of the Bay and Watershed, and added a fourth: flooding.

Key Habitat (Chapter 4)

To restore fish and other aquatic species whose populations have declined due to habitat loss or degradation, the CCMP presents an action plan to assess, protect, and enhance key habitats throughout the Watershed. It targets instream and riparian areas, along with tidal marshes and lowland sloughs, as high priority habitats for protection and enhancement. In the forested uplands, the plan commits to remove barriers to fish passage and improve riparian and instream conditions in salmon core areas. It commits to upgrade road culverts and enhance 100 miles of instream habitat by 2010.

In the lowland agricultural areas, the CCMP calls for major riparian enhancement projects designed to control livestock access to streams and improve water quality. It promotes bio-engineered river stabilization projects pioneered by TBNEP and the Soil and Water Conservation District (SWCD) and calls on the agricultural community to enhance river banks to healthy riparian condition (HRC). Based on the success of TBNEP prototype fish-friendly tide gates, the plan outlines a strategy to upgrade 25 tide gates in lowland sloughs. It also calls for the enhancement of 750 acres of tidal marsh through purchase, donation, or easements on marginal agricultural lands.

To improve rearing habitat for juvenile fish and to reduce flood impacts, the CCMP supports hydromodification to reconnect rivers and sloughs. With about 85% of lowland wetlands lost to diking and draining, scientists and citizens stress the importance of hydrologic connectivity and recommend projects to open up blocked sloughs and to reconnect floodplain wetlands to river channels. Projects of this magnitude will require additional analysis and planning.

To address the need for additional analysis and planning, the CCMP calls on the U.S. Army Corps of Engineers (COE) and the local sponsor to develop a hydrodynamic computer model to describe and predict changes in river flow. A completed analysis will guide multiple agencies in a coordinated effort to increase habitat and mitigate environmental and economic flood damages.

While this CCMP focuses on the threatened Oregon Coast coho salmon and other salmonids, the general emphasis on ecosystem health should benefit other species, including those listed as threatened or endangered under the Endangered Species Act.

Water Quality (Chapter 5)

Today, the Bay receives high bacterial loads and other pollutants from diverse sources including livestock operations, wastewater treatment plants, on-site sewage disposal systems (OSDS) and urban runoff. Many stream reaches also fail to meet water quality criteria for temperature, and exceed recommended concentrations of suspended solids. Significant oxygen depression and excessive nutrient concentrations have been observed in some lowland sloughs.

To improve water quality and reduce agricultural contributions to bacterial contamination, Oregon Senate Bill 1010 requires the development of agricultural water quality management plans (SB 1010 plans). The North Coast Basin SB 1010 Plan will encompass Tillamook Bay. To meet the landowner-supported pollution prevention and control measures (PCMs) required in the SB 1010 plan, livestock operation managers should implement voluntary farm management plans. The CCMP water quality action plan describes the improved farm practices necessary, and commits to helping local farmers implement voluntary farm management plans. Moreover, it calls for annual Confined Animal Feeding Operation (CAFO) inspections by 2004, with all agricultural operations (not just CAFOs) in compliance with the SB 1010 plan by 2010. To strengthen these efforts, the CCMP identifies agency partners, educational programs, and likely funding sources to improve agricultural practices in Tillamook County.

Recently-completed storm sampling of Tillamook Bay and the Trask and Tillamook Rivers found that 16B73% of the bacteria was of human origin, with the human-origin bacteria proportion tending to rise as the storm wore on. See Table 5-2, reporting findings of Bower and Moore, 1999. Based on these findings, the CCMP targets human activities and outlines action plans to upgrade wastewater treatment plants, expand sewer networks, and ensure that on-site disposal systems work properly. Wastewater treatment plants will eliminate all discharge failures by 2002, and the city of Tillamook will expand its sewer network by 2005. In the estuary, ODA will update shellfish management plans based on new information about bacterial sources, levels, and distribution.

Reducing bacteria inputs, enhancing key habitat, and addressing erosion and sedimentation problems will also reduce other water quality problems, such as excessive nutrients and low dissolved oxygen. However, specific water quality actions address temperature and suspended sediments.

Erosion and Sedimentation (Chapter 6)

Excessive sedimentation can simplify or degrade habitats and modify river flows and flood patterns. Sediment loading, movement, and deposition all affect instream and estuarine habitat and Bay bathymetry. The CCMP targets forest roads, an important source of human-caused sediment loading, and outlines a strategy to identify, prioritize, and upgrade forest roads. Under the leadership of Department of Forestry (ODF), the CCMP commits to upgrade 1,400 miles of forest roads with better culverts and drainage ditches. The plan also calls on state and private foresters to decommission at least 50 miles of unneeded forest management roads by 2010.

To improve sediment and habitat conditions associated with timber harvesting, the CCMP encourages state and private forest owners to go beyond the Forest Practices Rules in protecting riparian and high-risk areas. The plan recognizes the voluntary efforts of the Oregon Forest Industries Council (OFIC) and private foresters to improve riparian and instream habitats.

In the lower Watershed, the CCMP targets urban runoff and calls on Tillamook County and the cities of Tillamook, Bay City, and Garibaldi to adopt new ordinances to control erosion due to construction. Other lower Watershed sources of sediment, including streambank erosion and runoff from agricultural lands, are addressed through actions in the Key Habitat and Water Quality chapters. These actions will reduce sediment loading to help meet habitat requirements for salmonids and other aquatic species and achieve state water quality standards by 2010.

Flooding (Chapter 7)

Large floods continue to damage human property, modify hydrology, and impact aquatic habitats. The CCMP endorses the Tillamook County Flood Hazard Mitigation Plan (FHMP) and its approach to comprehensive floodplain management. It supports better land use planning, structural and non-structural floodwater control, and innovative ways to enhance floodplain function and restore habitats. Based on a careful hydrological and hydraulic analysis, Tillamook County will implement future projects to improve drainage and increase floodplain water storage capacity.

Under the Performance Partnership, Tillamook County will coordinate flood management programs of the COE, the Federal Emergency Management Agency (FEMA), and other agencies working to integrate flood control and habitat restoration. Although we support the human safety and economic actions outlined in the FHMP, the NEP's Clean Water Act basis limits this CCMP's Action Plan to environmental issues.

CCMP Implementation

Implementation and Finance (Chapter 8)

To address the need for better, faster, more efficient government services, the CCMP describes a Performance Partnership to coordinate and leverage agency resources. The NEP will continue through this new County department, which will coordinate a consortium of agencies, non-profits, and business and citizen members for greater cooperation among agencies and more innovative solutions for the citizens they serve. The CCMP also supports economic incentives to engage landowners in long-term environmental restoration and stewardship. Chapter 8 describes the Tillamook County Performance Partnership as the implementation vehicle and identifies likely sources of funding to accomplish program goals and objectives.

Citizen Involvement (Chapter 9)

To develop and reinforce strong stewardship among all citizens, the Plan supports new institutions in Chapter 9 to empower local citizens and provide them with information they need to make informed decisions about their watershed. The CCMP vision identifies the Tillamook Bay Watershed Council (TBWC) as the primary mechanism to ensure continued citizen support for implementation. The plan outlines a strategy to maintain a Tillamook Coastal Watershed Resource Center (TCWRC) that serves as a clearinghouse for geographic information and provides expertise to watershed councils.

To help citizens become effective partners in implementing the CCMP, the Citizen Involvement Action Plan sets forth new education and outreach programs for farmers, riparian owners/users, watershed council members, local judiciary, and others responsible for good land management. The Plan calls for better institutional linkages among regional universities, the local community college, and public schools. Other actions recommend better training for teachers and greater opportunities for outdoor learning.

Monitoring and Research Needs (Chapter 10)

The CCMP includes a plan to monitor the implementation and effectiveness of the Action Plan in meeting goals and objectives. The monitoring strategy in Chapter 10 describes quantitative methods to assess changes in key environmental parameters, and a format for monitoring CCMP implementation and effectiveness.

Although earlier studies provided a wealth of environmental information, scientists and stakeholders still have much to learn about how the ecosystem works and how to prioritize management actions. For these reasons, the

Plan recommends additional assessment and monitoring programs and applied research in selected areas. Some important examples include:

- map and prioritize critical habitats for protection and enhancement;
- characterize interactions between oysters/eelgrass/burrowing shrimp;
- track fish population trends;
- characterize fish use of the estuary;
- identify road problems and prioritize upgrades;
- monitor water quality (bacteria, temperature, total suspended solids, etc.) hot spots and track trends;
- provide better information for farm management plans; and
- develop hydrodynamic computer models for river management.

These and other technical studies will optimize limited implementation dollars, ensure public accountability, and allow managers to evaluate progress in meeting goals and objectives. In most cases, state and federal agencies have already developed solid field methods to conduct surveys and implement monitoring programs. The Performance Partnership will develop a Web-based accountability system, housing all monitoring data at the Tillamook Coastal Watershed Resource Center, tracking progress and costs for easy Internet access. Quality-assured monitoring data will be available in GIS. Intent is for all studies and data to be Web-accessible. The Performance Partnership plans to better coordinate agency activities and to maintain robust monitoring programs that track core monitoring objectives, detailed in Chapter 10, Monitoring and Research Needs.

Federal Consistency (Chapter 11)

Coordinating still-evolving programs has been X and will continue to be X a major concern of the Tillamook Bay National Estuary Project and the Tillamook County Performance Partnership, which will implement this CCMP. In keeping with our Clean Water Act mandate and good management principles, Chapter 11 reviews federal mandates, laws, and programs which may affect or be effected by this plan, and sets forth a mechanism for avoiding and correcting inconsistencies.

Citizens' Priority Actions

The actions in the CCMP were developed based on citizen input. Beginning with the Visioning Process in 1995 and culminating with the Roundup in July of 1997 (see Chapter 9, Citizen Involvement), a list of 24 widely-supported citizen suggested actions emerged:

Water Quality

- Devise additional strategies for the control of fecal coliform bacteria.
- Ensure adequate wastewater treatment plant capacity.
- Prevent livestock access to streams with fences and/or vegetative buffers.*
- Achieve significant dairy participation in the MEAD project.

Key Habitat

- Define critical and protected fish habitat on small watershed scale.
- Support the Oregon Plan for Salmon and Watersheds (formerly the Oregon Plan and the CSRI).
- Control burrowing shrimp.
- Identify, assess, and map sloughs.
- Expand, identify, and facilitate economic incentives and cost-sharing programs for restoration/enhancement.
- Identify, assess, and map wetland areas.
- Increase the amount and quality of salmonid habitat (7 strategies).
- Protect and expand aquatic (salmonid) habitat.
- Tide gate and lowland culvert management and modification.
- Curtail land use in critical sub-basins.
- Designate Bayocean Spit as a Recreation/Natural zone.
- Protect riparian and aquatic habitats.
- Establish a land trust or adopt the Central Coast Land Conservancy as recipient and manager of purchased lands and easements.
- Encourage wetland restoration on private lands, through economic incentives and other methods.

Erosion and Sedimentation

- Resurvey the Bay bottom (bathymetry) to document changes.
- Upgrade forest roads by improving drainage structures and culverts.
- Develop and maintain better roads.
- Prevent livestock access to streams with fences and/or vegetative buffers.*

Flooding

- Set up association/control district to coordinate flood mitigation.

General

- Integrated GIS education, support, and planning.
- Establish a watershed council for Tillamook Bay.

* Repeated action

High Priority Goals and Actions

Directed to fully develop an action plan for each of the priority problems, subcommittees composed of management conference members and interested stakeholders used the citizen recommendations as a starting point. Although the action titles have changed, the intent of those 25 recommendations is woven throughout the current action plan. Some good ideas are not included in this plan due to the requirements and constraints of the legislation that funds the NEP, but are found elsewhere (*e.g.*, econ-omic development and the socio-economic effects of flooding are addressed in the Performance Partnership Goals and the Tillamook County Flood Hazard Mitigation Plan).

This list of priority goals and actions was developed using a three-pronged approach:

1. Management Committee Members completed a survey ranking each action (as published in the September 1997 Draft CCMP) as to its environmental benefit and its cost-benefit ratio (*i.e.,* "bang-for-the buck"). The top priority actions from the Management Committee Prioritization Exercise are on Page 1-16. Management Committee members' agency plans and comments on each action detailed in Appendices B and C. The highest scoring actions were then grouped according to six major strategies or goals which closely reflect the goals identified by the Tillamook County Performance Partnership.
2. To confirm public support for the priority actions, we revisited the priority goals and actions identified in the Visioning Process, the Roundup (Page 1-14), and the results of the 1995 TBNEP Public Questionnaire and the Tillamook County Futures Council Household Survey of March 1998.
3. We went out for final public comment in spring 1999, soliciting comments on the final draft. After placing newspaper news releases and radio announcements, and mailing 1,000 postcards to the TBNEP mailing list, the CCMP was made available on the TBNEP and Tillamook Coastal Watershed Resource Center web pages, and hard copies were placed in key locations. Comments have been accounted for in this document.

The ideas of the actions in the CCMP Priority Goals and Actions List appear repeatedly as priorities in each review process, indicating solid community support.

Just because a goal or action doesn't appear on the priority list doesn't mean that it isn't important, or that it won't get implemented — *it will! We intend to eventually implement each and every action and meet every goal.*

Table 1-1: Management Committee Priority Actions*

Actions		Environmental Benefit Average Score	Cost Benefit Average Score
WAQ-01	Implement agricultural pollution prevention and control measures	2.75	2.63
HAB-09	Limit livestock access to streams	2.75	2.38
SED-08	Restrict harvest practices & activities in areas at high risk of landslide	2.75	2.38
HAB-06	Protect & enhance floodplain/lowland riparian vegetation	2.75	2.22
HAB-21	Protect and enhance tidal wetlands	2.71	2.38
HAB-15	Adopt local ordinance to protect riparian areas	2.63	2.50
SED-02	Develop forest road maintenance and improvement plans	2.63	2.38
SED-06	Ensure sufficient resources to enforce Forest Practices Act	2.63	2.38
SED-01	Identify road problems & prioritize upgrades	2.63	2.25
HAB-16	Adopt local ordinance(s) to protect instream habitat	2.57	2.50
HAB-27	Prevent introduction & control exotic species	2.57	2.38
HAB-08	Protect & enhance freshwater wetland habitat	2.57	2.25
HAB-25	Reconnect sloughs & rivers to improve water flow	2.57	2.00
HAB-31	Support the Oregon Plan for Salmon & Watersheds	2.56	2.20
HAB-05	Protect & enhance upland riparian areas	2.56	2.10

* Management Committee members rated the September 1998 Draft CCMP actions for this exercise, providing environmental and cost-benefit scores as well as information about their agencies' activities and plans. Since some action numbers and titles have changed since then, they may not correspond exactly with those in this draft. They rated each action's environmental benefit/importance and cost-effectiveness "High", "Medium," or "Low" and these ratings were assigned values of 3, 2, or 1 and averaged. Other information from the exercise is summarized in Appendices B and C.

High-Priority CCMP Goals and Related Actions

Goal: Implement Pollution Control Measures

WAQ-01: Define, Implement, and Enforce Pollution Prevention and Control Measures on Agricultural Lands
WAQ-02: Implement Voluntary Farm Management Plans
WAQ-03: Implement Revised CAFO Inspection Procedure
WAQ-04: Use Farm-Specific Agronomic Rates for Nutrient Management
WAQ-05: Provide Farm Management Training Programs
WAQ-09: Ensure Properly Functioning On-Site Sewage Disposal Systems
WAQ-10: Implement Temperature Management Strategies

Goal: Improve Roads

SED-01: Implement Road Erosion and Risk Reduction Projects
SED-04: Ensure Sufficient Resources to Enforce Forest Practices Act

Goal: Enhance Riparian Areas

HAB-05: Protect and Enhance Upland Riparian Areas
HAB-06: Protect and Enhance Lowland/Floodplain Riparian Areas
HAB-09: Control Livestock Access to Streams
HAB-10: Stabilize Streambanks Using Alternatives to Riprap
HAB-11: Encourage Protection and Enhancement on Private Lands
HAB-13: Increase Incentive Program Payments

Goal: Enhance Instream Conditions

HAB-07: Protect and Enhance Instream Habitat
HAB-09: Control Livestock Access to Streams
HAB-14: Ensure Minimum Streamflows
HAB-15: Revise Local Ordinances to Increase Protection of Riparian Areas, Wetlands, and Instream Habitat
WAQ-10: Implement Temperature Management Strategies
WAQ-11: Implement Suspended Sediments Management Strategies
SED-02: Implement Practices That Will Improve Sediment Storage and Routing

Goal: Enhance Estuary and Tidal Habitat

HAB-11: Encourage Protection and Enhancement on Private Lands
HAB-13: Increase Incentive Program Payments
HAB-15: Revise Local Ordinances to Increase Protection of Riparian Areas, Wetlands, and Instream Habitat
HAB-17: Characterize Estuarine and Tidal Habitats
HAB-18: Prioritize Tidal Sites for Protection and Enhancement
HAB-20: Protect and Enhance Eelgrass Habitats

Goal: Improve Floodplain Condition

FLD-01: Develop a GIS-Based, Unsteady State Hydrodynamic Model
FLD-02: Implement Watershed Drainage Modification Projects
FLD-04: Update Existing Floodplain Map
FLD-05: Restrict New Construction and Development in the Floodplain
HAB-19: Protect and Enhance Tidal Marsh
HAB-21: Remove or Modify Ineffective Tide Gates and Floodplain/Lowland Culverts

CCMP Goals and Objectives: Key Habitat

Goal	**Assess, Protect, and Enhance Riparian Habitat**
Objectives	Enhance 200 miles of forested riparian habitat to healthy riparian condition by 2010.
	Enhance 500 miles of riparian habitat in the 0–500' elevation band to healthy riparian condition by 2010.
Goal	**Assess, Protect, and Enhance Instream Habitat**
Objectives	Enhance 100 miles of upland instream habitat by 2010.
	Upgrade 50% of all tide gates by 2010.
Goal	**Assess, Protect, and Enhance Wetland Habitat**
Objectives	Enhance 100 acres of freshwater wetland by 2010.
	Enhance 750 acres of tidal wetland by 2010.
Goal	**Assess, Protect, and Enhance Estuary and Tidal Habitats**
Objectives	Enhance 750 acres of tidal wetland by 2010.
	No net decline in eelgrass beds.
Goal	**Enhance Health of Salmonids, Shellfish, and Other Aquatic Species**
Objective	Achieve Oregon Department of Fish and Wildlife (ODFW) wild fish production and escapement goals (See chart on Page 4-2) by 2010.

Goals, Objectives, and Monitoring

The CCMP lays out a 10-year action plan to achieve specific targets. It builds on the NEP, and calls agencies, watershed councils, and industry groups to action under a Performance Partnership. This new partnership will implement the CCMP and commits to meeting CCMP goals by 2010.

To firm our commitments and measure our progress, the CCMP defines goals and objectives, and lays out a monitoring plan to measure our progress and adjust the plans as needed. Indicators such as bacteria loads, riparian condition, and eelgrass beds will be monitored. The TBNEP Management Committee agreed on these objectives, which define accountability for all stakeholders, based on best available science and best professional judgment. We believe these goals to be ambitious, but realistic.

The TBNEP offers these goals and objectives as challenges to the agencies, citizens, industries, and other stakeholders who commit to meeting them under the Tillamook County Performance Partnership.

CCMP Goals and Objectives: Water Quality

Goal	**Promote Beneficial Uses of the Bay and Rivers**
Objectives	Achieve water quality standards for bacteria in the rivers and Bay by 2010.
	Document at least a 25% reduction in bacteria loads to rivers, with apparent trends by 2005 and statistically significant results by 2010.
	Achieve at least a 25% reduction every four years in the number of days that the rivers are not in compliance with water quality standards for bacteria.
Goal	**Reduce Instream Temperatures to Meet Salmonid Requirements**
Objectives	Achieve in-stream temperatures that meet salmonid requirements by 2010.
Goal	**Reduce Instream Suspended Sediments to Meet Salmonid Requirements**
Objectives	Achieve in-stream suspended sediment concentrations that meet salmonid requirements by 2010.
	Document at least a 25% reduction in sediment loads to rivers, with apparent trends by 2005 and statistically significant results by 2010.
Goal	**Improve Farm Management Practices**
Objectives	Achieve Senate Bill 1010 compliance among 100% of livestock operations by 2010.
	Inspect every CAFO annually by 2004.
Goal	**Assess and Upgrade Wastewater Treatment Infrastructure**
Objective	End wastewater treatment plant failures by 2002.
Goal	**Assess and Upgrade Urban Runoff Treatment Infrastructure**
Objective	Control runoff from all construction and development in urban areas by 2003 (Erosion and Sedimentation objective).

CCMP Goals and Objectives: Erosion and Sedimentation

Goal	**Reduce Sediment Risks from Forest Management Roads**
Objectives	Upgrade 1,400 miles of forest roads on state and private lands by 2010. Decommission 50 miles of forest management road by 2010. Conduct regular road maintenance on all 2,000 miles of forest management roads.
Goal	**Reduce the Adverse Impacts of Rapidly Moving Landslides**
Objectives	Upgrade 1,400 miles of forest roads on state and private lands by 2010. Decommission 50 miles of forest management road by 2010. Conduct regular road maintenance on all 2,000 miles of forest management roads.
Goal	**Improve Channel Features to Improve Sediment Storage and Routing**
Objectives	Habitat Riparian and Water Quality suspended sediments objectives below
Goal	**Reduce Adverse Impacts of Erosion and Sedimentation from Developed and Developing Areas**
Objective	Control runoff from all construction and development in urban areas by 2003.
Goal	**Reduce Adverse Impacts of Erosion and Sedimentation from Agricultural Areas**
Objectives	Lowland, freshwater wetland, and tidal marsh habitat objectives below
Related CCMP objectives	Enhance 200 miles of forested riparian habitat to healthy riparian condition by 2010. (Habitat Objective) Enhance 500 miles of riparian habitat in the 0–500' elevation band to healthy riparian condition by 2010. (Habitat Objective) Enhance 100 miles of upland instream habitat by 2010. (Habitat Objective) Enhance 750 acres of tidal wetland by 2010. (Habitat Objective) Achieve instream suspended sediment concentrations that meet salmonid requirements by 2010. (Water Quality Objective) Document at least a 25% reduction in total suspended solids loads to rivers, with apparent trends by 2005 and statistically significant results by 2010. (Water Quality Objective)

CCMP Goals and Objectives: Flooding

Goal **Improve Floodplain Condition**

Objective Complete 20 projects within the two years following adoption of hydrodynamic model which:

- measurably reduce runoff rate in the Watershed's uplands (increasing interflow and ground water recharge, thereby reducing stream temperatures and increasing summer flows);
- improve drainage characteristics in the Watershed's lowlands (*e.g.*, connect sloughs and rivers to fresh water exchange in sloughs);
- increase floodplain storage capacity in the Watershed's lowlands (*e.g.,* set back levees to increase floodwater capacity, increase riparian area, and create opportunity for sediment deposition); and
- improve the natural environment's capacity to withstand and benefit from flood events.

Goal **Develop and Maintain a Comprehensive Floodplain Management Plan**

Objective Implement a GIS-based, unsteady state hydrodynamic model by year 2001.

Raise at least 60 houses at least 3 feet above the 100-year flood elevation by year 2001, and other houses as resources permit.

Construct 10 livestock and equipment pads in flood-prone areas by 2001 to reduce pollution from petrochemicals and animal wastes during major floods.

Secure and/or remove known hazardous chemicals from areas where they pose a real threat to water quality during flood events by 2005.

Citizen Involvement goals:

Goal **Improve Community Education**

Goal **Strengthen KB12 Science and Outdoor Programs**

Goal **Promote Community Development**

Key Habitat Action Plan

Riparian, Instream, and Wetland Habitat

HAB - 01 Characterize Riparian and Instream Habitat
HAB - 02 Assess and Map Riparian and Wetland Habitat
HAB - 03 Prioritize Upland Protection and Enhancement Sites
HAB - 04 Prioritize Floodplain/Lowland Protection and Enhancement Sites
HAB - 05 Protect and Enhance Upland Riparian Areas
HAB - 06 Protect and Enhance Lowland Riparian Areas
HAB - 07 Protect and Enhance Instream Habitat
HAB - 08 Protect and Enhance Freshwater Wetland Habitat
HAB - 09 Control Livestock Access to Streams
HAB - 10 Stabilize Streambanks Using Alternatives to Riprap
HAB - 11 Encourage Protection and Enhancement on Private Lands
HAB - 12 Sponsor a Native Vegetation Planting Day
HAB - 13 Increase Incentive Program Payments
HAB - 14 Ensure Minimum Streamflows
HAB - 15 Revise Local Ordinances to Increase Protection of Riparian Areas, Wetlands, and Instream Habitat
HAB - 16 Effectively Enforce Laws and Regulations

Estuary, Sloughs, and Tidal Marsh

HAB - 17 Characterize Estuarine and Tidal Habitats
HAB - 18 Prioritize Tidal Sites for Protection and Enhancement
HAB - 19 Protect and Enhance Tidal Marsh
HAB - 20 Protect and Enhance Eelgrass Habitats
HAB - 21 Remove or Modify Ineffective Tide Gates and Floodplain/Lowland Culverts
HAB - 22 Enhance Large Wood in Estuary
HAB - 23 Update the Estuary Plan and Zoning
HAB - 24 Reconnect Sloughs and Rivers to Improve Water Flow
HAB - 25 Control Burrowing Shrimp Populations
HAB - 26 Prevent Introduction and Control Exotic Species

Fishery Practices

HAB - 27 Effectively Enforce Fishing Regulations
HAB - 28 Evaluate Commercial and Sport-Fishing Practices
HAB - 29 Implement Essential Fish Habitat Mandates
HAB - 30 Support the Oregon Plan for Salmon and Watersheds

Water Quality Action Plan

WAQ-01 Define, Implement, and Enforce Pollution Prevention and Control Measures on Agricultural Lands
WAQ-02 Implement Voluntary Farm Management Plans
WAQ-03 Implement Revised Confined Animal Feeding Operation (CAFO) Inspection Procedure
WAQ-04 Use Farm-Specific Agronomic Rates for Nutrient Management
WAQ-05 Provide Farm Management Training Programs
WAQ-06 Ensure Adequate Wastewater Treatment Capacity
WAQ-07 Expand Sewer Network
WAQ-08 Ensure Adequate Urban Runoff Treatment and Retention
WAQ-09 Ensure Properly Functioning On-Site Sewage Disposal Systems
WAQ-10 Implement Temperature Management Strategies
WAQ-11 Implement Suspended Sediments Management Strategies
WAQ-12 Evaluate Shellfish Growing Area Classifications
WAQ-13 Update Shellfish Management Plan Closure Criteria

Erosion and Sedimentation Action Plan

Roads, Landslides, and Forest Practices

SED-01 Implement Road Erosion and Risk Reduction Projects
SED-02 Implement Practices That Will Improve Sediment Storage and Routing
SED-03 Reduce Risks in Landslide-Prone Areas
SED-04 Ensure Sufficient Resources to Enforce Forest Practices Act
SED-05 Reduce Sedimentation from Non-Forest Management Roads
SED-06 Develop, Implement, and Enforce a Stormwater Management Ordinance

Flooding Action Plan

FLD-01 Develop a GIS-Based, Unsteady State Hydrodynamic Model
FLD-02 Implement Watershed Drainage Modification Projects
FLD-03 Elevate and/or Relocate Structures, Livestock and Equipment
FLD-04 Update Existing Floodplain Map
FLD-05 Regulate New Construction and Development in the Floodplain
FLD-06 Effectively Clear Mapped Lowland Floodways or Floodplains of Hazardous Materials

Citizen Involvement Action Plan

CIT - 01	Implement an Oregon State University Extension Watershed Masters Series
CIT - 02	Implement an Associate of Arts Oregon Transfer Degree in Environmental Studies
CIT - 03	Improve Professional Development for K–12 Teachers
CIT - 04	Strengthen Organizational and Institutional Linkages
CIT - 05	Expand Authentic Learning Experience Opportunities
CIT - 06	Establish a Land Trust or Conservation Organization
CIT - 07	Sustain the Tillamook Bay Watershed Council
CIT - 08	Sustain the Tillamook Coastal Watershed Resource Center

CHAPTER

2

STATE OF THE BAY

The Land and the People

The Tillamook Bay estuary is about 60 miles west of Portland and 45 miles south of Astoria on the Oregon Coast. Like other Northwest Coast estuaries, it supports diverse living resources including anadromous fish, shellfish, and birds; some of which have been listed as threatened or endangered species.

Tucked between the rugged Coast Range and the Pacific Ocean, Tillamook Bay drains a 597 mi^2 watershed that includes some of North America's richest timber and dairy land. The Bay supports an oyster aquaculture industry and boasts some of the best salmon fishing on the West Coast. Historically dependent on resource industries, the Tillamook Bay area economy increasingly relies on tourism and transfer payments to support about 25,000 citizens. Yet dairy farming, logging, and fishing continue to define the cultural landscape of the area.

Years of development and change to the landscape created several environmental problems that result in conflicts among the diverse user groups in the Watershed. For example, high bacterial inputs from agricultural and urban sources cause closures of shellfish beds about 90 days per year. In other cases, important fish and wildlife habitat has been modified and simplified to provide for transportation, agriculture, urban development, and forestry.

To address environmental issues in the Bay and Watershed, the 1992 nomination to the National Estuary Program defined three priority problems:

- *pathogen contamination affecting shellfish and water contact use;*
- *sedimentation affecting freshwater and saltwater flows and habitat for bay shellfish and fish; and*
- *changes in living resources in the upper Watershed, particularly due to loss of spawning habitat for anadromous fish.*

After the Flood of 1996, these problems broadened in scope and the Management Committee added a fourth priority problem – flooding:

- *The interaction of human activities with dynamic natural systems has increased the magnitude, frequency, and impacts of flood events.*

Figure 2-1. Painted relief map of Tillamook Basin.
Source: Larry Reigel, U.S. Fish and Wildlife Service, Oregon State Office.

This chapter provides a brief environmental characterization of the Bay and Watershed. It includes a geographic overview followed by a description of the four priority problems confronting the community. For each problem, the chapter describes the causes of the problem, reviews status and trends of relevant resources and contaminants, and describes goals and objectives to address the problem.

The Bay and the Watershed

Tillamook Bay is a shallow estuary averaging only 6.6 feet (2 m) deep over its 13 square miles (34 km^2). At low tide, about half of the Estuary bottom is exposed as intertidal sand/mud flats, presenting navigational challenges similar to those facing the first known European explorers who entered the Bay in 1797. Today, these intertidal flats provide important growing areas for oyster culture.

Several deep channels, running roughly north-south, represent the geological signatures of river mouths drowned by the rising Pacific Ocean about 9,000 years ago. Boaters and fish, including salmon, depend on these channels. The Oregon Department of Fish and Wildlife (ODFW) rates Tillamook Bay as the State's premier recreational shellfishing area.

The last ocean-bound ship left the town of Tillamook in 1912. Anxious to improve ocean-borne commerce, developers dredged and modified the main navigational channels in the Bay and river mouths. But heavy sediment loads convinced the U.S. Army Corps of Engineers (COE) to stop dredging the main Bay in 1913. The Corps, which last dredged the mouths of the Trask and Wilson Rivers in an attempt to control flooding in 1972, discontinued river dredging primarily due to high costs. Today only the Port of Garibaldi at the northern end of the Bay serves deep-water traffic.

Five rivers enter Tillamook Bay from the south, east, and north. See Figures 1-1 and 2-1. Salmon fishermen still recognize the Bay and its rivers — the Tillamook, Trask, Wilson, Kilchis, and Miami — as some of the West Coast's most productive fish habitats. In 1998, the Wilson River produced more juvenile Chinook salmon than any other monitored river in coastal Oregon (Dalton *et. al.* 1998). See Table 2-1. Yet the current harvest of Chinook, chum, coho, and steelhead pales compared with the bounty of earlier years. In August 1998, the National Marine Fisheries Service (NMFS) listed the North Coast coho salmon as a threatened species and populations of chum and steelhead have been declining. Conditions have been more favorable for Chinook, with very strong runs in recent years. A number of factors have been identified as possible contributors to the decline of salmonids, including: over-harvesting, hatchery practices, loss or simplification of habitat (reducing spawning and rearing success), poor ocean conditions, and reduced water quality.

Table 2-1. Number of juvenile Chinook salmon captured, estimated migrants and migrants per meter of stream length, by age class, for ODFW monitored streams of the Oregon Coast, 1998.

Stream (tributary to)	Length (meters)	Number Captured	Estimated Migrants	Migrants per meter
North Fork Nehalem River	70,675	67,962	984,449	13.929
Little North Fork Wilson River	27,891	204,907	1,223,944	43.883
Little South Fork Kilchis River	11,703	22,347	109,097	9.322
Little Nestucca River	101,122	13,795	98,679	0.799
Siletz Mill Creek	30,907	1	?	?
Bales Creek (upper Yaquina)	7,895	40,937	249,308	31.578
Yaquina Mill Creek	16,862	2,003	7,063	0.419
Cascade Creek	11,465	8	26	0.002
Tenmile Creek (combined) (ocean)	30,971	950	3,396	0.110
West Fork Smith River (Umpqua)	59,716	29,715	127,726	2.139
North Fork Coquille River	51,529	6,481	38,199	0.741

Source: Adapted from Dalton, T. 1998. *Juvenile Salmonid Outmigration in the Little North Fork Wilson and Little South Fork Kilchis Rivers*. Oregon Department of Fish and Wildlife study for the Tillamook Bay National Estuary Project, Garibaldi, OR.

Like most Pacific Northwest estuaries, Tillamook Bay is part of a coastal, temperate rainforest ecosystem. Much of the Tillamook Bay Watershed, especially the uplands (in this document, areas above 500 feet elevation), is rich forest, blanketing the rainy Coast Range. Mean annual precipitation averages 90 inches (229 cm) per year in the lower basin and close to 200 inches (510 cm) per year in the uplands. The Watershed=s coniferous forests X trees such as Douglas fir, true fir, spruce, cedar, and hemlock X cover about 89% of the total land area. Hardwood species such as alder and maple also grow throughout the region. Most of the older trees have been lost to fire and timber harvest. Today, Douglas fir is the dominant species. Foresters describe this environment as "highly productive," from both biological and commodity perspectives.

In the lower Watershed, forest gives way to rich alluvial plains used primarily for dairy agriculture. Meandering rivers and networks of small channels once provided plentiful fish habitat, large wood, and organic matter. Early settlers recognized the rich agricultural potential of this land and drained it with numerous dikes, levees, and ditches. Today's 40 mi^2 (104 km^2) of agricultural lowland supports about 28,600 dairy cattle[1], producing 95% of Oregon=s cheese. Cattle also produce hundreds of thousands of tons of manure annually and much of the bacteria washing

[1] Calculated in 1,000-pound units, including calves, heifers, and dry stock
Source: Pedersen, B. pers. com. (1998)

into the Estuary. Urban and rural residential development contributes significant fecal bacterial contamination during heavy storms and untreated stormwater carries grease, pesticides, sediment, and animal waste. Development also impairs floodplain function and lowland habitat.

The Estuary

Several deep channels wind through intertidal mud flats that are exposed at low tide. The Bay receives fresh water from five rivers and exchanges ocean water through a single channel in the northwest corner. Despite large freshwater inflows, especially during the rainy winter months, heavy tidal fluxes dominate the system. Extreme diurnal tides can reach a range of 13.5 ft (4.1 m), with a mean tidal range of 5.6 ft (1.7 m) and diurnal range of 7.5 feet (2.3 m). Tidal effects extend various distances up the rivers, ranging from 0.4 miles (0.6 km) for the Miami River, to 6.8 miles (11 km) for the Tillamook River (Komar 1997). The volume of water entering the Bay due to tides has been estimated at 1.63×10^9 cubic feet (4.63×10^7 cubic meters) (Perch *et al.* 1974). See Table 2-2.

The Bay experiences the full range of estuarine circulation patterns, from well stratified to well mixed, depending on the season and variations in river discharge. During heavy rain winter months, November through March, researchers describe a stratified system, but during low precipitation summer months, the Bay shifts to a well-mixed estuarine system (Komar 1997). Salinity ranges from around 32 ppt near the ocean entrance to around 5 ppt at the upper (southern) end of the Bay near the river mouths. Water temperature ranges from around 47B66^{o}F (8B19^{o}C) over the year. The Estuary maintains relatively high levels of dissolved oxygen (DO) throughout the year and ranges from about 6.0 ppm to 12.0 ppm. Except for some lowland sloughs and tributaries, eutrophication and low DO do not appear to be problems for Tillamook Bay. However the Bay experiences high levels of bacteria, especially after storms and associated agricultural and urban runoff and point source overflow. Chapter 5, Water Quality, discusses water quality problems and the actions proposed to achieve water quality goals.

When rising sea levels drowned the river mouths to create Tillamook Bay about 9,000 years ago (USDA 1978), large amounts of marine sediments entered the Bay until about 6,000 years ago, when the Estuary reached a dynamic equilibrium between sediment deposition and resuspension. (as cited in Coulton *et al.* 1996). A predominant northern longshore drift deposited sands to create the elongated north-south peninsula known today as Bayocean Spit. The spit generally protected the Estuary from ocean intrusion until 1952, when the sea breached the eroding spit and deposited additional marine sediments in the southwestern corner of the Bay. The COE documented a decrease in Bay water volumes from 40,614,928 yd^3

(31,051,168 m^3) in 1867 to 30,690,992 yd^3 (23,464,061 m^3) in 1954. Bay volume rebounded to 32,475,034 yd^3 (24,828,008 m^3) by 1995.

Table 2-2. Comparison of Representative Estuaries in Coast Range Ecoregion

Estuary	Total Area* (Acres)	Drainage Basin (Square Miles)	Intertidal Area (% of Total Area)	Mean Flow (cfs)
Oregon				
Alsea Bay	2,516	474	71	2,070
Chetco River	171	359	11	1,700
Coos Bay	13,300	605	60	2,200
Coquille River	1,083	1,085	56	3,300
Elk River	290	94	NA	610
Necanicum Bay	451	87	60	NA
Nehalem Bay	2,749	855	64	3,600
Nestucca Bay	2,176	322	73	1,540
Netarts Bay	2,743	14	88	N/A
Pistol River	230	106	NA	N/A
Rogue River	880	5,100	35	7,800
Salmon River	438	75	78	538
Siletz River	1,461	373	78	1,930
Siuslaw River	3,060	773	53	3,150
Sixes River	330	129	NA	646
Tillamook	9,216	570**	60	2,164
Winchester Bay	6,543	4,560	43	7,435
Winchuck River	130	70	NA	NA
Yaquina Bay	4,349	253	54	1,078
Washington				
Grays Harbor	58,000	2,550	63	NA
Willapa Bay	79,000	720	50+	NA
California				
Humboldt Bay	NA	220	NA	N/A
Eel River	NA	3,622	NA	9,700
Klamath River	NA	15,480	NA	20,600

*At Mean High Water. **The watersheds of the five rivers only. The total Tillamook Bay Watershed, including the Bay, covers 597 square miles.

Sources: NOAA, 1985; Percy *et al.* 1974, U.S. Army Corps of Engineers 1989.

The estuary provides habitat for numerous fish, shellfish, birds, marine mammals, and sea grasses. See Figure 2-2. A 1974B1976 monthly seine and trawl survey (Bottom and Forsberg 1978) identified 59 species of fish in the Bay at various times of the year. Five species of anadromous

salmonids use the estuary at some point in their life cycle. A 1996 TBNEP survey (Golden *et al.* 1998) identified 154 benthic invertebrate species. The prolific benthic community includes rich clam beds dense areas of eelgrass, and abundant burrowing shrimp communities. Clams and Dungeness crabs continue to provide important commercial and recreational fisheries. The Bay also provides important habitat for many birds migrating on the Pacific flyway. After earlier declines, the seal population has grown in recent years due to marine mammal protection laws. Today, groups of these marine mammals can be seen sunning themselves on intertidal sand flats at low tide.

In the tidal and subtidal estuary, eelgrass beds provide important habitat for crabs and fish species such as salmon, herring, northern anchovy, and smelt. Although eelgrass beds show great spatial variability, the Bay currently contains healthy eelgrass beds.

In the intertidal areas, anecdotal evidence suggests increased burrowing shrimp populations. The ghost or sand shrimp, *Neotrypaea californiensis*, and mud shrimp*, Upogebia pugettensis,* both dig burrows 10–20 inches (25.6B51 cm) deep. Undermined by burrowing shrimp, oysters sink into the sediment and suffocate. Scientists and oyster growers speculate over options for controlling burrowing shrimp and reasons for their population growth. However, few solid facts exist regarding the ecological interactions between oysters, eelgrass, and burrowing shrimp. The TBNEP recently began a 4-year study to explore the question.

From a management perspective, the Oregon Department of Land Conservation and Development (DLCD) classifies Tillamook Bay as a "shallow draft development" estuary under Goal 16 of the Statewide Planning Goals. This classification categorizes Tillamook Bay as an "estuary with maintained jetties and a main channel (not entrance channel) maintained by dredging at less that 22 feet (6.7 m); these estuaries have development, conservation, and natural management units." (DLCD 1987).

State and local planners define management units according to biological and physical features and allow particular activities and uses in those areas, while prohibiting others. Portions of the estuary shorelands are zoned for urban, rural, natural, conservation and development use. Special shoreland sites allow for dredging and channel maintenance, water-dependent development, mitigation and restoration sites, and protection of neighboring wetland areas and significant habitat sites.

Figure 2-2 Habitat map

Figure 2-2 shows the diverse benthic habitats of Tillamook Bay. This map shows eelgrass beds that serve as baseline monitoring data.
Source: Strittholt, J., and P. Frost. 1996. Determining Abundance and Distribution of Eelgrass (*Zostera spp*.) in the Tillamook Bay Estuary, Oregon Using Multispectral Airborne Imagery.

Climate

Tillamook County receives a lot of rain. From 1961 through 1990, The City of Tillamook averaged 90 inches (229 cm) of rain per year with 76% of total precipitation occurring from October through March. The highest precipitation and rainfall events occurred during November, December, and January. Tillamook County averaged more than 23 days per year in which precipitation exceeded 1 inch (2.54 cm). In 1996, however, 126 inches (320 cm) of lowland rain (and very heavy upland rain and snow) led to severe flooding throughout the Basin and caused significant economic and environmental damages. New flooding at the close of 1998 added to the toll. Chapter 7, Flooding, provides an overview of flood problems and trends and proposes actions and goals for reducing flood damage.

The seasonal, episodic nature of precipitation defines the natural system. Fall Chinook migrate upstream with the first heavy rains of autumn. Big storms can cause major landslides in the steeply sloped upland regions. Although heavy storms have characterized the natural system for thousands of years, human activities have exacerbated the impacts and consequences of high rainfall (Coulton *et al.* 1996).

Westerly winds predominate and carry the temperature-moderating effects of the ocean over all of western Oregon. Summers are cool and dry; winters wet and moderate (USDA 1964). Winds blow nearly continuously throughout the year and often reach gale force in the winter. Prevailing winds come from the northwest during the summer and from the south and southwest during the winter.

Temperatures in Tillamook County are moderate. The mean annual temperature is 50.4^{o}F (10.2^{o}C), with yearly mean maximum and mean minimum temperatures documented at 59.3^{o}F (15.1^{o}C) and 41.6^{o}F (5.4^{o}C), respectively. Those 30 years averaged less than one day per year with a temperature over 90^{o}F (32^{o}C). September had the greatest number of extreme temperatures while July and August recorded the highest temperature of 102^{o}F (38.89^{o}C).

Hydrology

As noted above, the Tillamook Watershed receives abundant precipitation. The Tillamook basin drains the west slope of the Coast Range, where precipitation increases with elevation. Due to relatively warm winter temperatures, most precipitation falls as rain. Large rainfall events can produce flood events. However, the rare combination of snowmelt and an influx of warm, wet subtropical moisture cause most of the largest flood events (1964 and February 1996).

Most soils in the Tillamook basin have very high infiltration rates and overland flow is uncommon. Overland flow can occur when soils become saturated during major rainstorms or frozen during unusually cold weather. Land use practices can, to a limited degree, impact soil infiltration rates. Land use practices, such as road building, can also cause subsurface flow to become overland flow. The belief that forests beneficially reduce flooding has been the source of considerable debate. Forest harvesting and roads have been found to modify stream flows in small basins. Results for small basins (Ziemer and Lisle 1998) suggest that timber harvesting can increase summer low flows and average fall peak flow. However, Ziemer and Lisle also found no appreciable increase in peak flows for the largest of floods from timber harvesting in the Pacific Northwest (and elsewhere).

Proponents of the belief that forests can reduce floods have often applied a concept called hydrological maturity. This concept hypothesizes that as the vegetation in a watershed becomes "more mature," the risk of floods diminishes. Interestingly, the average age of the forests in the Tillamook Watershed has increased annually since the great Tillamook Burn fires. Thus, the perception by some that the frequency of flooding has increased over the same time is inconsistent with the change in the "hydrologic maturity" of the basin.

Soils and Geology

Tillamook Bay and its Watershed are situated in typical Pacific Northwest coastal terrain. A relatively straight coastline consists of miles of sandy beaches punctuated with cliffs of igneous rock and small inlets such as the Bay. East of the Pacific Coast, the high, steep ridges of the Coast Range climb up to 3,500 feet (1,064 m). These forested upland areas consist mostly of volcanic basalt base material with moderately deep overlying soils formed from basalt, shale, and sandstone material.

A discontinuous coastal plain separates the coast and the mountains. Derived from basalt and sandstone-shale bedrock, these deep, level floodplain soils have been deposited over thousands of years by the streams and rivers. These soil deposits range in width from a few hundred feet to more than a mile and can extend upstream up to seven miles along broad stream channels. These are among the most fertile soils in the area, but require drainage for maximum productivity. Originally, this land was almost all forested; but most has been cleared and is used for silage and pasture. Most farmers irrigate their land in the dry summer months. Between the bottomland floodplain and the forested regions, extensive alluvial terraces extend up to 80 feet (24 meters). These soils, with high to medium organic content, make up about 50% of the Tillamook Basin=s tillable lands. More detailed soil information appears in the TBNEP *Environmental Characterization Report*, Chapters 1 and 5.

Vegetative Communities

Approximately 89% of the Watershed is forestland, based on geographic imaging. The natural, or potential vegetation of the Tillamook Basin is evenly distributed between the Sitka spruce (*Picea sitchensis*) and western hemlock (*Tsuga heterophylla*) vegetation zones. These two vegetation zones extend from British Columbia to Northern California, running roughly parallel to the coast with the hemlock zone also enclosing the Willamette Valley (Franklin and Dryness 1973). However, disturbance has drastically affected the Tillamook basin's vegetation.

Natural disturbance from fire, flood, windstorm, or large geologic event resets the successional dynamics of the vegetative communities. Disturbance is characterized in part by its frequency and magnitude. For the Tillamook Watershed, a number of disturbance events play important roles in shaping the basin. Historically, the upland forests were likely burned relatively infrequently, but with very high intensity. Winter windstorms may have helped set the stage for the catastrophic fires by creating large areas of blowdown. The lowland forest may have burned somewhat more frequently, due to fires set by Native Americans. Debris flows and (within floodplains) floods disturbed riparian forests fairly often. Historical riparian forests in the Tillamook were often hardwood dominated (*e.g.* alder, cottonwood, willow, crabapple) or mixed hardwood and conifer (Coulton 1996). A series of human-caused forest fires beginning in the 1930s, known as the Tillamook Burn, burned much of the natural vegetation of the mixed conifer upland forests, and most have been replanted in Douglas fir trees. Hardwoods continue to dominate riparian areas.

The spruce zone covers the lower regions of the Watershed and normally occurs at elevations below 450 feet (150 meters). It is a wet zone with annual precipitation ranges between 78 inches (200 cm) and 118 inches (300 cm). The nearby ocean adds frequent summer fogs and moisture to otherwise dry months and distinguishes the spruce zone from the higher elevation hemlock zone. The temperature averages 51^{o}F (10.6^{o}C) annually with an average January minimum of 40^{o}F (4.7^{o}C) and a July maximum of 70^{o}F (20.6^{o}C) at Astoria. The soils are deep, fine textured, typically acid (pH 5.0 to 5.5) and high in organic matter (15B20%).

Dense, tall stands of Sitka spruce, western hemlock, western red cedar (*Thuja plicata*), Douglas fir (*Pseudotsuga menziesii*), and grand fir (*Abies grandis*) dominate the spruce zone. In dune areas close to the ocean, shore pine (*Pinus contorta contorta*) is locally common. Following disturbance by fire, logging, or windstorm, a dense shrub community often dominates the spruce zone, eventually yielding to either a dense stand of red alder, or a mixture of spruce, hemlock, and Douglas fir. Replacement of the alder stands can be very slow, due to the dense shrub understory. The resulting communities are semi-permanent brush fields, spruce stands, or red cedar and hemlock that grew on downed logs.

The hemlock zone normally extends in elevation between 450 feet (150 meters) and the subalpine zone of the Coast Range. With less ocean influence and summer fog, the upland hemlock zone still receives heavy precipitation. In fact, the upland regions average up to 142 inches (360 cm) of rain each year with very little precipitation in the late spring to fall period. The zone temperature averages 50°F (9.6°C) annually with a January minimum of 30°F (-0.7°C) and a July maximum of 78°F (25.6°C) at Valsetz. The soils are derived from sedimentary and basalt parent materials, of moderate depth and medium acidity, with a high infiltration rate.

In the hemlock zone the dominant vegetation is dense conifer forest. Forest stands are dominated by Douglas fir, western hemlock, and western red cedar, with other conifers mixed in, such as grand fir, Sitka spruce, and Pacific yew (*Taxus brevifolia*). Hardwood species occurring in the hemlock zone include red alder, bigleaf maple, black cottonwood (*Populus trichocarpa*), and Oregon ash (*Fraxinus latifolia*). Following disturbance, these zones generally grow up in first year residual species and invaders of the groundsel *(Senecio)* and willowherb (*Epilobium)* genera. This community is replaced during years two to five by one dominated by fireweed (*Epilobium angustifolium*), thistle (*Cirsium vulgare*), and bracken fern (*Pteridium aquilinum*). Shrubs such as vine maple, Oregon grape, salal, and blackberries (*Rubus* spp.) dominate the next community. Eventually conifers such as Douglas fir overtop the shrubs.

Settlement and Commerce

The Native Americans inhabiting the Tillamook Basin at the time of European contact were known as the Nehalem band of the Killimuck (also known as Tillamook) tribe (Seaburg and Miller 1990). They tapped marine, riverine, estuarine, and terrestrial sources for a broad-ranging diet and stable food supply. The only recorded alteration to the landscape caused by the Killimuck was periodic burning of the lowlands to encourage growth of grains and produce pasturage for horses (Coulton *et al.* 1996). This burning kept some lowlands open and clear of stands of large trees.

The first European-American settler in the region, Joseph Champion, landed a whaling boat on the banks of the Estuary and lived the winter of 1851 in a tree stump. Henry W. Wilson brought the first cattle into the area in 1852 and the population grew to 80 by 1854. Most settlers came to the Watershed to farm, and immediately began clearing, diking, and draining the lowland forest to make more farm land available. They also converted a significant portion of the intertidal and freshwater wetlands to pasture by the early 1900s (Coulton *et al.* 1996). Cheese was the best way to market milk from this remote area, and many small cheese factories opened. Ten smaller cheese producing cooperatives joined forces in 1909 as the Tillamook County Creamery Association. Today, agriculture occupies 6% of the Watershed. See ownership map, figure 2-3.

Figure 2-3. Ownership of land in the Tillamook Bay Watershed.
Source: Tillamook Coastal Watershed Resource Center, from TBNEP Geographic Information Systems (GIS) database. Bay City, OR.

Early settlers shipped their products by boat, and port activities (from Tillamook and Garibaldi) such as importing and exporting, shipping, and navigational improvements have long been part of the local economy. Boats needed deepwater channels to transport logs and lumber to West Coast markets (Levesque 1985). The Port of Tillamook maintained a shallow draft channel before 1913 as far as the City of Tillamook for ocean-going ships, and the main navigation channel was dredged regularly, beginning in the late 1880s. Dredging near the City of Tillamook ended in the 1920s. The Corps of Engineers last dredged the mouths of the Wilson and Trask Rivers in 1972 in an attempt to alleviate flooding, but ended dredging due to cost considerations.

The North Jetty, completed in 1918, was intended to aid navigation, but may have had the opposite effect by accelerating sand accretion in the Bay (Coulton *et al.* 1996). Logistical improvements and cost reductions over the past few decades have made road transportation much more viable than marine shipping. The County's main highway link with the Willamette Valley, Highway 6, follows the Wilson River east through the Coast Range. Rail transportation also handles a portion of the County's shipping. The railroad begins at the Port of Tillamook Bay Industrial Park just south of the Trask River and crosses the Trask, Wilson, Kilchis, and Miami Rivers to pass north out of the Tillamook Bay drainage.

Although natural resource extraction industries have historically supported the Tillamook Bay region, the Watershed became a tourist destination around the turn of the century (Coulton *et al.* 1996). Hiking, beach combing, wildlife viewing, sport fishing, off road vehicle use, crabbing, and clamming draw numerous tourists. Many people, especially retirees, are also finding the Tillamook Bay Watershed an attractive place to live. See Figure 2-3. Thus recreational users are competing for natural resources traditionally devoted to farming, fishing, and forestry.

Fig 2-4. Sources of personal income in Tillamook County, 1993.
Source: Radtke, H.D. 1995. Economic trends in the northern coastal regional economy. Report prepared for the Tillamook Bay National Estuary Project, Garibaldi, OR.

The Priority Problems:

Key Habitat Loss and Simplification

Priority Problem

Loss and simplification of key habitat, and past and present fisheries practices, have contributed to declines in salmonids and other aquatic and estuarine associated organisms. Important riparian, instream, freshwater off-channel, tidal slough, and estuarine habitats have been lost or degraded. Fishery practices include management of natural production, hatcheries, and harvest.

Anadromous salmon and trout runs are integral to the economy, ecology, and culture of the Pacific Northwest. Yet these salmonid species are under stress throughout the Coast Range ecoregion. After years of declining populations, the National Marine Fishery Service (NMFS) listed the coho salmon as an endangered species in August, 1998.

Factors contributing to the decline of salmonids include: over-harvesting; hatchery practices; poor ocean conditions; human-caused barriers to fish passage; channel form changes; loss of large wood; and loss or modification of riparian, instream, wetland, estuarine, and tidal habitat. Many of the practices that produced these factors for decline have been modified or eliminated. Nonetheless, the Watershed retains a legacy from these past practices. Other practices contributing to the factors for decline may not yet have been changed to adequately minimize adverse effects.

In the Estuary, sediments from the Watershed and ocean have altered Bay bathymetry and habitats. The introduction of marine sediments resulting from an ocean breach of Bayocean Spit in 1952 may have altered the bay's habitat. Heavy sediment loads due to extensive forest fires and past logging activities may have contributed to habitat change around the southern end of the Bay. Changes in estuarine sedi-mentation patterns may adversely affect ecological interactions among eelgrass, burrowing shrimp, and oysters.

This section documents status and trends of key habitats in the Tillamook Bay Watershed and describes how these changes affect living resources.

Habitat Status and Trends

Lowland/floodplain habitat. Agricultural and urban development in the lowland floodplains altered riparian and instream habitats vital to salmon and other aquatic species. In earlier times, bottom land forest and open grassland covered a rich alluvial plain that regularly flooded in winter. This lowland floodplain's off-channel sloughs, oxbows, and wetlands provided ample habitat for rearing fish. A forest of mixed hardwoods and conifers supplied organic matter and insects to feed fish and support aquatic food webs. Large log jams in the main rivers led to frequent seasonal flooding in the floodplains, regularly depositing sediments to lowland areas and providing large areas of salmonid habitat. Log jams and other large wood also created scour pools in the mainstream channels.

Adequate levels of large wood are an important component of healthy salmonid habitat. It is widely acknowledged, however, that the total amount and distribution of large wood has been greatly reduced over the last century to levels significantly below what existed historically across the landscape. Early developers cut down riparian trees to expedite log drives and cleared logjams to reduce flooding and improve navigation. Around 1900, loggers used splash dams to move logs downstream and subsequently damaged instream and riparian habitat in several river reaches. Prior to the early 1980s, ODFW policy was to clear streams and rivers of wood to enhance fish passage. Such activities X as well as urban development, impervious surfaces, and other land changes X caused changes in the hydrograph, sediment routing and deposition, and channel complexity. Stream habitat survey results in the Oregon Coastal Basin show that large wood levels in streams are lower than desired. The ODFW rates about 40% as "adequate to good" and about 60% as "poor." See Table 2-3. The Oregon Plan for Salmon and Watersheds (OPSW) includes several voluntary measures to improve the recovery rate for large wood,

Table 2-3. Instream habitat quality according to ODFW Aquatic Inventory Project*

	Good (stream miles)	Fair (stream miles)	Poor (stream miles)
Gravel availability	65	122	110
Gravel quality	184	56	57
Large wood key pieces*	9	21	267*
Large wood pieces	61	54	182
Large wood volume	78	19	199
Pool area	50	77	170
Pool frequency	98	83	116
Riparian vegetation (large wood recruitment potential, thermal cover)	85 (Conifer or mixed conifer and deciduous)	195 (Deciduous)	17 (Brush, grass, or bare)

* More stream stretches were selected by agency priority ranking than on a random basis.

** "Key pieces" must be longer than the active channel width; very difficult in many of these streams.

Color map

Figure 2-5 Characterization of the Tillamook Bay valley historic landscape, circa 1857.
Source: P. Benner in: Coulton, K., P. Williams, P. Benner and M. Scott. 1996. *Environmental History of the Tillamook Bay Estuary and Watershed*, prepared for the Tillamook Bay National Estuary Project by Philip Williams and Associates, Portland, OR.

Table 2-4: Characteristics of surveyed areas[1]

Parameter	Surveyed Under 500'	Total Under 500'	Surveyed Above 500'	Total Above 500'	Total Surveyed	Total
Stream miles	127	458	170	829.2	297	1287.2
Watershed (mi^2)	89.8	138.8	11.2	458.2	100	597
Uplands (dry)	68		11.4		79.4	
Wetlands:	21.5		.0105		21.5105	
Tidal wetlands	1.6					
X Tidal forest	.02					
Tide flat	8.9					
Freshwater wetlands	5.7		.0105		21.5105	
X Freshwater forested wetland	.5					
Water: (includes Bay and Cape Meares Lake)	5.3					

[1] Compiled by Sean Allen for the Tillamook County Performance Partnership from GIS data: most from 1982 National Wetlands Inventory, except water areas from 1857 survey reconstruction Tillamook Bay outline in Coulton *et al.* 1996.

Table 2-5 Tidal wetland change

Tidal wetland	Total mi^2
Historical amount*	**5.52**
Freshwater today	3.33
Still tidal wetland	0.3
No longer wet	1.89
New** tidal wetland	1.3

* Based on Coquille-Brenner silt loam soils identified in 1964 USDA Soil Survey

** Includes .7 mi^2 designated as water in the 1857 survey (See Coulton *et al.* 1996) and .6 mi^2 which was not included in the 1964 soil survey and can't be determined.

placing pieces in stream channels and relocating in-unit leave trees in core areas to maximize their benefit to salmonids.

The basin has lost most of its floodplain and lowland wetlands. See Figure 2-5 and Tables 2-4 and 2-5. Much of the landscape has been diked, ditched, filled, drained, and cleared, with poorly designed tide gates and culverts cutting off fish access to remaining wetland habitat. Instream habitats have been channelized, straightened, riprapped, and mined. Most lowland riparian areas have been cleared of vegetation, except brush and grass. Livestock have direct access to streambanks and streams in some locations, resulting in crumbling streambanks, trampled vegetation, and disturbed streambeds. Livestock in streams also pose a public health problem by polluting the water with bacteria. Healthy riparian areas still exist in some floodplain and lowland areas, notably along Hoquarten and Squeedunk Sloughs.

Upper watershed habitat. Tillamook County's forestlands have provided timber for wood products industries since the 1880s. While the earliest European American settlers considered the extensive stands of timber a hindrance to farming, the timber industry was the County's most important industry by 1894 (Levesque 1985). As demand for timber products increased and the technology evolved, the number of timber workers and amount of harvested timber increased dramatically. Through the Donation Land Act of 1850, the Homestead Act of 1862, and the Timber and Stone Act of 1878, private timber companies acquired much of the County's valuable timber (Levesque 1985). Large-scale logging began in the early 1900s with no effort to reforest cleared lands.

The Tillamook Burn, a series of forest fires from 1933–1951, profoundly affected the use of forestlands in the region. The fires killed most (about 200,000 acres) of the old-growth timber in the Wilson and Trask river watersheds, burning some areas repeatedly. Roads were then built for salvage logging, fire protection, and replanting (Levesque 1985). Reforestation of the burned acreage began in 1949. Since salvage logging ended in 1959, timber harvesting in the Tillamook Burn area, now the Tillamook State Forest, has been mainly commercial thinning. However, remaining private timberlands have been relatively intensively cut (300 million board feet) in the past 10 years (Labhart, pers. com. 1997).

The huge Tillamook Burn forest fires contributed to relatively high sediment loads during the mid-20th Century. They likely increased surface erosion and were documented to have triggered many debris flows. Moreover, massive salvage logging after the fires left a legacy of poor quality logging roads and skid trails. These changed the frequency and composition of landslides, reducing the supply of large wood, and continue to supply excessive upland forest sediment. Many of these legacy forest roads have poorly designed culverts and road crossings, blocking fish passage (Mills 1997).

Estuarine habitat. Fish and shellfish were historically plentiful in Tillamook Bay and residents quickly began a commercial fishing industry. A small export fish cannery, constructed in Hobsonville in 1885, shipped its products to San Francisco. Commercial gillnet fishing in the Bay began in the late 1800s. Large historic populations of Chinook, coho, and chum salmon in the basin were well documented. Commercial fishing of coho salmon was regulated as early as 1892. Fish hatcheries were established in the early 1900s, with the Trask River hatchery in operation since 1914 (Coulton *et al.* 1996). Tillamook Bay's gillnet fishery closed in 1961, and commercial salmon fishing was limited to the sea (Tillamook System Coho Task Force 1995).

Tillamook Bay still supports a thriving charter fishing service, with paid guides hosting recreational anglers. Despite restrictions on certain species, seafood and fish product processing remains a local industry.

Shellfish harvests before the 1960s were rarely documented, but Tillamook Bay has long been a major clam and oyster producer. Oysters are not native to Tillamook Bay, but were first planted in the Bay in 1928. Conditions in the Bay are very good for oysters and Tillamook Bay dominated Oregon oyster production for many years. Likewise, the Bay has long been a major clam producer, currently producing about 60% of Oregon's clam harvest. More information about harvest levels is in the *TBNEP Environmental Characterization Report*, Chapters 2 and 3.

Dredging and channel control, large wood removal, sedimentation, and the breach of Bayocean Spit have changed the Bay's bathymetry and reduced its complexity. See map, page 2-32. However, diverse species continue to use the Bay. Its tidal channels and sloughs, intertidal sand and mud flats, eelgrass beds, and tidal marsh areas provide structural complexity and a rich source of insects, zooplankton, epibenthic organisms, and other species upon which salmon and other aquatic species depend for food. Juvenile and adult salmonids undergo physiological transition in the sloughs and channels before entering the next phase of their journey.

Tidal sloughs were adversely impacted by adding tide gates, filling channels, and disrupting hydrologic connectivity in the floodplain and wetlands. Water in today's sloughs shows evidence of low dissolved oxygen (DO) and increased turbidity. Water quality behind tide gates can suffer due to long residence times and restricted access to tidal and other water exchange. Poorly functioning tide gates and culverts often block fish passage. The loss of off-channel rearing habitat in tidal and freshwater sloughs and oxbows may be an important factor in the decline of coho salmon.

Key Habitat Goals and Objectives

The CCMP uses mapping and the prioritization process to maximize potential for each unique basin. To address habitat loss in the lowland floodplain area, the CCMP recommends intensive riparian plantings and selective hydrological modifications to protect and enhance fish habitat, improve water quality, mitigate flood damages, and reduce negative impacts of erosion and sedimentation. For upper Watershed riparian areas, the CCMP recommends protection measures and 200 miles of enhancement projects, combined with an action plan to upgrade and maintain forest roads and remove fish passage barriers. Below 500 feet elevation, CCMP objectives include 500 miles of riparian enhancement work and 100 acres of freshwater wetland enhancement. To restore estuarine habitat, 750 acres of tidal marsh will be reclaimed (equal to about 22% of historic tidal marsh lost.) The CCMP outlines actions to restore fish access to tidal sloughs and improve water quality in the important rearing areas for juvenile salmonids. In addition, the CCMP outlines steps to protect eelgrass beds, restore large wood to the Estuary, and maintain intertidal areas for aquaculture. These actions are outlined in Chapter 4, Key Habitat.

Specific key habitat goals and objectives include:

Goal	**Assess, Protect, and Enhance Riparian Habitat**
Objectives	Enhance 200 miles of forested riparian habitat to healthy riparian condition by 2010.
	Enhance 500 miles of riparian habitat in the 0–500' elevation band to healthy riparian condition by 2010.
Goal	**Assess, Protect, and Enhance Instream Habitat**
Objectives	Enhance 100 miles of upland instream habitat by 2010.
	Upgrade 50% of all tide gates by 2010.
Goal	**Assess, Protect, and Enhance Wetland Habitat**
Objectives	Enhance 100 acres of freshwater wetland by 2010
	Enhance 750 acres of tidal wetland by 2010.
Goal	**Assess, Protect, and Enhance Estuary and Tidal Habitats**
Objectives	Enhance 750 acres of tidal wetland by 2010.
	No net decline in eelgrass beds.
Goal	**Enhance Health of Salmonids, Shellfish, and Other Aquatic Species**
Objective	Achieve Oregon Department of Fish and Wildlife (ODFW) wild fish production and escapement goals (See chart on Page 4-2) by 2010.

Water Quality

Priority Problem

Bacteria and other pathogens from both point and non-point sources present a principal water quality problem. Bacterial pollution threatens public health through the ingestion of contaminated shellfish and water, or direct water contact. It also results in frequent closure of commercial shellfish harvesting areas. Many stream reaches do not meet water quality criteria for bacteria or temperature, and exceed recommended concentrations of suspended solids . Dissolved oxygen concentrations meet water quality standards in most areas of the Watershed except in lowland sloughs, where significant oxygen depression has been observed. Nutrient concentrations do not appear to adversely impact water quality except in lowland sloughs. No acute or chronic affects from toxic substances have been observed or monitored.

Tillamook Bay has a long history of bacterial pollution problems. Beginning in the 1970s, scientists measured high levels of bacteria in the Bay and in shellfish meats. To protect consumers from eating contaminated shellfish, the federal government required the State of Oregon to develop a shellfish management plan. The current plan, adopted in 1991, regulates harvest closures based on estimated amounts of bacteria in the water. To control bacteria loads from agricultural sources, the Rural Clean Water Program was implemented locally in 1981. This program was federally funded through the USDA. The NRCS provided the agricultural producer participants with technical assistance in developing their 5 to 10-year Rural Clean Water Conservation Plans and in installing/implementing waste management structures/practices. Along with local cost share, the federal government spent more than $6 million over 15 years to improve manure storage facilities and control runoff around livestock confinement areas in the Tillamook Bay Watershed. (Dorsey-Kramer 1995).

Today, the Bay continues to receive high bacterial loads from diverse sources including livestock operations, wastewater treatment plants, on-site sewage disposal systems (OSDS), and urban runoff. Along with state partners, TBNEP recently estimated the relative ratio of human, dairy, and "other" origin bacteria (Bower and Moore 1999). This CCMP recommends actions to address the problem.

Tillamook Bay has other water quality problems. See Appendix A: 303(d) list and Figure 2-6: 303(d) map. Temperatures in the lower reaches of the Trask, Tillamook, and Wilson rivers exceed water quality standards and may adversely affect salmon habitat during part of the year. Characterized by slow water movement and nearby agricultural and urban activities, lowland sloughs sometimes have low levels of dissolved oxygen (DO). High sediment concentrations and flow modifications also adversely impact instream habitat for salmon and other aquatic species.

Bacteria Status and Trends

Bacterial loading has historically been highest during rainy seasons of the year: fall, winter, and early spring. Seasonal rains wash pollutants off farm fields and from urban areas and can cause sewage treatment plant overflows or bypasses. These pollutants create public health risks associated with water contact and raw shellfish consumption. To protect consumers from contaminated oyster meats, ODA regulates shellfish harvesting and closes the Bay after heavy rains or unexpected discharges from sewage treatment plants. Compliance with FDA's standards for shellfish growing waters allows Oregon's shellfish growers to participate in interstate commerce. Figure 2-7 shows the current shellfish management areas for the Bay, which ODA defines as "prohibited," "conditional," and "restricted" to limit human consumers= exposure to water-borne pathogens. These closures represent an important problem for local oyster growers. Although not native to Tillamook Bay, oysters grow well under aquaculture methods and historically provided significant income to the region. Both shellfish harvesters and managers agree that harvest area classifications and closure criteria should be updated when new data trends support changes. The CCMP includes specific action plans that direct the agencies involved to coordinate efforts and use the best available science and information to keep shellfish area classification and harvest management plans current.

Contaminants from Agricultural Lands

During 1979 and 1980, the Department of Environmental Quality (DEQ) sampled the five rivers in the Tillamook Bay Watershed and identified potential bacterial sources from livestock operations, wastewater treatment plants, and failing septic tanks. In response to heavy pollutant loads from agricultural sources, the United States Department of Agriculture (USDA) awarded Tillamook County a Rural Clean Water Program (RCWP) in 1979. Through the USDA Farm Services Agency, the federal government contributed more than $6 million to improve manure storage facilities and control runoff around livestock confinement areas. Although a subsequent monitoring program failed to describe a clear statistical trend, most scientists and farmers agree that the RCWP improved water quality in the rivers. Despite these earlier achievements, substantial amounts of bacteria from livestock continue to enter Tillamook Bay and its tributaries, probably due to an increase in the total number of dairy cows in the Watershed. To tackle these problems, the CCMP provides an action plan to improve farm management practices, tighten inspections of Confined Animal Feed Operations (CAFOs), and train livestock managers in new methods and technologies that will reduce the impacts of their activities on water and habitat quality.

Figure 2-6. 303(d) map for bacteria and temperature. Sites are listed in Appendix A: 303(d) list.

Figure 2-7.

Contamination from Urban and Residential Areas

Recent studies conducted by theTBNEP and its partners suggest that urban and rural residential sources contribute more pathogen contamination than originally suspected. The Watershed contains three incorporated cities (Tillamook, Garibaldi, and Bay City), six wastewater treatment plants, and an uncounted number of household septic systems. Developed areas contribute non-point source pollutants including pathogens, oil and grease, nutrients, and excess heat. On-site sewage disposal systems (OSDS/septic systems) also contribute bacteria and nutrients from homes, trailer parks, and public areas. Although scientists have not precisely quantified the amounts of pollutants from each source, TBNEP studies identified major sources and estimated bacteria loads to the Bay.

Wastewater treatment plants. Wastewater treatment plants in the Tillamook Bay Watershed X operated by the cities of Tillamook, Garibaldi, and Bay City, plus the Port of Tillamook, the Tillamook County Creamery Association (TCCA), and Pacific Campground X are generally in good condition. All plants have been in operation since 1972 or earlier and each has been upgraded at least once since it began operation.

- The City of Tillamook has experienced two bacteria violations in the past five years, but recently upgraded its clarifiers, increasing capacity from 2 million gallons per day (mgd) to 5.6 mgd. The sewer system continues to have problems with infiltration and inflow in winter.
- The Port of Tillamook's wastewater system had extreme infiltration and inflow problems; with as much as 95% of the water treated during winter derived from infiltration. To address the problem, the Port replaced all sewer lines, installed new STEP systems, and repaired the lagoons. The $500,000 project was completed in July 1998.
- Bay City's wastewater treatment plant is two years old, and uses a modern ultra-violet light disinfectant system. An overflow lagoon is available to prevent untreated waters from discharging into the Bay.
- The City of Garibaldi also experiences infiltration and inflow during the winter. Over-capacity flows are by-passed directly to the Bay.
- The TCCA X which spent $3 million to upgrade its wastewater treatment facility in 1989B1992 X currently meets its National Pollution Discharge Elimination System (NPDES) permit requirements at the compliance point of the plant. However, the water has high bacteria counts at the facility's discharge point to the Wilson River. The TCCA currently treats this problem with increased chlorine concentrations in the effluent.
- Pacific Campground uses septic systems during summer and a combination settling and Bio-Pure batch reactor during winter. No major problems have been reported with this system.

Table 2-6. *Draft* Storm Event Bacteria Source Distribution

Date	Location	River Mile	% Dairy	Human	% Wild
	Trask River				
2/28/98	Below trailer park	3.7	65	24	11
"	5th Street boat ramp, above WWT facility	1.5	74	20	6
"	Hospital Hole bridge, below WWT facility	1.2	69	25	6
3/3/98	Below trailer park	3.7	33	67	0
	5th Street boat ramp, above WWT facility	1.5	41	58	1
	Hospital Hole bridge, below WWT facility	1.2	62	33	5
	Tillamook River				
2/28/98	Roadside rest area	8.1	22	50	28
"	Tillamook River Road	4.9	48	35	17
"	Burton Bridge below trailer park	4	41	57	2
"	Netarts highway bridge	0.9	43	57	0
3/3/98	Roadside rest area	8.1	23	73	4
"	Tillamook River Road	4.9	58	42	0
"	Burton Bridge below trailer park	4	42	56	2
"	Netarts highway bridge	0.9	66	28	6
	Bay				
2/28/98	Memaloose	-0.5	74	16	10
3/3/98	Memaloose	-0.5	67	32	1

Source: Bower, R., and Moore, J. 1999. *Identifying Sources of Fecal Coliform Delivered to Tillamook Bay*. OSU. In preparation for Tillamook Bay National Estuary Project, Garibaldi, OR.

The CCMP recommends actions to address problems of long-range treatment capacity and needed sewer upgrades.

Stormwater and septic tanks. In most cases, stormwater receives no treatment before it enters the rivers and Bay from urban sources. Oil, grease, pesticides, sediment, and animal waste are transported directly to the receiving waters via storm drains and street gutters. Recent studies identified significant amounts of human bacteria in the rivers, possibly from failing septic tanks. See Table 2-6. The ODA contracts with Tillamook County to survey OSDSs along the shorelines within the drainage basin at least every 12 years. This is part of a required sanitary survey for commercial shellfish growing areas. The CCMP recommends a more frequent inspection process for OSDSs located near waterways to ensure adequate design and function.

Nutrients and Dissolved Oxygen Status and Trends

Plant nutrients, such as nitrogen and phosphorus, can stimulate algal growth and photosynthesis, leading to low levels of dissolved oxygen (DO) in the water. Low DO can be harmful to aquatic or estuarine systems. Streams with low DO no longer provide suitable habitat for rearing, spawning, and migrating salmon. Large inputs of organic wastes, slow water movement, and high temperature can cause low DO. According to surveys by citizen volunteers, TBNEP, and state agencies, the main Bay and rivers generally show healthy nutrient and oxygen levels.

However, initial surveys of lowland sloughs indicate several places where DO drops below the 8.0 mg/L standard[2].

To improve water quality and improve fish habitat, the CCMP recommends reconnecting lowland sloughs to improve water flow and fish access. It also supports riparian restoration and fencing projects in the lowlands. See Chapter 4: Key Habitat. To track trends and detect problems, the CCMP monitoring plan commits to long-term measurements of all major water quality parameters, including bacteria, nutrients, DO, sediments, and others as required by the State. Results from biological monitoring programs such as eelgrass studies or benthic surveys can also identify water quality problems. See Chapter 10: Monitoring and Research Needs for more details.

Temperature Status and Trends

Warm water impairs rearing for juvenile salmonids, inhibits adult migration, and decreases dissolved oxygen levels. After river monitoring in 1995B1998, DEQ listed all or part of all five rivers as water quality limited for temperature: Kilchis River from mouth to headwaters, and Murphy Creek from mouth to headwaters; Miami River mouth to Moss Creek; Wilson River mouth to headwaters; Trask River mouth to South Fork of Trask, North Fork mouth to Bark Shanty Creek, North Fork of North Fork mouth to headwaters, and Mill Creek from mouth to headwaters; and Tillamook River mouth to Yellow Fir. See Appendix A: 303(d) List and Figure 2-6: 303(d) List Map.

To develop a temperature TMDL, DEQ conducted baseline monitoring at 40 sites in the Trask, Miami, Tillamook and Wilson Rivers in 1997. Based on these data, DEQ monitored temperature at 60 locations in the Tillamook Bay Watershed in 1998. Additional monitoring is scheduled for 1999.

[2] Ambient Standard: During salmonid spawning periods DO must not be lower than 11 mg/L unless intergravel DO exceeds 8.0 milligram/liter mg/L. If altitude and temperature conditions preclude attainment of the standard, then DO must be at least 95% of saturation. In water bodies that support cold water aquatic species (such as salmonid species), DO must be at least 8 mg/L, or if diurnal monitoring data are available, the minimum shall not fall below 6.5 mg/L. For estuarine waters, DO concentrations must exceed 6.5 mg/L.

Water Quality Goals and Objectives

To address water quality problems in Tillamook Bay, the CCMP supports stronger agricultural pollution control measures and voluntary farm management plans consistent with ODA mandates. It outlines measures to keep manure and other agricultural wastes out of streams and provide the research and training to help local farmers improve their practices. In response to recent scientific findings, the CCMP also calls on the County to ensure that on-site disposal systems (OSDS) function properly. Other actions call for better infrastructure planning to ensure adequate sewer and wastewater treatment facilities. To address water quality problems related to habitat, the CCMP calls for additional watershed-specific temperature and sediment management plans that identify site-specific riparian restoration activities. These actions are detailed in Chapter 5, Water Quality.

Specific water quality goals and objectives include:

Goal	**Promote Beneficial Uses of the Bay and Rivers**
Objectives	Achieve water quality standards for bacteria in the rivers and Bay by 2010.
	Document at least a 25% reduction in bacteria loads to rivers, with apparent trends by 2005 and statistically significant results by 2010.[3]
	Achieve at least a 25% reduction every four years in the number of days that the rivers are not in compliance with water quality standards for bacteria.[3]
Goal	**Reduce Instream Temperatures to Meet Salmonid Requirements**
Objectives	Achieve in-stream temperatures that meet salmonid requirements by 2010.
Goal	**Reduce Instream Suspended Sediments to Meet Salmonid Requirements**
Objectives	Achieve in-stream suspended sediment concentrations that meet salmonid requirements by 2010.
	Document at least a 25% reduction in sediment loads to rivers, with apparent trends by 2005 and statistically significant results by 2010. [3]
Goal	**Improve Farm Management Practices**
Objectives	Achieve Senate Bill 1010 compliance among 100% of livestock operations by 2010.
	Inspect every CAFO annually by 2004.
Goal	**Assess and Upgrade Wastewater Treatment Infrastructure**
Objective	End wastewater treatment plant failures by 2002.
Goal	**Assess and Upgrade Urban Runoff Treatment Infrastructure**
Objective	Control runoff from all construction and development in urban areas by 2003.

[3] Based on 1997B1998 monitoring results.

Figure 2-8 Historic bathymetric surface derived for Tillamook Bay from a survey in 1867. Note the large, deep area south of the inlet, and the complexity of the Bay bottom. By 1957 the Bay bottom was greatly simplified and deep areas in the southern half of the Bay were filled in.
Source: Bernert, J., and T. Sullivan. 1998. Bathymetric analysis of Tillamook Bay: Comparison among bathymetric databases collected in 1867, 1957, and 1995. E&S Environmental Chemistry, Corvallis, OR. Prepared for the Tillamook Bay National Estuary Project, Garibaldi, OR.

Erosion and Sedimentation

Priority Problem

Current levels of erosion and sedimentation may adversely impact the human and natural environment. Historic increases in sediment may have caused the loss of spawning and rearing habitat, degradation of estuarine habitats, and changes in the Bay depth, circulation patterns, and response to floods.

Sedimentation has been considered an issue in Tillamook Bay and its surrounding watershed due to changes in Bay bathymetry, along with the filling-in of river mouths, sloughs and ditches. In addition heavy sediment loads can damage Bay ecosystems and salmon habitat, and contribute to flooding problems. These problems result from changes in sediment quantity and quality, and in how sediments have moved through the Watershed, as well as into the Bay from the ocean. Solutions to excessive sedimentation depend on understanding the sources of sediments and implementing management actions to minimize their impact on rivers and the Bay.

Erosion and Sedimentation Status and Trends

Recent studies (McManus and Komar *et al.* 1998) completed by the TBNEP indicate that "about 50% of Bay surface sediments are contributed by marine beach sand carried into the Bay by waves, tidal currents and winds, while the remaining 50% is sand, silt, and clay from river sources." Marine sediments enter the Bay through the single opening to the ocean during the daily tidal exchanges. Marine sediments have also entered the Estuary during geological events such as the breaching of Bayocean Spit in 1952 and a tsunami around 1700. River sediments result from natural erosion on the steep slopes of the upper Watershed, along with degraded, eroding streambanks in the lowland floodplains. Earlier studies (Glenn 1978, USDA 1978) estimated about 90% of riverine sediments are derived from upland sources and about 10% from the lowland/floodplain. These source estimates are proportional to basin-scale land use, with about 89% of the Watershed in forested uplands.

Sedimentation in the rivers and Bay is a natural process that can be modified by human actions. Sediment quantity and quality affect habitat quality. Reconciling core analysis and Bay bathymetry, scientists described a heavy rate of sedimentation from 1867 to 1954 (averaging 68 cm/100 years). The period of heavy sedimentation saw four major forest fires, salvage logging, and agricultural, urban, transportation system and other development, along with the breach of Bayocean Spit. During the last four decades, 1954 to 1995, average sedimentation rates (5 cm/100 years) dropped below historic or "background" sedimentation rates (20B40 cm/100 years) (McManus and Komar *et al.* 1998). See Table 2-8.

Table 2-7 Sediment source breakdown for the Kilchis watershed

Source Type	Normal Year	Major Storm	Extreme Storm
Road surface erosion	50B500 yd^3	50B1000 yd^3	1000B5000 yd^3
Road washouts	100 yd^3	2500 yd^3	25,000 yd^3
Road landslides	2000 yd^3	20,000 yd^3	200,000 yd^3
Abandoned road landslides	0 yd^3	5000 yd^3	100,000 yd^3
Background landslides	100B1000 yd^3	1000B100,000 yd^3	100,000B500,000 yd^3

Source: Mills, K. 1997. Forest roads, drainage, and sediment delivery in the Kilchis River watershed. Prepared for the Tillamook Bay National Estuary Project, Garibaldi, OR. 48 pp.

Table 2-8 Modern sedimentation rates in Tillamook Bay

Location	Years	Rates (cm/100 years)
Average Bay	1867B1954	68
(Bathymetry)	1867B1995	48
	1954B1995	5
Western Bay	post-breach	>200*

Source: McManus and Komar *et al.* 1998. The Tillamook Bay National Estuary Project: Sedimentation Study. Final Report, TBNEP, Garibaldi, OR.

Sediment deposition rates in the Bay are now returning to near historic levels. See Table 2-8. However, concern about sediment remains since most sediment is now routed and deposited directly to the estuary, rather than deposited evenly on the lowland floodplain. Loss of instream complexity and floodplain connectivity may speed up the movement of sediment through the system and impact instream habitat value. Levees, roads, and dikes keep the sediment in the channels and move it directly to the lower river channels and Bay.

Historic logging practices and forest fires likely contributed enhanced loads of fine-grained sediments carried by the rivers and subsequent rapid growth of shoreline and tidal flats in the southern (upper) end of the Bay. McManus and Komar *et al.* (1998) state that "clearcutting and forest fires are known to result in an increase in sediment yields, but the increase is temporary, lasting only a few years until vegetative cover is re-established, and it appears to mainly produce fine-grained sediment, clays and silt." They go on to say, "Although we have seen that this fine sediment is relatively insignificant in producing the general shoaling of Tillamook Bay, since most of it is flushed through to the ocean, its enhanced loads in the rivers might account for the rapid outward growth of the shoreline and expansion of tidal flats. Furthermore, increased concentrations of fine-grained sediment in the rivers are known to be detrimental to fish, as are other water quality factors. Thus, if there are to be changes in the management of Tillamook Bay and its surroundings, the focus should be

on human activities in the watersheds of the five major rivers," and practices that can lead to decreased yields of fine-grained sediments."

Studies by ODF to estimate current human-caused sediment sources in the Kilchis Watershed show landslides as the main source of sediment loads to streams. Due to both road fill failures and washouts in major storms, legacy forest roads pose greater landslide risk than roads built with current road construction techniques. See Table 2-7. A 1995B1996 ODF study found that roads built prior to current standards continue to pose risk of increased sediment delivery from the road surface and drainage ditches and from fill material failures (Mills 1997).

Through the Road Erosion and Risk Project, described in Action SED-01, and other OPSW actions, described in Appendix D, state and industrial forest landowners have agreed to identify sediment risks from roads and to address those risks, improving road fills, stream crossings, and drainage and surface problems. ODFW and Forest Practice Rules require that stream crossing structures be designed and constructed to allow for fish passage. State and federal agencies have agreed to comply with structural design standards. The most recent Oregon Plan Watershed Restoration Inventory reports that at least 530 culverts were removed, replaced, upgraded or installed for fish passage in 1996B97, and stakeholders are committed to continuing this effort. Industrial forest landowners estimate they will spend about $13 million a year for the next 10 years on this project for the coastal Evolutionarily Significant Units (ESUs) alone. The Tillamook District of ODF reports spending $4.2 million in 1998 on roads, installing 365 new culverts, building two new bridges, spreading rock, and improving and inventorying roads. State Forest Lands will spend an additional $2.5 million per year for the next two bienniums to improve Tillamook State Forest roads. Action SED-05 calls on owners of non-forest management roads to address their sedimentation and fish passage problems as well.

Lowland sediments result mainly from bank erosion on agricultural lands. The absence of riparian vegetation in the lowlands destabilizes river banks and increases bank erosion. Without fences or other controls, livestock trample streambanks, destroy riparian vegetation, and increase erosion and water quality problems. In addition, stream channel modifications and the use of riprap to stabilize streambanks may increase erosion through changes in river fluvial response.

Erosion and Sedimentation Goals and Objectives

To better address human-caused sediment problems, the CCMP recommends actions to reduce sediment loads from forest roads (built prior to current design standards) and unstable slopes. In the upper Watershed, the plan calls for increased installations of cross-drainage culverts to prevent washouts, and harvest restrictions in sensitive, steep slope areas. It also calls for improved forestland management over the entire landscape, supporting and enhancing existing elements of the Oregon Plan for Salmon and Watersheds related to surveying, prioritizing, and improving forest roads (improving road surfaces and cross-drainage, sidecast pullback, improved stream-crossing structures, etc.) that pose a risk to water quality. In addition, it calls for supporting monitoring to demonstrate the effectiveness of current forest practices and to identify necessary modifications consistent with the Oregon Forest Practices Act to improve the effectiveness or implementation of the practices.

The CCMP also calls for encouraging actions that can help restore more natural sediment storage and routing. Such actions include restoring instream large wood and more functional floodplains, and encouraging the retention of vegetation to someday provide large wood for debris flows that may reach fish-bearing streams. In the lowlands, the CCMP outlines actions to control livestock access to streams, replant riparian vegetation, and stabilize streambanks with alternatives to riprap. It spells out requirements for effective runoff control on construction sites and urban areas, and identifies measures to ensure that road authorities design and maintain roads to minimize erosion and sedimentation. These actions are detailed in Chapter 6, Erosion and Sedimentation.

Specific erosion and sedimentation goals and objectives include:

Goal	**Reduce Sediment Risks from Forest Management Roads**
Objectives	Upgrade 1,400 miles of forest roads on state and private lands by 2010. Decommission 50 miles of unneeded forest management roads by 2010. Conduct regular road maintenance on all 2,000 miles of forest management roads.
Goal	**Reduce the Adverse Impacts of Rapidly Moving Landslides**
Objectives	Upgrade 1,400 miles of forest roads on state and private lands by 2010. Decommission 50 miles of forest management road by 2010. Conduct regular road maintenance on all 2,000 miles of forest management roads.
Goal	**Improve Channel Features to Improve Sediment Storage and Routing**
Objectives	Key Habitat riparian and Water Quality suspended sediments objectives
Goal	**Reduce Adverse Impacts of Erosion and Sedimentation from Developed and Developing Areas**
Objective	Control runoff from all construction and development in urban areas by 2003.
Goal	**Reduce Adverse Impacts of Erosion and Sedimentation from Agricultural Areas**
Objectives	Lowland, freshwater wetland, and tidal marsh Habitat objectives below
Related CCMP Objectives	Enhance 200 miles of forested riparian habitat to healthy riparian condition by 2010. (Key Habitat Objective) Enhance 500 miles of riparian habitat in the 0–500' elevation band to healthy condition by 2010. (Key Habitat Objective) Enhance 100 miles of upland instream habitat by 2010. (Key Habitat Objective) Enhance 750 acres of tidal wetland by 2010. (Key Habitat Objective) Achieve instream suspended sediment concentrations that meet salmonid requirements by 2010. (Water Quality Objective) Document at least a 25% reduction in total suspended solids loads to rivers, with apparent trends by 2005 and statistically significant results by 2010. (Water Quality Objective)

Figure 2-9. Aerial photograph of flooding on February 10, 1996, at Tillamook, OR, after the floodwaters had begun to recede.
Source: Coulton, K. 1996. Philip Williams and Associates, Aerial reconnaissance of flooding for the Tillamook Bay National Estuary Project, Garibaldi, OR.

Flooding

Priority Problem

The interaction of human activities with dynamic natural systems has increased the magnitude, frequency, and impacts of flood events. These events affect water quality through increased erosion and co-mingling of flood waters with industria, agricultural and waste products. Each time a significant flood occurs, water quality and aquatic wildlife are negatively impacted as contaminants enter the system.

Flood Impacts Status and Trends

For all three of the original TBNEP priority problems X fish and wildlife habitat loss, water quality degradation, and erosion and sedimentation X flooding is a unifying natural process, contributing to both the quality and impairment of these ecosystem issues. The Flood of 1996 focused attention on flooding. To resolve the flood problems in the Tillamook Bay area, and also to resolve the original TBNEP priority problems, management efforts will need to satisfy multiple objectives: to reduce flood-related hazards and damages, while minimizing the potential long-term environmental impacts and economic costs of flood control and floodplain management practices.

Tillamook Bay's uniqueness among Oregon estuaries stems in part from its five tributary rivers. The four southern rivers — Tillamook, Trask, Wilson, and Kilchis — enter the Bay relatively close together, their respective valleys merging into a single, wide floodplain. Fingerlike highlands divide the floodplain. Downtown Tillamook sits upon one of these highlands, adjoining Hoquarten Slough.

Prior to modification of the river channels and sloughs, settlers to Tillamook described "flood lakes," vast pools of water in the valley of the Wilson and other rivers, during rainy winter months. These lakes could extend to the foothills of the Coast Range. The floodwaters annually deposited thick layers of rich loam on the valley floor, creating prime agricultural land. However, the annual floods also made the land unsuitable for permanent habitation, so it lay unoccupied.

Modification and taming of the floodplain began in the 1850s. Before then, river channels clogged with logs and debris jams easily flooded over their banks. Once the channels were cleared, the lowlands flooded less frequently. Further changes through 1937 reduced channel complexity, allowing the land to drain even faster, with most clearing and draining of the floodplain completed during the 1920s. The addition of riverbank levees eliminated the natural connectivity between river and floodplain through the sloughs. After that, only the highest river flows resulted in floods. The constraining levees kept the water in the channels and quickly moved the sediment, once deposited evenly on the floodplain, to the lower

river channels and Bay. Dikes also reduced the extent of freshwater wetland and tidal marsh flooding.

These changes permitted significant agricultural, residential, and commercial development on the Tillamook Bay floodplain. This now interferes with floodplain function and places more people and property in harm's way when flooding does occur. For example, non-farm houses have been built along the Wilson and Trask rivers, quite close to the rivers' normal banks. The Wilson River floodplain has been extensively developed in a narrow corridor along US 101 (North Main Street). Flooding is a persistent problem in all three of these areas and others.

Two consequences of flooding are common in Tillamook County: inundation and erosion. Inundation is the presence of standing or flowing water in places which are normally dry; erosion refers to the physical removal of soil from river banks, or the digging of channels in formerly flat areas due to high flows. The lowland floodplains experience two types of flooding: 1) tidal flooding, which is controlled primarily with dikes; and 2) riverine flooding, controlled with levees. Both types of flooding have varying magnitudes and recurrence intervals and include three conditions or characteristics:

- Riverine bankfull conditions, which occur several times a year.
- First bottomland flooding, which affects lower areas of the floodplain, recurs every 2 to 50 years. Riverbank levees contain smaller first bottomland floods, keeping the water within the main channel.
- Second bottomland flooding, which covers the low and high areas of the floodplain, recurs roughly every 50 to 5,000 years. Despite extensive flood control measures, these floods continue to impact developed areas.

The Wilson River, the river with a continuous height gauge for the longest period of record, reached flood stage (11 feet) 43 times between 1970 and 1996. The highest crest occurred in February 1996 (18.50 feet), nearly two feet higher along North Main Street (Hwy. 101) in Tillamook than the previous high of 16.91 feet in January 1972. Ten other floods over 16 feet also occurred in that time frame: in December 1974, December 1977, January 1980, February 1981, January 1982, December 1982, February 1986, November 1986, December 1987, and January 1990. The average recurrence interval for a 16+ foot flood, since 1970, is 2.25 years.

Prior to 1970, the great flood of 1964 also caused significant impacts to the Tillamook area. In the aftermath of this flood, state and federal agencies conducted significant "clean-up" activities that removed large wood from and straightened many channels.

Work done by OSU scientists in the past decade[4] found that precipitation data used to calculate the original 100-year floodplain used for land use planning purposes in many cases underestimated the actual rainfall amounts or failed to account for higher upland precipitation. This recent information indicates that the 100-year floodplain may need to be recalculated to more reliably locate improvements outside the Tillamook 100-year floodplain.

The great flood of February 1996, which had an estimated recurrence interval exceeding 100 years, was probably of the second bottomland type. The speed of floodwater rise and the duration of flooding are additional concerns. Both of these factors indicate that flood control in Tillamook now involves more than just the maximum floodwater elevation. Both rapidly rising floodwaters and long duration floods increase the risks to life and property out of proportion to the maximum elevation of the flood.

The conflict between human activity and flooding also has serious environmental consequences. More intense land use has increased concern about excess nutrient loading, hydrocarbons, heavy metals, and pesticides, all of which are carried downstream in flowing water and may increase water quality impacts during flood events. Moreover, flooding tends to wash bacterial contaminants from accumulated manure and malfunctioning septic systems off floodplain lands, and may interfere with septic system and sewage treatment facility function. Therefore, flood management solutions must address water quality problems, in addition to floodwater quantity and movement.

[4] Parameter-elevation Regressions on Independent Slopes Model (PRISM) studies, available at WWW.ocs.orst.edu.

Specific flooding goals and objectives include:

Goal **Improve Floodplain Condition**

Objective Complete 20 projects within the two years following adoption of hydrodynamic model which:

- measurably reduce the runoff rate in the Watershed's uplands (increasing interflow and ground water recharge, thereby reducing stream temperatures and increasing summer flows);
- improve drainage characteristics in the Watershed's lowlands (*e.g.*, connect sloughs and rivers for fresh water exchange in sloughs);
- increase floodplain storage capacity in the Watershed's lowlands (*e.g.,* set back levees to increase floodwater capacity, increase riparian area, and create opportunity for sediment deposition); and
- improve the natural environment's capacity to withstand and benefit from flood events.

Goal **Develop and Maintain a Comprehensive Floodplain Management Plan**

Objective Implement a GIS-based, unsteady state hydrodynamic model by year 2001.

Raise at least 60 houses at least 3 feet above the 100-year flood elevation by year 2001, and other houses as resources permit.

Construct 10 livestock and equipment pads in flood-prone areas by 2001 to reduce pollution from petrochemicals and animal wastes during major floods.

Secure and/or remove known hazardous chemicals from areas where they pose a real threat to water quality during flood events by 2005.

Citizen Involvement

Problem

Environmental awareness within the community and sound environmental decision-making by stakeholders depend on focused education programs and progressive community development. Currently, too few educational resources regarding the Tillamook Bay Estuary exist for citizens, watershed council members, resource users, and others involved in or affected by community decisions. Adult education must be strengthened to meet the needs of diverse stakeholder groups. In addition, K–12 programs must connect learning experiences to the environment and the community.

To ensure the success of our efforts to resolve the four priority problems, the Management Conference determined that improved education and institutional infrastructure are required. The Performance Partnership will foster citizen stewardship through public interaction and education, strengthen institutional links, and create and support new institutions needed to carry out the Habitat, Water Quality, Erosion and Sedimentation, and Flooding Action Plans.

Few educational and training resources exist to serve the diverse stakeholder groups involved in community decision-making. Improving adult education regarding Tillamook Bay and Watershed through college classes and community education and outreach will strengthen citizen stewardship and encourage community support for implementing the CCMP.

K-12 education not only brings children and their families into the process for today's actions, but lays the foundation for future efforts. This action plan strengthens teacher training in natural science and outdoor education programs in Tillamook County as part of systemic changes under the Educational Act for the 21st Century.

To build local capacity, foster citizen leadership, and improve community decision-making, Tillamook County requires new and renewed institutions. These must provide better training, greater expertise, and stronger enforcement of local ordinances. State-of-the-art information technologies offered through the Tillamook Coastal Watershed Resource Center will support local infrastructure and nourish community development. The Tillamook Bay Watershed Council will keep citizens engaged as it coordinates restoration and enhancement projects and promotes watershed health and community education. A private non-profit land trust will acquire, conserve and manage lands, and receive donations.

Specific citizen involvement goals include:

Goal **Improve Community Education**

Goal **Strengthen K-12 Science and Outdoor Programs**

Goal **Promote Community Development**

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CHAPTER

3 MANAGEMENT FRAMEWORK

Chapter 3, Management Framework, provides a brief overview of policies and programs relevant to the CCMP for the Tillamook Bay Watershed. First, habitat and water quality management are discussed on a basin-wide basis. Next, resource management programs are broken down by area: lowland and floodplain, upland forest, and estuary and slough. Lastly, opportunities for improvement and the CCMP responses are explored.

Basin-Wide Habitat and Water Quality Management

Fish and wildlife habitat, water quality, excess erosion and sedimentation, and flooding problems are profoundly interrelated. Likewise, the Endangered Species Act (ESA) and the Clean Water Act (CWA), along with various other state, federal, and local laws and programs, overlap and support one another in many ways.

In recent years, government agencies and private citizens throughout Oregon have focused on managing aquatic and terrestrial resources to better meet salmonid habitat requirements. This section provides an overview of those policies that impact the entire watershed. These include the ESA, the State's voluntary Oregon Plan for Salmon and Watersheds (OPSW, or the Oregon Plan), the federal government's regulatory role in water quality management, and the Oregon Land Use Planning Program.

In many instances, elements of these plans and the CCMP address the same issues. In this case, the CCMP endeavors to at least be consistent with other plans. Other times, the CCMP recommends actions beyond the requirements of other programs. Because of the requirements of the Clean Water Act, the CCMP focuses on actions that protect and enhance the health of the estuary and Watershed. Important actions that address the economic and social well-being of the citizens of Tillamook County are often addressed in these other plans (*e.g.*, economic and public safety issues associated with flooding are discussed in the Tillamook County Flood Hazard Mitigation Plan) but are not addressed in the CCMP.

The Endangered Species Act

In 1973, Congress passed the Endangered Species Act (ESA) to protect and preserve endangered plants and animals from extinction. The ESA of 1973 replaced two previous laws, the Endangered Species Preservation Act of 1966 and the Endangered Species Conservation Act of 1969. Congress passed further amendments to the Act in 1978, 1982, and 1988.

The ESA is perhaps the most forceful piece of environmental legislation passed to date in the U.S. More than any other environmental policy, it can restrict use of private or public land by designating it as critical habitat for endangered or threatened species. In the Tillamook Bay Watershed, listing of salmonids as threatened may result in reduced timber harvests from public and private lands, reduced recreational and commercial salmonid harvest, and a host of land use provisions aimed at protecting and enhancing habitat.

Section 3 of the ESA classifies an "endangered species" for protection when it is in danger of extinction within the foreseeable future throughout all or a significant portion of its range. A "threatened" classification is provided to a species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Under the ESA, the National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS) share responsibility for listing and overseeing the restoration of populations of threatened and endangered species. The NMFS oversees all ESA responsibilities for anadromous salmonids and other marine listings. The agencies' responsibilities include: deciding on and reviewing species' status; designating "critical habitats:" Section 7 consultations with other agencies on their activities and plans for compliance with the ESA; enforcing laws; and developing and reviewing species recovery plans. Oregon Department of Fish and Wildlife (ODFW) administers a statewide ESA that limits the activities of state agencies on state lands. Where overlap exists, the more restrictive federal ESA is enforced.

Incidental Take Permits

An important provision of the ESA is the "incidental takings" clause. Section 9 of the ESA prohibits the take of federally listed species without appropriate authorization. The ESA provides this authorization by issuing "incidental take" permits. An incidental taking is the "killing, harming, or harassment" of a federally listed species due to activities which are not aimed at disrupting the species and are otherwise lawful. Incidental take permits include:

- the amount (number of species) or extent (habitat loss) of anticipated take, if any;

- measures considered reasonable and prudent to minimize the take; and
- nondiscretionary terms and conditions to implement the reasonable and prudent measures, including the procedures used to handle or dispose of any individuals of the species actually taken.

Habitat Conservation Plan

Application for an incidental take permit is subject to a number of requirements. One method is for the permit applicant to prepare a Habitat Conservation Plan (HCP). Development of an HCP and application for an incidental take permit are voluntary, although in the absence of appropriate authorization, no take can lawfully occur.

An HCP must specify the following:

- measures the applicant will undertake to monitor, minimize, and mitigate such impacts; the funding that will be made available to undertake such measures; and the procedures to deal with unforeseen circumstances;
- alternative actions the applicant considered that would not result in take, and the reasons why such alternatives are not being utilized;
- impacts likely to result from the proposed taking of federally listed species; and
- additional measures that NMFS may require as necessary or appropriate for the purposes of the conservation plan, such as an Implementing Agreement that spells out the roles and responsibilities of all parties.

The Northwest Forest Plan

Originally adopted in 1994 as the federal response to the Endangered Species Act listing of the Northern Spotted Owl, the Northwest Forest Plan amended the Bureau of Land Management and U.S. Forest Service Land Use Planning and Management Documents. Certain best management practices (BMPs), often stricter than those required on state or private land, were adopted for federal forest lands. Regardless of the status of these owl populations, the Northwest Forest Plan will likely remain in place as a measure related to the listing of various other species throughout the Northwest.

The Oregon Plan for Salmon and Watersheds

In an effort to prevent the need for the federal restrictions imposed under the ESA, Oregon developed the Oregon Plan as a tool to rebuild depleted salmonid stocks. Driven largely by voluntary efforts, the Oregon Plan promotes four concepts fundamental to watershed planning and aquatic habitat restoration:

1) coordination among all involved parties (agencies, industries, volunteers, etc.);
2) locally-based actions and solutions;
3) extensive monitoring; and
4) adaptive management.

The National Marine Fisheries Service (NMFS) initially accepted the plan as a viable way to halt further dwindling of coho (and later, steelhead) populations, agreeing to delay a decision about federal listing for two years. NMFS would then review the progress made during the first two years of the Oregon Plan's implementation. Conservation groups criticized the Oregon Plan, however, claiming the plan relies too heavily on voluntary commitments and lacks the strength to reverse declining numbers of fish. In June 1998, a federal magistrate ordered NMFS to immediately reconsider listing coastal coho, calling the agency's decision to accept the Oregon Plan "arbitrary and capricious."

The NMFS listed the coastal coho as "threatened" in August of 1998. Despite the listing, the State continues to implement the Oregon Plan to reach its goal of restoring native fish populations and the aquatic systems that support them.

The Oregon Plan's broad-based, multi-faceted approach evolved from two measures: the Healthy Streams Partnership (HSP) and the Coho (followed by the Steelhead) Restoration Plans. These initiatives promote activities that involve all of Oregon's public and private land use stakeholders. Since the Oregon Plan was developed in the same time frame as the CCMP, they overlap considerably. Related Oregon Plan actions are listed here, and cross-referenced in the CCMP Action Plans.

The Healthy Streams Partnership

Underscoring the Oregon Plan's emphasis on multi-party coordination, the HSP represents a commitment among several public and private interests to restore water quality in Oregon's streams. Most notably, the HSP outlines an agreement between the Oregon Department of Environmental Quality (DEQ) and the Oregon Department of Agriculture (ODA) to design specific plans aimed at improving water quality in watersheds throughout the State. For each agency, the partnership prioritizes watersheds to reflect the State's salmonid restoration effort and sets a

specific timeline for the planning process. Specific planning and regulatory activities, most notably TMDLs and SB 1010, are discussed within this chapter.

Restoration Plans

As the backbone of the Oregon Plan, the goal of both the coastal Coho Plan (formerly known as the Coastal Salmon Restoration Initiative) and the Steelhead Supplement is to restore coastal salmonid runs in Oregon to support sustainable recreational and commercial fisheries. These comprehensive, science-based plans outline a range of public and private, locally-based activities to restore salmonid populations and their habitat. They impose virtually no new restrictions on the public, relying instead on the voluntary efforts of landowners and stakeholders. Similarly, the plans provide extensive measures for individuals, citizens' groups, industry, landowners, and government agencies to restore their watersheds through focused and coordinated efforts.

Within the Tillamook Bay Watershed, the following groups or agencies implement the Restoration Plans. The following list summarizes the workplans identified in the Steelhead Supplement that are related to the CCMP, and is therefore not exhaustive. Corresponding workplans exist for coho. For an exhaustive list, please refer to the Oregon Plan. For a more detailed summary of the measures contained in the Oregon Plan that impact the Tillamook Bay Basin, please refer to Appendix D.

Department of Fish and Wildlife (ODFW). The ODFW has one of the largest roles in implementing the Oregon Plan. The Department's role can be broken down into four broad responsibilities: (1) physical habitat assessments and improvements; (2) technical assistance to agencies and citizens; (3) hatcheries; and (4) fisheries. Each of these responsibilities consists of many measures. Specific Oregon Plan Actions that are related to the CCMP include:

ODFWIA1S	Population Health Goals for Wild Steelhead (and Coho)
ODFWIB1S	Assess Adult Escapement and Juvenile Production of Wild Steelhead
ODFWIB2S	Inventory and Monitor Wild Steelhead Habitat and Distribution
ODFWIB3	Habitat Restoration Evaluation
ODFWIB4	Inventory Artificial Barriers
ODFWIB5	Inventory Water Diversions (also involves WRD and OSP)
ODFWIIIA2	Manage Steelhead Fisheries to Minimize Impact on Wild Steelhead
ODFWIIIA3	Manage Trout Fisheries to Reduce Ecological Interactions and Mortality on Juvenile Salmonids
ODFWIIIC2S	Evaluate Hook and Release Mortality on Wild Steelhead

ODFWIIIC3S	Assess Marine Survival of Wild Steelhead
ODFWIIID1S	Emphasize Wild Steelhead Restoration in Annual Cooperative Enforcement
ODFWIVA1	Provide Technical Assistance to Regulatory Agencies for Habitat Protection
ODFWIVA3	Apply for Additional Instream Water Rights
ODFWIVA5	Prevent Large Wood Removal
ODFWIVA6	Promote and Assist Voluntary Habitat Protection Actions
ODFWIVA7	Landowner Stewardship Award
ODFWIVA8	Identify Instream Flow Priorities
ODFWIVB2	Promote Habitat Restoration
ODFWIVB3	Promote Use of Beavers to Restore Salmonid Habitat
ODFWIVB4	Use Hatchery Carcasses to Increase Wild Salmonid Production
ODFWIVB6	Fish Habitat Improvement Tax Credit Program
ODFWIVC1	Cooperative Removal of Barriers
ODFWIVC2	Screen Diversions Less Than 30 cfs
ODFWIVC4	Screening of Water Diversions Greater Than 30 cfs
ODFWIVC5	Enhancing Compliance with Fish Screening Statutes
ODFWIVC6	Enhancing Compliance with Fish Passage Statutes
ODFWVA1	Conduct an Outreach Program

Department of Forestry (ODF). Like ODFW, ODF has a range of responsibilities in implementing the Oregon Plan. The major ODF measures include assessing habitats, reducing sediment loading from road failures, improving riparian widths and compositions, improving fish access to spawning and rearing areas, and improving instream habitat conditions:

ODF1S	Road Erosion and Risk Project
ODF2S	State Forest Lands Road Erosion and Risk Project
ODF3S	Technical and Policy Review of Rules and Administrative Processes Related to Slope Stability
ODF4S	Stream Habitat Assessments
ODF5S	North Coast Salmonid Habitat Restoration Project
ODF7S	Fund 7 New Fish Biologists to Provide Technical Assistance for Salmonid Habitat Restoration
ODF8S	Riparian Hardwood Conversions
ODF9S	Northwest State Forest Lands Management Plan
ODF10S	Forest Practices Monitoring Program
ODF11S	Monitoring of Riparian Management Areas under the Forest Practices Act

ODF12S	Monitoring Effectiveness of BMPs in Protecting Water Quality During Aerial Applications of Forest Pesticides
ODF13S	Storms of 1996 Monitoring Project
ODF14S	Monitoring Water Temperature Protection BMPs
ODF15S	Evaluation of Road and Timber Harvest BMPs to Minimize Sediment Impacts
ODF16S	Evaluation of Adequacy of Fish Passage Criteria
ODF17S	Site Specific Plans for Vegetation Retention within RMAs on Northwest and Southwest (Grants Pass) Oregon State Forest Lands.
ODF18S	Wildlife Tree Placement on State Forest Lands
ODF19S	Additional Conifer Retention along Fish Bearing Streams in Core Areas
ODF20S	Limited RMA for Small Type N Streams in Core Areas
ODF21S	Active Placement of LWD during Forest Operations
ODF22S	25 Percent In-Unit Leave Tree Placement and Additional Voluntary Retention
ODF23S	BMP Compliance Audit Program
ODF24S	State Forest Lands Stream Habitat Assessment and Instream Projects
ODF25S	Fish Presence/Absence Surveys and Fish Population Surveys
ODF27S	Increased Riparian Protection
ODF28S	Protection of Significant Wetlands, Including Estuaries
ODF29S	Forest Practice Chemical Protection Rules
ODF30S	Large Woody Debris Recruitment Incentives
ODF31S	Large Woody Debris Placement Guidelines
ODF32S	Fish Presence Survey [OAR 629 635 200(11)]
ODF33S	Increase Number of Streams and Stream Miles Protected
ODF34S	Improve Fish Passage BMPs on Stream Crossing Structures
ODF35S	Increase Design for Larger Flows
ODF36S	Upgraded Road Construction and Fill Requirements
ODF37S	Upgraded Skid Trail Construction and Fill Requirement
ODF38S	Clearcut Limitations
ODF50S	Kilchis Watershed Analysis
ODF54S	Forest Resource Trust
ODF55S	Stewardship Incentive Program (SIP)
ODF 56S	Landowner Stewardship Award
ODF57S	Enhancement of ODF Monitoring Program
ODF58S	Liability Limits for Fish Enhancement Projects
ODF59S	Integrated Forest Assessment
ODF60S	Additional Forest Products Harvest Tax (HB 3700)

ODF61S	Analysis of "Rack" Concept for Debris Flows
ODF62S	Voluntary No Harvest Riparian Management Areas

Private Forest Landowners. Under the Oregon Plan, the private forest industry engages in a number of projects to improve water quality and enhance habitat, including a $170 million program to improve fish passage and road management. Examples include culvert repair, stream enhancement work to core area streams, bridge replacements, and increased buffers on fish bearing streams. Road audit/inventory is in its second year of determining priorities for scheduled maintenance and upgrade to a 100-year flood storm occurrence, and prioritizing placing crushed rock on forest roads to reduce or eliminate sedimentation. OFIC commitments are outlined in ODF's workplans.

Department of Environmental Quality (DEQ). DEQ's major roles in the basin under the Oregon Plan include enforcing the provisions of the Clean Water Act, revising and implementing water quality standards, managing NPDES permits, conducting water quality monitoring, and drafting Total Maximum Daily Loads:

DEQ1S	Implementation of Recently Revised Water Quality Standards for Temperature, Dissolved Oxygen, and Sedimentation
DEQ2S	Development of 303(D) List and Identification of Priorities for TMDL Development
DEQ3S	Watershed Council Support
DEQ4S	Enhance 401 Certification for Fill/Removal Operations
DEQ5S	Revise Water Quality Standard for Sediment
DEQ6S	Implement Antidegradation Water Quality Standard
DEQ7S	Apply for Instream Water Rights on Streams with TMDLs
DEQ9S	Implement Water Quality Standards for Biological Criteria, Nutrients, Toxics and pH
DEQ10S	Develop Water Quality Standards for Wetlands
DEQ11S	Revise Water Quality Standards for Nutrients
DEQ12S	Designation of Salmon Critical Habitat as Outstanding Resource Waters
DEQ14S	Management of Point Source Discharges through NPDES Permits
DEQ15S	Management of Storm Water Discharges through NPDES Permits
DEQ16S	Revise SRF Loan Criteria to Help Protect Salmon
DEQ17S	Implement On-site Program to Control Nutrient Loads
DEQ18S	Implement Groundwater Protection Act
DEQ19S	Water Quality Monitoring and Assessment
DEQ20S	Coastal Nonpoint Pollution Control Program

DEQ21S Tillamook Bay National Estuary Program

Division of State Lands (DSL). DSL is revising its removal-fill permitting requirements, reducing instream gravel removal activities, revising essential salmonid habitat rules, and coordinating restoration, education, and planning activities with other agencies:

DSL1 Develop Standardized Permit Conditions Reflecting Best Management Practices for Removal Fill Activities

DSL2 Limit Commercial Gravel Removal from Individual Bars to Annual Recruitment

DSL3 Revise Administrative Rules on Essential Salmonid Habitat

DSL4 Strengthen Interagency Coordination in Removal-Fill Permitting

DSL6 Revise the GA for Erosion Control to Enhance Habitat Protection

DSL7 Revise the GA for Fish Habitat Enhancement to Improve Habitat Values

DSL8 Facilitate More Wetland Restoration and Enhancement Projects

DSL9 Develop Guidelines for Issuing Individual Permits, rather than GAs

DSL10 Conduct Monitoring and Outreach on Recreational and Small Scale Placer Mining in Essential Habitat

DSL12 Analyze a Payment in Lieu of Mitigation Approach for Commercial Gravel Removal

DSL13 Target Compensatory Wetlands Mitigation to Salmon Habitat Projects

DSL14 Work with Other Agencies to Clarify Jurisdiction over Removal of Large Woody Debris

DSL15 Increase Field Presence in Coastal Essential Salmonid Habitat

DSL16 Develop Administrative Rules for Mitigation Banking and For Payment or Protection in Lieu of Mitigation

DSL17 Promote Coordination of Wetland Inventories with Other Natural Resource Planning Efforts

DSL18 Develop Administrative Rules on Locally Significant and Outstanding State Wetlands

DSL19 Continue Implementation of Oregon's Wetland Conservation Strategy

DSL21 Evaluate the Habitat Potential of Scattered Coastal Tracts

DSL23 Update Public Education Materials on Removal-Fill Projects

DSL24 Develop Information Packets for Watershed Councils

DSL26 Analyze and Implement Regulatory Streamlining Options

DSL27 Add Permanent Field Staff in Coastal Basins

DSL31	Extend Essential Salmonid Habitat Designations to Include Steelhead
DSL33	Develop and Implement a Compliance Monitoring Program

Department of Land Conservation and Development (DLCD). Under the Oregon Plan, DLCD implements the Coastal Nonpoint Pollution Control Program (CNPCP), identifying estuarine restoration opportunities, and implementing (statewide planning) Goal 5 rules for riparian and wetland protection:

DLCD 1	Implement the Coastal Nonpoint Pollution Control Program (CNPCP)
DLCD 2	Riparian Area Technical Assistance
DLCD 3	Identify Estuarine Restoration Opportunities
DLCD 5	Implement Urban Management Measures under the CNPCP

Department of Agriculture (ODA). ODA's primary responsibilities under the Oregon Plan are to implement the SB 1010 Program, manage Confined Animal Feeding Operations, and educate farm operators:

ODA 1	SB 1010 Program
ODA 2	Confined Animal Feeding Operations Program (CAFOs).
ODA 3	Education/Outreach/Incentives

Department of Transportation (ODOT). ODOT focuses on physical improvements to roads and culverts, resource planning, education, and habitat enhancement projects:

ODOT2	Culvert Inventory, Assessment, and Remediation
ODOT3	Resource Management Plans
ODOT4	Participation in Watershed Councils
ODOT6	Environmentally Sensitive Design
ODOT7	Storage and Disposal Plan for Woody Debris
ODOT8	Statewide Erosion Control Handbook
ODOT12	Education
ODOT15	Habitat for Fish in Wetland Mitigation
ODOT19	Mitigation Banking
ODOT20	Compliance Audit

Oregon Marine Board (OMB). The Marine Board's primary effort involves increased enforcement of marine and aquatic habitat-related laws:

OMB1	Increase Number of Streams Adopted Through Adopt a River Program.
OMB2	Increase Number of Boat Waste Pump Outs and Dump Stations.
OMB3	Increase Enforcement of Outfitter/Guide Laws.

Water Resources Department (WRD). The Oregon Plan measures for

WRD emphasize flow monitoring, reporting, and protection; fish passage; and instream water rights management:

WRD S 1	Public Interest Review to Protect Salmonids
WRD S 2	Water Right Transfer Review for Fish Concerns
WRD S 4	Issuance of Instream Water Rights (ISWRs)
WRD S 6	Identify Unmet Instream Flow Needs
WRD S 7	Coordinated Enforcement Plan
WRD S 8	Increased Distribution and Enforcement
WRD S 9	Installation of Monitoring Stations
WRD S 10	Inventory Water Diversions
WRD S 11	Dissemination of Streamflow Data
WRD S 12	Improving Efficiency and Prohibiting Waste
WRD S 13	Agricultural Water Conservation Program
WRD S 14	Municipal Water Management Program
WRD S 15	Instream Transfers and Leases
WRD S 16	Water Right Forfeiture
WRD S 17	Public Outreach and Information
WRD S 19	Off stream Storage
WRD S 20	Serious Water Management Problems Areas
WRD S 21	Peak Flow Protection
WRD S 22	Modification or Replacement of Diversion Dams Which Interfere with Fish Passage
WRD S 25	Compliance Rate Monitoring
WRD S 29	Amend Current Licenses to Improve Fish Passage

Federal Agencies and the OPSW:

Although not bound by State rules, federal agencies are part of the OPSW, which recognizes their efforts in the following OPSW actions:

Bureau of Land Management and U.S. Forest Service

BLM/USFS1 X Watershed/Habitat Restoration

BLM/USFS2 X Research

BLM/USFS3 X Monitoring and Evaluation

BLM/USFS4 X Inventories

BLM/USFS5 X Planning and Assessment

BLM/USFS6 X Technical Training

BLM/USFS7 X Cooperative Funding

BLM/USFS8 X Education/Interpretation/Outreach

BLM/USFS9 X Natural Disaster Coordination

BLM/USFS10 X Interagency and Tribal Coordination

BLM/USFS11 X Watershed Council Support and Coordination

BLM/USFS12 X Key Aquatic Habitat Acquisition

BLM/USFS14 X Clean Water Act Section 303 Compliance

BLM/USFS15 X Safe Drinking Water Act Implementation

U.S. Fish and Wildlife Service

USFWS1 X Jobs-in-the-Woods Program

USFWS2 X Habitat Conservation Plan Development

USFWS3 X Aquatic Habitat Conservation Agreement Development and Conservation Activities

USFWS4 X Technical Assistance on 1996 and 1997 Floods

USFWS5 X Partners for Wildlife (PFW) Program

USFWS7 X Assistance to Watershed Councils

USFWS8 X Northwest Forest Plan Implementation Assistance

USFWS9 X Biological Opinions to Prevent or Reduce Impacts to Listed Species

USFWS12 X Acquisition and Restoration of Coastal Wetlands for National Wildlife Refuges

USFWS13 X Review of Dredge and Fill Projects

USFWS14 X Response to Oil and Hazardous Substance Spills

USFWS16 X Technical Assistance for Planning

USFWS17 X Adopt-A-River and SalmonWatch Programs

USFWS18 X Support to Ongoing Educational Programs (Outdoor School and Salmon Camp)

USFWS19 X Natural Resource Education and Community Awareness of Aquatic Resources

USFWS20 X National Estuary Program

USFWS22 X Avian Predator Management

USFWS23 X Environmental Contaminant Investigations

National Oceanic and Atmospheric Administration and National Marine Fisheries Service

NOAA-NMFS1 X Hire the Fisher Habitat Restoration Program

NOAA-NMFS2 X Watershed Councils

NOAA-NMFS3 X Habitat Conservation Plans

NOAA-NMFS4 X Habitat Matrix

NOAA-NMFS5 X Northwest Forest Plan and Regional Ecosystem Office

NOAA-NMFS8 X Fisheries Harvest

NOAA-NMFS9 X Supplementation

NOAA-NMFS10 X Hatchery Research

NOAA-NMFS11 X Section 404/10 Actions

NOAA-NMFS12 X Highway Projects

NOAA-NMFS15 X Water Supply Projects

NOAA-NMFS18 X Coastal Change Analysis

NOAA-NOS19 X Coastal Management and Nonpoint Sources

NOAA-OAR22 X Oregon Sea Grant

NOAA-NMFS24 X Steelhead Genetics

NOAA-NMFS25 X Population Status

NOAA-NMFS26 X Estuarine and Ocean Ecology Research

NOAA-COP27 X U.S. Global Ocean Ecosystem Dynamics Program (GLOBEC)

NOAA-NMFS29 X For the Sake of the Salmon

NOAA-NMFS31 X Access Remote Sensing Data through the Global Fiducial Program

NOAA-NOPP32 X National Ocean Partnership Program

NOAA-OAR33 X Effects of El Nino

NOAA-NMFS34 X Data Collection

NOAA-NMFS35 X Hazardous Materials Response and Assessment

NOAA-NMFS36 X National Status and Trends Program

NOAA-NMFS37 X Estuary Eutrophication

NOAA-COP39 X Land Cover Change Analysis

NOAA-NMFS40 X Memorandum of Understanding with the Natural Resource Conservation Service

NOAA-NMFS41 X Integration of Endangered Species Act with Water Quality Management Planning

Environmental Protection Agency

EPA1 X Aligning Water Quality Recovery Priorities with Salmon Recovery

EPA2 X Development of Water Quality Standards that More Closely Match Salmon Life History Needs

EPA3 X Monitoring and Evaluation of Best Management Practices

EPA4 X Technical Assistance

EPA5 X Funding Assistance

Bureau of Reclamation

BOR1b X Funding for Oregon Water Resources Department

BOR1d X Technical Assistance for Watershed Council Activities

BOR4a X Development of Fish Kill Remediation Strategies

Natural Resource Conservation Service

NRCS1 X Conservation Operations

NRCS2 X Soil Survey

NRCS3 X Snow Survey

NRCS4 X National Resources Inventory (NRI)

NRCS5 X Plant Materials Program

NRCS6 X Farm Bill Financial Assistance Programs

NRCS7 X Resource Conservation and Development (RC&D)

NRCS8 X State Technical Committee

NRCS9 X Hire-the-Fisher Habitat Restoration Program

NRCS10 X Cooperative River Basin and Small Watershed Program

NRCS11 X Assistance and Guidance

Federal Highway Administration

FHWA1 X Culvert Repair and Modification

Bonneville Power Administration

BPA3 X Funding for Habitat Project Placeholder

BPA9 X Access to Computer and GIS Data Bases

Federal Water Policy

Federal water quality policies mandate and provide authority for state and local water quality regulations. The 1972 Clean Water Act (CWA) and its subsequent amendments and the 1990 Coastal Zone Management Act Reauthorization Amendments established the major federal guidelines on water quality control throughout the country. State and local authorities implement provisions of these policies in the Tillamook Bay Watershed primarily through the management mechanisms discussed throughout this chapter.

The Clean Water Act

The federal CWA provides the management framework for virtually all local water quality policies and projects. In addition to providing funding for water quality enhancement programs and projects, the Act mandates the creation and enforcement of water quality standards.

Water Quality Standards

Section 303 of the CWA requires states to set water quality standards for the protection of existing and designated beneficial uses for surface water bodies. In Oregon, the Environmental Quality Commission (EQC) sets

these standards on all water quality parameters including temperature, turbidity, pH, dissolved oxygen, bacteria, biological criteria, and habitat modification.

Section 303 (d) of the Clean Water Act requires states to develop a list of water bodies that do not meet U.S. Environmental Protection Agency (EPA) standards for the water quality parameters listed above. In the Tillamook Bay Watershed, stream reaches are currently 303(d) listed for bacteria, temperature, sedimentation, and habitat modification. The DEQ also lists "water bodies of concern," where more data are needed to establish failure to meet water quality standards. Many local stream reaches are listed as "of concern" for parameters including: flow modification, habitat modification, sedimentation, nutrients, dissolved oxygen, and pH. The DEQ is presently monitoring water bodies throughout the Watershed to collect the data needed to clarify their 303(d) status.

Total Maximum Daily Loads

For these 303(d) listed stream reaches, the CWA further requires states to develop water quality management strategies known as Total Maximum Daily Loads (TMDLs). TMDLs address the sources and degrees of pollution in 'water quality limited' streams, rivers, and lakes. Specifically, they (1) provide strategies to reduce chemical, nutrient, and sediment loading as well as physical inputs like sunlight where necessary, and (2) set daily limits on the amount and type of pollutants that can enter the stream. According to the DEQ's *Guidance for Developing Water Quality Management Plans that Function as TMDLs*, "a TMDL addresses pollution problems by systematically identifying problems, linking them to watershed characteristics and management practices, establishing water quality improvement objectives, and identifying and implementing new or altered management measures designed to achieve those objectives." They also include enforcement mechanisms when sources violate load allocations. DEQ will publish draft temperature and bacteria TMDLs for the Tillamook Basin in 1999.

Coastal Nonpoint Pollution Control Program

Section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA) requires states with Coastal Zone Management Plans to develop and implement programs to control sources of nonpoint pollution which impact coastal water quality. The National Oceanic and Atmospheric Administration (NOAA) and the U.S. Environmental Protection Agency (EPA) provided guidance to the states on program development and approval in January 1993. Coastal states are to implement a set of management measures based on guidance published by EPA. The guidance contains 56 management measures separated into six groups: agricultural activities, forestry activities, urban areas, marinas, hydromodification activities, and protecting wetlands.

Oregon Department of Environmental Quality (DEQ) and Department of Land Conservation and Development (DLCD) have joint responsibility for coordinating the implementation of Section 6217 of CZARA. With assistance from other state agencies, DEQ and DLCD submitted the Oregon Coastal Nonpoint Pollution Control Program, (CNPCP) to NOAA and EPA in July of 1995. Oregon's CNPCP submittal described existing programs and proposed work tasks that would meet the terms of CZARA and EPA's guidance and work to improve water quality in Oregon's coastal management area. Current state water quality, wetland, and land use laws, as well as the Forest Practices Act and the early development of The Oregon Plan for Salmon and Watersheds insured that the state already met many requirements of CZARA. In January 1998, after reviewing the state's program submittal, EPA and NOAA returned their findings to the state, granting conditional approval to Oregon's program. The findings included 13 conditions of approval.

DEQ and DLCD divided the approval conditions into 40 discrete tasks. Of these tasks, approximately 25% had been addressed to the satisfaction of EPA and NOAA as of March 1999, although documentation of these resolutions has not yet been formalized. With the help of partner agencies (such as the Oregon Department of Transportation and the Department of Agriculture), who participated in development of the original submittal, the remaining 75% have been prioritized within the framework of the state's larger water quality and salmon recovery efforts.

Oregon plans to implement some CNPCP Management Measures through Water Quality Management Plans being developed as required by the TMDL process, the agricultural water quality plans (SB 1010 rules) and the State Forest Practices Act in the following Oregon Plan priority basins: Umpqua, Rogue, South Coast, and Tillamook/North Coast.

Oregon Statewide Land Use Planning

In 1973, the Oregon Legislature adopted Senate Bill 100, which enacted the statewide land use planning program. Oregon's Department of Land Conservation and Development (DLCD) administers the program through a system of planning goals and guidelines that mandate communities and counties to meet certain land use requirements. Tillamook County and its incorporated communities administer statewide goals through locally developed, adopted and enforced comprehensive plans and implementing ordinances, including those that regulate development within wetland, riparian, and estuarine areas. Enforcement is also provided by the COE and DSL, which administers pass-through grant funds to local governments to complete local wetlands inventories under Goal 5.

Resource Management

Lowland and Floodplain

Lowland areas have been altered as a result of urbanization and the conversion of lowland areas to pastureland. This section discusses the current policies that manage the use and conservation of resources located in the lower basin. Specifically, it summarizes:

- wetland conservation,
- water quality management on agricultural lands,
- riparian management, and
- flood control.

Wetlands Conservation

Most of the basin's wetlands have been lost to conversions for human use. Efforts to conserve remaining wetland habitats focus on local land use regulation, removal-fill laws, and restoration incentives.

Land Use Planning

The Tillamook County Comprehensive Plan maps and identifies significant wetland areas as mandated by Statewide Land Use Planning Goal 5 (freshwater) and Goal 17 (coastal). The Tillamook County Land Use Ordinance protects these significant areas from development by permitting development only if it will not result in major impacts to the wetland areas. Municipalities' regulations may or may not necessarily concur with the State's Goals.

Removal-Fill Permits

Regardless of whether local jurisdictions identify wetlands as "significant," all wetlands actions fall under the jurisdiction of the Oregon Division of State Lands (DSL), U.S. Army Corps of Engineers (COE), and EPA. Because of the extent of wetland loss in the basin and elsewhere, these agencies place increasingly stringent regulations on wetland alteration. In addition, the U.S. Department of Agriculture (USDA) offers incentives to landowners to enhance degraded habitats on agricultural lands.

Under Section 404 of the CWA, fill activities affecting "waters of the United States" require a permit from the COE. Oregon's Removal and Fill Law requires authorization for any activity which removes 50 or more cubic yards of material per year from state waters and/or places an equal amount into state waters. Although removal-fill activities affect more than just wetlands (rivers, streams, lakes, and bays also fall under this law), this policy is vital in restricting major wetland conversion activities.

Both COE and DSL issue permits (called "Nationwide Permits" and "General Authorizations," respectively) which release an applicant from applying for "small" jobs. The NMFS, U.S. Fish and Wildlife Service (USFWS), DEQ, and ODFW review proposed projects' impacts on fish and wildlife habitats.

The DSL recently designated essential salmonid habitat (ESH) for wild salmonid runs in Oregon. The designation protects rearing and spawning (but not migratory) areas for native runs by requiring removal-fill permits for most instream activities, regardless of size.

Restoration Incentives

The federal government has made an effort in recent years to focus funding on wetland restoration activities. The most prominent include USDA Farm Bill and CWA funding.

Wetlands Reserve Program (WRP). Administered by the Natural Resource Conservation Service (NRCS) and Farm Services Agency (FSA), the WRP is a voluntary program under the USDA Farm Bill through which landowners receive payment for permanent or 30-year conservation easements. The program also offers cost-share for wetlands restoration.

Wildlife Habitat Incentives Program (WHIP). WHIP is a voluntary, incentive-based program designed to help private landowners improve fish and wildlife habitat. Under WHIP, landowners create and implement habitat development plans with technical and financial assistance from the NRCS.

Clean Water Act 319 Funds. Established by the CWA Amendments of 1987, the 319 program provides money to states to implement "on-the-ground" projects which will improve water quality through the reduction of nonpoint source pollution. Funding is not directed solely toward wetland areas. Managers in the basin use a significant portion of 319 funding to prevent and treat pollution by supporting wetland projects.

The State of Oregon also assists with wetland projects through the ***Wetland Mitigation Banking Revolving Fund***, which DSL administers, providing grants for wetland restoration and enhancement projects.

Water Quality Management on Agricultural Lands

In recent years, water quality has become an important farm management issue. The Oregon Department of Agriculture (ODA) is improving stewardship on agricultural lands through increased Confined Animal Feeding Operation (CAFO) inspections and Senate Bill (SB) 1010 Agricultural Water Quality Management Area Plans. NRCS and Tillamook County Soil and Water Conservation District (SWCD) efforts also demonstrate the agricultural community's increased emphasis on water quality.

Confined Animal Feeding Operations (CAFOs)

Within the Tillamook Bay Watershed, Confined Animal Feeding Operations (CAFOs) are the primary agricultural activity. Statewide, the ODA manages CAFOs through permits and periodic inspections. Recently, the agency located an additional inspector in Tillamook to ensure operator compliance with CAFO permits in the North Coast Basin.

Senate Bill 1010

The ODA plays a vital role in the implementation of the Healthy Streams Partnership agreement through Senate Bill 1010. Under SB 1010, ODA works with farmers, ranchers, and other parties to develop Agricultural Water Quality Management Area Plans for regions that contribute to water quality limited streams (or wherever a water quality management plan is required by law). Focusing exclusively on agricultural lands and practices, SB 1010 responds to TMDL requirements assigned to agricultural lands. Due for completion in the spring of 1999, the goal of the North Coast Basin plan will be "to prevent and control water pollution and soil erosion from agricultural activities in order to achieve water quality standards."

Like TMDLs developed by DEQ, Agricultural Water Quality Management Area Plans identify the factors contributing to agricultural nonpoint source pollution, recommend measures to correct them, and provide enforceable pollution prevention control measures. Once completed, all farm operations within a basin plan's range must comply with its provisions. The basin plan provides flexibility in the specific management measures operators use to meet the plan's conditions.

Individual Farm Plans. Since 1980 and the beginning of the Tillamook County Rural Clean Water Project, NRCS and SWCD have worked with CAFO and other farm operators to reduce contamination from agricultural lands. Currently, implementation of the North Coast Basin SB 1010 Plan depends upon these agencies' commitment to work toward the development of voluntary farm management plans that adhere to the conditions of the North Coast Basin Plan.

The SWCD, NRCS, and FSA help operators develop and finance their plans. To varying degrees, plans typically follow a template that ODA includes in the SB 1010 Plan.

Environmental Quality Incentives Program (EQIP): As part of the USDA Farm Bill, EQIP allows NRCS and FSA to provide planning, technical, and financial assistance to help agricultural landowners develop farm management plans. The program provides incentives like technical assistance, payments, and cost sharing to improve manure management, and institute erosion control and other practices which benefit water quality.

Methane Energy and Agricultural Development Project

The Methane Energy and Agricultural Development (MEAD) project will employ a process of anaerobic digestion of animal wastes to produce biogas which is then used as fuel for a heat and energy production plant. Poised for development, MEAD will convert a portion of the waste produced by Tillamook County's dairy cattle into marketable products including energy, potting soil, soil amendments, and hot water or steam.

Water Quality Management on Developed Lands

Three sources of wastewater from residential, commercial, and industrial lands contribute to degraded water quality in the Bay: wastewater treatment plants, stormwater runoff, and septic systems. These are managed and regulated by the DEQ, Tillamook County, and/or the cities of Tillamook, Bay City, and Garibaldi.

National Pollutant Discharge Elimination System (NPDES) Permits

Under the Clean Water Act, NPDES Permits control all point sources discharging into waters of the State. The DEQ administers the NPDES program, which provides the primary regulatory tool for wastewater treatment facilities by limiting the amount of pollutants discharged into state waters. In the Tillamook Bay Watershed, six treatment facilities operate. Four are publicly owned and two privately owned.

Stormwater Control Permits

Under federal law, the DEQ regulates sedimentation from development and construction on parcels of land five acres or larger through stormwater permits. Stormwater permits regulate the escape of sediment from construction and industrial sources. The person or entity responsible for the development must submit an Erosion and Sediment Control Plan to DEQ before construction can begin. The objective of the plan is to minimize the erosion of disturbed land during construction and post-construction activities.

On-Site Sewage Disposal System (OSDS) Management

The Environmental Quality Commission (EQC) established standards for the design, construction, operation, and maintenance of OSDSs. Responsibility for enforcing these guidelines falls to the DEQ, which has contracted local responsibility for permitting, inspections, and certification to Tillamook County. The FDA requires a periodic survey of septic systems near commercial shellfish harvesting water bodies.

Riparian Resource Management

Riparian areas link aquatic and terrestrial habitats as well as upland and lowland areas. Throughout the Watershed, riparian conditions vary due to the intensity of land use and effectiveness of regulations. Tillamook County and the cities regulate riparian alteration, except on agricultural lands (where they regulate only structures) and forested land. On these lands, ODA and ODF have sole authority to establish policies under SB 1010 and through the Forest Practices Act (FPA), respectively. Both the ODA's SB 1010 and Oregon's non-farm/forest riparian policies are summarized below. ODF policy is discussed in the 'Upland Forest' section of this chapter.

Non-Farm and Forest Land

The Tillamook County Land Use Ordinance implements Oregon's Statewide Land Use Planning Goals and defines riparian protection throughout the County's unincorporated areas. Currently, the ordinance defines riparian zones as areas within 50 feet of estuaries, lakes larger than one acre, and the main stems of selected rivers where widths are greater than 15 feet. (Within the Tillamook Bay Watershed these include the Tillamook, Trask, Kilchis, Wilson, and Miami rivers.) The Ordinance designates those streams not listed above but still reaching at least 15 feet in width 25-foot riparian zones. All other perennial streams have 15-foot riparian zones.

The DLCD recently amended its Goal Five (Open Spaces, Scenic and Historic Areas, and Natural Resources) provisions by expanding the required riparian buffer. By the end of 2000, Tillamook County expects to expand its 50-foot buffers to 75 feet, and those designated 25 and 15 feet will become 50 feet. In addition to restricting development, the ordinances also protect riparian vegetation by prohibiting removal of trees or more than 50% of the understory vegetation within the riparian area. The incorporated cities have adopted similar land use ordinances, updating them at their own pace.

Floodplain/Lowland Pastures

SB 1010 water quality management plans place increased emphasis on riparian restoration in agricultural lands. Although the North Coast Basin plan will not mandate riparian restoration, management measures it establishes should improve riparian zones over the long term. The SB1010 process defines pollution prevention and management control measures (PCMs) to improve water quality and enhance riparian areas to a healthy riparian condition (HRC).

The Conservation Reserve (Enhancement) Program. The Conservation Reserve Program (CRP) provides rental payments to agricultural landowners for conserving riparian buffers. However, local landowners have not applied for CRP funding because rental payments do not match the value of pastureland. The USDA has funded Oregon under the Conservation Reserve Enhancement Program (CREP). Designed to increase CRP payments to landowners, CREP funds may increase the usage of CRP in the basin.

Lowland Flood Control

Lowland habitats have been severely altered due to structural flood control tools utilized to create and maintain pastureland. Structural flood control involves levees, dikes, and, until the 1970s, channel dredging. Tillamook Bay's floodplain has an extensive system of levees and dikes created by a patchwork of independent diking districts. This system effectively controls daily flooding of tidal marshes and annual flooding of floodplains.

Project Impact

The Federal Emergency Management Agency (FEMA) in June 1998 designated Tillamook County as a Disaster Resistant Community under its Project Impact program. Project Impact constitutes an effort by FEMA to enable natural disaster-prone communities to better safeguard against loss of life and property during major events. A community-based approach, it provides seed money for communities to leverage private and public funds to finance disaster mitigation projects.

Habitat Restoration and Flood Mitigation Activities

The Corps of Engineers (COE) initiated and funded a Reconnaissance Study in March 1998 to determine their interest in funding a detailed feasibility study of flood mitigation and ecosystem restoration activities in Tillamook basin. If further studies are justified and supported by the community, the COE will prepare a scope of work and cost-sharing agreement with a non-federal sponsor. A multi-year feasibility study would identify and design specific flood mitigation and habitat restoration projects within the Watershed. Raising the 50% local match for the $3

million feasibility study and model is a major stumbling block, and the Tillamook County SWCD, as the local sponsor, is seeking State help.

WRDA 99 Program

Specific projects determined through the feasibility study may be implemented under the "WRDA 99" program. This COE initiative under the Clean Water Action Plan aims to mitigate the impacts of flooding while restoring wetland and riverine habitats. The COE has identified Tillamook Bay as a priority area for study. If implemented locally, WRDA 99 measures will likely include floodplain restoration; house-raising and relocation from floodways; selective and voluntary dike modifications and/or setbacks; and other mitigation and restoration activities. The federal government is presently considering WRDA 99 for adoption.

Tillamook County Flood Hazard Mitigation Plan

In October 1996, Tillamook County's Board of Commissioners adopted a comprehensive Flood Hazard Mitigation Plan (FHMP). The goals of the FHMP are to reduce: 1) flood hazards and damage, 2) the environmental impacts of flooding, and 3) the long-term costs of flood control and floodplain management. The FHMP recommends a suite of activities to achieve its goals:

- structural capital improvement projects;
- relocation and elevation projects;
- maintenance and monitoring;
- river planning; flood warning and emergency response;
- complaint response and enforcement; and
- intergovernmental coordination.

The FHMP and CCMP include similar objectives, including managing floodplains, rivers, streams, and other water resources for multiple uses, such as flood and erosion hazard reduction, fish and wildlife habitat, and water supply.

National Flood Insurance Program

Tillamook County participates in the National Flood Insurance Program (NFIP). The NFIP, established by Congress in 1968, provides low-cost flood insurance within communities with approved flood control programs. Tillamook County has had an approved program since 1978. In 1997, 1,099 flood insurance policies provided $122 million in total coverage in Tillamook County.

Tillamook County Flood Hazard Ordinance

To be eligible for the NFIP, Tillamook County passed a flood hazard ordinance consistent with the NFIP. A principal tool for flood regulation is the Flood Hazard (FH) Overlay Zone, contained in the County Land Use Ordinance. The FH Zone restricts any uses that threaten community health and safety as a result of flood or erosion and requires flood damage protection for uses within the zone. The FH Ordinance also regulates the alteration of floodplains and construction or alteration of barriers to flood water within the Overlay Zone.

Because of the complexity of the flood problems in the City of Tillamook and tidal effects on flooding, no floodway was established as part of the federal flood insurance study. The methods for delineating floodways do not apply in this case, because flood waters flow in many directions: away from the river channel, down the river channel; and around log and debris jams. Tillamook Bay tidal action, which complicates and increases flood hazards, cannot be incorporated in available floodway procedures. As a result, no floodway restrictions exist on building in these areas.

Other Local Efforts

The Tillamook County SWCD can legally engage in flood control projects, but to date has not done so. Recently, the Tillamook County Flood Control Group has led a citizens' movement to create a Tillamook County Flood Control District. The group did not place a referendum on the November 1998 ballot, though it may do so in 2000.

Upland Forest

Forest Management Regulations

Eighty-nine percent of the Tillamook Bay Watershed is forested. The Oregon Department of Forestry regulates operations on all non-federal forest lands under the Oregon Forest Practices Act (FPA), which establishes standards for forest management operations. These standards are designed to limit the impact of forest operations on water quality and fish and wildlife habitats. ODF will soon manage Tillamook State Forest lands under its Northwest State Forest Management Plan and X if implemented X the Western Oregon State Forests Habitat Conservation Plan (HCP).

The Forest Practices Act

The Forest Practices Act (FPA) of 1971 was the State's first effort to use Oregon Administrative Rules (OARs) to comprehensively regulate forest management activities. The periodically-revised FPA regulates forest practices on both state and private forest land, defining standards for such activities as slash disposal, harvesting, road construction, reforestation, and the application of chemicals. In consultation with other agencies, the Board of Forestry develops and implements all rules relating to these and other issues. The ODF administers the FPA.

Northwest State Forest Management Plan

Due to be adopted in 1999, the Oregon Northwest State Forest Management Plan (OPSW Action ODF-95) provides a long-range vision of the management of State Forest lands, including the Tillamook State Forest, under an approach called "structure-based management." The goal of structure-based management is to selectively harvest forest lands in a manner that provides a diverse forest landscape and creates habitat for all indigenous fish and wildlife species.

Structure-based management. A new approach for State Forest lands called structure-based management (SBM) is a central theme in the development of the Northwest Oregon State Forest's Long Range Management Plan. Currently under development, an SBM approach would include a mix of active forest management techniques and practices that produce an array of forest stand structures across the landscape. ODF is analyzing four different stand structure targets, and is currently working out the eventual proportion of each structure across the forest, including:

- older forest structure,
- complex stands,
- closed canopy, and
- regeneration areas.

The individual stands themselves would be constantly changing, but the range of stand types and their relative abundance across the forest would be reasonably stable. Because the structures are in a dynamic balance across the landscape, the forest theoretically provides a steady flow of timber volume, jobs, habitats, and recreational opportunities.

Habitat Conservation Plan (HCP)

As part of its Forest Management Plan, ODF is developing the Western Oregon State Forests HCP to comply with the incidental take permit requirements of the ESA. The April 1998 Draft HCP proposes policies and objectives for the management of key habitats throughout much of the upper Watershed. The Draft HCP conserves salmonid habitat mostly through increased riparian protection and improved upland management.

Riparian Management in Upland Forests

Enforced under the FPA, Riparian Management Areas (RMA) provide the most critical salmonid habitat management mechanism established by the ODF. According to the FPA, RMA "widths are designated to provide adequate areas along streams, lakes, and significant wetlands to retain the physical components and maintain the functions necessary to meet the [FPA] protection goals for water quality and fish and wildlife."

Currently, ODF proposes to increase RMA widths in the basin under the Draft HCP. RMAs under the FPA and HCP are discussed below.

Forest Practices Act

The FPA is designed to ensure, to the extent practicable, that forest operators do not impair water quality or fish and wildlife habitat. Table 1-1 summarizes Riparian Management Area widths established under the FPA.

Table 1-1. Riparian Management Area Widths for Streams of Various Sizes and Beneficial Uses

Water Body*	Large	Medium	Small
Type F	100 feet	70 feet	50 feet
Type D	70 feet	50 feet	20 feet
Type N	70 feet	50 feet	**

* F=Fishbearing, D=Domestic use, N=Non fish bearing

**Any specified water quality protection measures, and see OAR 629-640-200.
Source: Oregon Forest Practices Administrative Rules and Abridged Forest Practices Act, January 1997. (OAR 629-635-310)

Habitat Conservation Plan. The April 1998 Draft HCP proposes adaptive management standards that emphasize the protection of aquatic resources. The proposed plan divides RMAs into three terrestrial zones of varying widths: the stream bank zone (high water level to 25 feet), the inner RMA zone (25 to 100 feet for Type F streams, 25 to 85 for Type N), and the outer RMA zone (100 to 170 feet for Type F, 85 to 170 for Type N). Specific management standards on operations within each of the RMA zones vary significantly based on fish presence or absence, stream size classification, and (for N type streams) stream function. In sum, the proposed HCP standards will produce enhanced riparian functioning beyond that attained under current FPA standards.

Federal Forest Lands

Bureau of Land Management and U.S. Forest Service lands are governed by the Northwest Forest Plan, originally adopted in 1994 as the federal response to the Endangered Species Act listing of the Northern Spotted Owl. The plan amended the agencies' Land Use Planning and Management Documents, adopting certain best management practices (BMPs), often stricter than those required on state or private land. The two agencies also have their own compliance rules for such federal laws as the Clean Water Act. USFS and BLM efforts which support the CCMP are listed on Pages 3-14 through 3-16.

Water Quality Management on Forest Lands

The FPA provides the fundamental water quality management policy enforced on non-federal forest lands. If implemented, the HCP also contains measures that will improve forest water quality management. Finally, as stated previously, private land owners also undertake activities to improve water quality under the Oregon Plan.

Forest Practices Act

Under Oregon Revised Statutes, the FPA "establishes best management practices and other rules applying to forest practices as necessary to insure that nonpoint source discharge of pollutants resulting from forest operations do not impair [state] water quality." The most significant provisions of the FPA with regard to sediment loading include the regulation of timber harvesting and forest roads.

Timber Harvesting. The FPA establishes standards for forest harvesting that will "maintain the productivity of the forest land, minimize soil and debris entering waters of the State, and protect wildlife and fish habitat." The types of measures defined for timber harvesting include soil protection, the location of trails and drainage systems, the treatment of waste materials, and provisions for maintaining forest productivity and harvesting on high risk sites.

Forest Roads. The FPA manages forest roads to prevent non-point source pollution from entering surface waters by regulating road location, design, construction, and maintenance. Specific examples of provisions include: avoiding road construction on high risk sites, RMAs, and other areas; road, culvert, and crossing design; debris and structure placement; road maintenance and closure requirements; and other provisions.

Habitat Conservation Plan

In addition to habitat conservation strategies aimed at RMAs, the HCP also proposes upland management activities that will reduce sediment loading into surface waterways. These activities focus on the relationship between slope stability and landslides as well as forest roads.

Slope Stability. According to the April 1998 Draft HCP, ODF proposes using risk-based management and site specific BMPs to restore properly functioning landslide processes and, ultimately, to restore and maintain aquatic habitats. Risk-based management principles include establishing a three-level approach to managing slope stability issues. The HCP defines input required from a geotechnical specialist at each of three levels. These include:

- Level I: Programmatic Planning, which requires no specific operations;
- Level II: Intermediate Level Planning, which requires a comparison of risk-based alternatives; and
- Level III: Site Specific Geotechnical Problem Solving, which requires site specific inventory, plans and analyses.

Forest Roads. Fundamental to the restoration and maintenance of aquatic habitats objective is the need to reduce sedimentation caused by road–related landslides and chronic erosion. The April 1998 Draft HCP presents procedures and standards for road system planning, design and construction, maintenance, and closure.

Estuary and Slough

Statewide Planning Goal 16 (Estuarine Resources) governs Tillamook Bay's estuarine and slough habitats. Tillamook County implements Goal 16 through the county Land Use Ordinance and Comprehensive Plan. The ODA manages shellfish harvests in the Bay.

Estuarine Planning

Goal 16 aims "to recognize and protect the unique environmental, economic, and social values of each estuary and associated wetlands [and to protect, maintain, develop, and restore the benefits of Oregon's estuaries]." Under Goal 16, the State established a coastwide classification system to maintain diversity among the State's estuaries. The classifications include natural, conservation, shallow draft development, and deep draft development. Tillamook Bay is classified as a shallow draft development estuary.

The Tillamook County Comprehensive Plan

The Comprehensive Plan establishes the long range plan for management of the estuary. Despite the Bay's classification as a "development" estuary, the plan emphasizes conservation of the Bay's resources and the long-term stability of life that depends on it. This is reflected in the ordinances that govern the Bay, and the land use map that designates much of the Bay as "estuary natural." See Figure 4-11. Classifications under the Tillamook County Land Use Ordinance include:

Estuary Development (ED). ED areas are "designated for navigational and other water-dependent commercial, industrial, or recreational uses." Habitat features are considered to be minimal. This zone is only found in and around development near the Bay.

Estuary Conservation 2 (EC2). EC2 areas "provide for long-term use of renewable resources that do not require major alterations of the estuary except for purposes of restoration." Habitat areas are recognized as partially altered and do not qualify for inclusion in EC1 or EN.

Estuary Conservation 1 (EC1). EC1 areas are designated to

1) "provide for long-term utilization of areas which support, or have the potential to support valuable biological resources, and
2) provide for long-term maintenance and enhancement of biological productivity and aesthetic values."

EC1 areas possess significant habitat values in the forms of tidal marshes, tideflats, seagrasses, and algae beds. This zone comprises much of the interface between terrestrial and aquatic habitats.

Estuary Conservation Aquaculture (ECA). "The purpose of the ECA Zone is to promote the continuing utilization of designated shellfish culture areas, while providing for low-intensity, water-dependent recreation, commercial and recreational fishing and crabbing." Habitat values are recognized as high and are protected for "scientific, research or educational purposes."

Estuary Natural (EN). EN areas are designated to "provide for preservation and protection of significant fish and wildlife habitats and other areas which make an essential contribution to estuarine productivity or fulfill scientific, research or educational needs." Most of Tillamook Bay is classified EN except for a significant tract of ECA in the Main Bay and ED zones near urbanized areas.

Dredging

Federal dredging by the U.S. Army Corps of Engineers (COE), which began in the mid-1890s, was once common in the lower Bay. Channels to Bay City and Tillamook were maintained for shallow draft commercial vessels. The lower Wilson and Trask rivers were dredged in 1972 in an attempt to reduce flooding. Citizen observations during the December 1972 floods indicated the dredging may have been helpful, but no objective data are available to evaluate the effect of the channel dredging. The COE suspended dredging outside the Garibaldi area shortly thereafter, because channel dredging could not prevent the effects of tidal flooding, and because natural sedimentation would refill the dredged areas every year. Still, some speculate that constricted channels are contributing to increased flooding.

The Oregon Shellfish Program

Shellfish harvesting is an important local industry and relies on the sustained health of the Bay. The ODA administers the Oregon Shellfish Program which manages commercial shellfish harvesting throughout the state. Under Oregon Administrative Rules, this program adopts the standards set for acceptable bacterial concentrations established in the FDA's National Shellfish Sanitation Program.

Slough Habitats

Many sloughs suffer from low levels of dissolved oxygen, elevated temperatures, and bacterial contamination. However, because most sloughs in the basin run through agricultural lands (pastures), the County is not permitted to regulate their management. ODA will address sloughs, like rivers, in the North Coast Basin Agricultural Water Quality Management Area Plan (SB 1010). See Resource Management discussion for Lowland and Floodplain, this chapter.

Opportunities for Improvement

This section summarizes potential weaknesses of the current management framework and suggests opportunities for improvement. Organized by the section headings found throughout the chapter, recommendations highlight areas wherein management changes will improve the conserva-tion of basin resources and produce significant improvements in salmonid habitat, water quality, sedimentation and erosion, and flood mitigation. Each identified problem includes relevant actions proposed in the CCMP.

Wetland Conservation

Enforcement of land use laws. Water quality and salmonid habitat will benefit substantially from improved enforcement of land use regulations.

HAB-16 Effectively Enforce Land Use Laws and Regulations

Land trust funding. Many key habitats could be preserved under a land trust. Tillamook Bay needs to work with a habitat conservation organization (*e.g*., Central Oregon Coast Land Conservancy, The Nature Conservancy, or Oregon Natural Heritage Program) to manage lands with conservation easements or lands that are purchased.

CIT-06 Establish a Land Trust or Conservation Organization

Water Quality Management on Agricultural Lands

Livestock access. Sufficient provisions are not in place to control livestock access to streams and riparian areas.

HAB-09 Control Livestock Access to Streams

CAFO inspections. Not all CAFOs can be inspected annually, with only one CAFO inspector covering nearly 200 CAFOs in a 5-county area (including Tillamook County).

WAQ-03 Implement Revised Confined Animal Feeding Operation (CAFO) Inspection Procedure

Farm operations. Farms have a significant impact on the natural environment, and operators should be up to date on the newest stewardship practices.

WAQ-05 Provide Farm Management Training Programs

Water Quality Management on Urban Lands

On-site sewage disposal systems. Increased monitoring of OSDS is needed to ensure they are not polluting ground and surface waters with fecal bacteria and nutrients.

WAQ-09 Ensure Properly Functioning On-Site Sewage Disposal Systems

Urban development. Erosion control on development is established only for projects greater than five acres. Those under five acres, which are not regulated, also produce significant sedimentation.

SED-06 Develop, Implement, and Enforce a Stormwater Management Ordinance.

Riparian Resource Management

Livestock access. Sufficient provisions are not in place to control livestock access to streams and riparian areas.

HAB-09 Control Livestock Access to Streams

Government lease incentives. Under USDA/NRCS lease and technical assistance programs, incentives are often inadequate compensation for the lost pasture.

HAB-13 Increase Incentive Program Payments

Lowland Flood Control

Floodplain mapping. Future flood mitigation and habitat improvement efforts will be hampered without a better understanding of floodplain dynamics and hydrology.

FLD-01 Develop a GIS-Based, Unsteady State Hydrodynamic Model

Floodplain alterations. Alterations to the basin's floodplains have reduced lowland habitats and exacerbated flooding. In addition, many past flood control measures degraded or destroyed critical aquatic habitat.

FLD-02 Implement Watershed Drainage Modification Projects

FLD-05 Regulate New Construction and Development in the Floodplain

FLD-06 Clear Mapped Lowland Floodways or Floodplains of Hazardous Materials

Flood impact mitigation. Many houses, businesses, and farms are located in flood-prone areas creating significant loss of property during flood events.

FLD-03 Elevate and/or Relocate Structures, Livestock, and Equipment

Upland Forest Resource Management

Forest Practices Act enforcement. Increased enforcement of forest operations would ensure complete compliance with the FPA and may reduce sediment loading in rivers.

SED-04 Ensure Sufficient Resources to Enforce Forest Practices Act

Water Quality Management on Forest Lands

Forest road management. Many forest management roads were built to channel water quickly to streams and rivers. This artificial drainage system quickens the flow of rainwater to the lowlands, increasing flood hazards. In addition, upland streams have been cleaned of debris to facilitate fish migration, which also increases flow.

FLD-01 Develop a GIS-Based Unsteady State Hydrodynamic Model
FLD-02 Implement Watershed Drainage Modification Projects
SED 01 Implement Road Erosion and Risk Reduction Projects
SED-02 Implement Practices That Will Improve Sediment Storage and Routing
SED-03 Reduce Risks in Landslide-Prone Areas
HAB-03 Prioritize Upland Protection and Enhancement Sites
HAB-05 Protect and Enhance Upland Riparian Habitat

Estuary and Slough Resource Management

Estuary management (County). The County's estuary planning (the Tillamook County Comprehensive Plan and Tillamook County Land Use Ordinance) does not reflect up-to-date research and data. Current estuary management policies use data developed in the 1970s.

HAB-23 Update the Estuary Plan and Zoning

Large wood. Insufficient efforts are being made to protect and enhance large wood in streams, rivers, and the estuary.

HAB-15 Revise Local Ordinances to Increase Protection of Riparian Areas, Wetlands, and Instream Habitat
HAB 22 Enhance Large Wood in the Estuary

Shellfish harvesting. Bay monitoring strategies have been revised since the last shellfish management plan was developed in 1991. The DEQ, ODA, and the TBNEP conducted an intensive study of a spring runoff event in March of 1998. This data and other TBNEP research regarding bacterial loading and fate in the Bay should improve the comprehensiveness of the management plan.

WAQ-12 Evaluate Shellfish Growing Area Classifications
WAQ-13 Update Shellfish Management Plan Closure Criteria

CHAPTER

4 KEY HABITAT Action Plan

Priority Problem

Loss and degradation of key habitat, and past and present fisheries practices, have contributed to declines in salmonids and other aquatic and estuarine associated organisms. Important riparian, instream, large wood, freshwater off-channel, tidal slough, and estuarine habitats have been lost or degraded. Fishery practices include management of natural production, hatcheries, and harvest.

Goal

Assess, Protect, and Enhance Riparian Habitat

Human activities have severely altered or removed riparian vegetation throughout the Watershed. Riparian areas have been modified by forestry practices, fires, agricultural activities, road construction, and/or urban development. Protecting and enhancing riparian habitat to healthy condition along perennial and seasonal streams throughout the Watershed will improve water quality and salmonid habitat, and reduce sediment loading.

Goal

Assess, Protect, and Enhance Instream Habitat

Human activities have severely degraded the quality of instream habitat throughout the Watershed. Critical examples of degraded habitat include loss of habitat structure, reduced woody debris, reduced or altered flows, blocked fish passage, and diverted water. Protecting and enhancing instream habitat will help restore viable populations of salmonids and other aquatic species.

Goal

Assess, Protect, and Enhance Wetland Habitat

Wetlands have been degraded or converted to other uses throughout the floodplain and tidelands. Wetland conversion to agricultural, urban, road, and other land uses has reduced off-channel rearing habitat for salmonids and altered stream flow in the floodplain and tidelands. Protecting and enhancing wetlands will provide habitat for salmonids and diverse aquatic species, help reduce flood and sediment impacts, and improve water quality.

Goal **Assess, Protect, and Enhance Estuary and Tidal Habitats**

Large acreages of tidal habitat have been filled, diked and/or drained for various human uses. These activities have significantly reduced rearing habitat for salmonids, and heavy sediment loads have impacted estuary and floodplain/lowland habitat. Protecting and enhancing estuary and slough habitat will help restore viable populations of salmonids and other species.

Goal **Enhance Health of Salmonid, Shellfish, and Other Aquatic Species Stocks**

Past and present fishery practices have contributed to the declines of salmonids and other aquatic species. While protecting and enhancing habitat will help stocks recover, fishery practices should also be carefully evaluated and modified as needed to enhance estuarine and marine commercial and sport fisheries.

Objectives

Enhance 200 miles* of forested riparian habitat to healthy riparian condition by 2010.

Enhance 500 miles of riparian habitat in the 0–500' elevation band to healthy condition by 2010.

Enhance 100 miles of upland instream habitat by 2010.

Enhance 100 acres of freshwater wetland by 2010.

Upgrade 50% of all tide gates by 2010.

Enhance 750 acres of tidal wetland by 2010.

No net decline in eelgrass beds.

Achieve Oregon Department of Fish and Wildlife (ODFW) wild fish production and escapement goals by 2010.**

* Note: Miles of riparian habitat refers only to the side of the stream being enhanced

**ODFW included production and escapement goals for coho and chum salmon, described in the table and text below, in its Oregon Coastal Salmon Restoration Initiative plan.

Table 4-1: Coho salmon production potential and spawner needs for Tillamook Watershed.

Spawner Escapement Goal	Marine Survival Rate of Brood	Production Potential			
		Spawning Habitat Quality Utilization			Total Return (Recruitment)
		High	Moderate	Poor	
17,100	10%	8,100	8,500	16,400	33,000
5,700	5%	4,000	4,300		8,300
2,000	3%	2,400			2,400

Note: Tillamook Bay, primarily the Kilchis and Miami rivers, hosts Oregon's largest population of **chum** salmon. The largest number of chum harvested the Bay was 264,570 in 1928 (Oakley 1962). If the catch represented 40.7% of the total population, similar to estimates derived for the fishery after the late 1940's, then since the 1960s the maximum estimated run has peaked at only 47,000 (or about 7% of the historic peak run into the Bay). Current evidence indicates that the potential maximum run of chum salmon is about 47,000 fish in Tillamook Bay with existing environmental conditions. Recruitment (return) of chum salmon by brood year (ages 3 through 5 combined in successive years of returns) has ranged between 2,608 (1957 brood year) and 34,729 (1970 brood year) where estimates of the age composition of the run were available.

Key Habitat Action Plan

Riparian, Instream, and Wetland Habitat

HAB - 01 Characterize Riparian and Instream Habitat
HAB - 02 Assess and Map Riparian and Wetland Habitat
HAB - 03 Prioritize Upland Protection and Enhancement Sites
HAB - 04 Prioritize Floodplain/Lowland Protection and Enhancement Sites
HAB - 05 Protect and Enhance Upland Riparian Areas
HAB - 06 Protect and Enhance Lowland Riparian Areas
HAB - 07 Protect and Enhance Instream Habitat
HAB - 08 Protect and Enhance Freshwater Wetland Habitat
HAB - 09 Control Livestock Access to Streams
HAB - 10 Stabilize Streambanks Using Alternatives to Riprap
HAB - 11 Encourage Protection and Enhancement on Private Lands
HAB - 12 Sponsor a Native Vegetation Planting Day
HAB - 13 Increase Incentive Program Payments
HAB - 14 Ensure Minimum Streamflows
HAB - 15 Revise Local Ordinances to Increase Protection of Riparian Areas, Wetlands, and Instream Habitat
HAB - 16 Effectively Enforce Laws and Regulations

Estuary, Sloughs, and Tidal Marsh

HAB - 17 Characterize Estuarine and Tidal Habitats
HAB - 18 Prioritize Tidal Sites for Protection and Enhancement
HAB - 19 Protect and Enhance Tidal Marsh
HAB - 20 Protect and Enhance Eelgrass Habitats
HAB - 21 Remove or Modify Ineffective Tide Gates and Floodplain/Lowland Culverts
HAB - 22 Enhance Large Wood in Estuary
HAB - 23 Update the Estuary Plan and Zoning
HAB - 24 Reconnect Sloughs and Rivers to Improve Water Flow
HAB - 25 Control Burrowing Shrimp Populations
HAB - 26 Prevent Introduction and Control Exotic Species

Fishery Practices

HAB - 27 Effectively Enforce Fishing Regulations
HAB - 28 Evaluate Commercial and Sport-Fishing Practices
HAB - 29 Implement Essential Fish Habitat Mandates
HAB - 30 Support the Oregon Plan for Salmon and Watersheds

Figure 4-1.

Figure 4-2.

Figure 4-3.

HAB - 01 Characterize Riparian and Instream Habitat

What

Complete ODFW Aquatic Inventory surveys for priority stream reaches. Schedule habitat resurveys based on ODFW guidelines to track trends and monitor progress. Complete Oregon Watershed Enhancement Board (OWEB) watershed assessments for all rivers to help prioritize protection and enhancement opportunities. Maintain all maps, data, and GIS layers in a user-friendly, community information center to support watershed councils.

Why

This information helps agencies and watershed councils identify problems and prioritize sites for protection and enhancement. ODFW Aquatic Inventory surveys provide key habitat information relevant to instream and riparian conditions. Watershed assessments provide a summary of all habitat information and highlight problem areas and/or opportunities for protection and enhancement. Better wetland/riparian maps will help County planners protect valuable areas from development and monitor progress in achieving enhancement targets.

How (Who.* When.)**

Step 1 Identify priority stream reaches for ODFW Aquatic Inventory surveys. Survey these reaches and update previous surveys in selected areas using ODFW crews. (ODFW. 2000.)

Step 2 Enter survey results in GIS database for use in analysis, site selection, and prioritization. (ODFW. 2000.)

Step 3 Use ODFW *North Coast Stream Project Guide to Restoration Site Selection Phase II*[1] to identify and prioritize instream protection and enhancement sites (See Appendix G) and help identify upland riparian sites. (Performance Partnership and ODFW. Annually.)

Step 4 Complete watershed assessments or analyses for the Miami, Wilson and Tillamook rivers. Involve citizens from watershed councils to complete the assessments and write action plans. Maintain all results, data, and maps at the Tillamook Coastal Watershed Resource Center. Use the watershed assessment results from all five rivers to identify and prioritize floodplain/lowland and estuary sites. (Performance Partnership and Tillamook Bay Watershed Council. 2001.)

Where

Priority reaches will be surveyed Watershed-wide.
Watershed Assessments for the Miami, Wilson, and Tillamook Rivers.

Lead Agencies

ODFW for Aquatic Inventory surveys.
Watershed councils for watershed assessment.

Other partners

Performance Partnership, BLM, USFS, ODF, private landowners.

[1] Thom, B., and K. Moore. 1997. North Coast Stream Project. Guide to Instream and Riparian Restoration Sites and Site Selection, Phase II.

* Coordinating entity, ensures that identified partners are on schedule.

**By end of named year.

Anticipated Costs

ODFW Aquatic Inventory surveys: $1,000–1,500 per mile x 200 miles = $200,000B$300,000.
Data analysis: $150 per stream mile x 200 miles = $30,000.
Watershed Assessments: $25,000B$40,000 per watershed, $90,000 total.

Monitoring

ODFW Aquatic Inventory surveys, the basis for monitoring riparian and instream status and trends, will be updated to track CCMP objectives:

- Enhance 200 miles of forested riparian habitat to healthy riparian condition by 2010.
- Enhance 500 miles of riparian habitat in the 0–500' elevation band to healthy condition by 2010.
- Enhance 100 miles of upland instream habitat by 2010.

Regulatory Issues

Land owner permission

Related Actions

HAB-02	Assess and Map Riparian and Wetland Habitat
HAB-03	Prioritize Upland Protection and Enhancement Sites
HAB-04	Prioritize Floodplain/Lowland Protection and Enhancement Sites
HAB-05	Protect and Enhance Upland Riparian Areas
HAB-06	Protect and Enhance Lowland Riparian Areas
HAB-07	Protect and Enhance Instream Habitat
HAB-09	Control Livestock Access to Streams
HAB-10	Stabilize Streambanks Using Alternatives to Riprap
HAB-11	Encourage Protection and Enhancement on Private Lands
HAB-14	Ensure Minimum Streamflows
WAQ-01	Define, Implement, and Enforce Pollution Prevention and Control Measures on Agricultural Lands
WAQ-08	Ensure Adequate Urban Runoff Treatment and Retention
WAQ-10	Implement Temperature Management Strategies
WAQ-11	Implement Suspended Sediments Management Strategies
SED-02	Implement Practices That Will Improve Sediment Storage and Routing
SED-03	Reduce Risks in Landslide-Prone Areas
SED-05	Reduce Sedimentation from Non-Forest Management Roads
FLD-02	Implement Watershed Drainage Modification Projects
OPSW:	DOGAMI-1, 4; C-1 DSL-1, 2, 9, 10, 12, 13, 21, 26, 27; ODF-4S, 13S, 16S. 24S, 25S, 27S, 32S, 34S, 35S, 50S, 61S, 62S ODFW-IB2S, IB4 ODOT-1 OPRW-2 WRD-S-11

HAB - 02 Assess and Map Riparian and Wetland Habitat

What

Create a detailed, accurate map of County riparian areas and wetlands based on the Cowardin[2] classification system and the COE/DSL delineation technique. Use the map to identify and protect existing wetlands and to locate potential protection and enhancement sites. Cover the entire study area.

Why

An updated riparian and wetland map would be used by County planners to:

- help comply with wetland inventory obligations under State Land Use Goals 5, 16, and 17;
- document riparian and wetland gains and losses associated with regulations and protection and enhancement activities; and
- create a standard riparian and wetland GIS database that is compatible with those of other agencies.

How (Who. When.)

Step 1 Gather existing sources of information on Tillamook Basin riparian areas and wetlands including Federal National Wetland Inventory (NWI) maps and assessments completed by cities, TBNEP GIS layers, etc. (DSL and Tillamook County. By 2000.)

Step 2 Use the Oregon Freshwater Wetland Assessment Manual protocol for areas that have not yet been surveyed and are known to contain wetlands. (DSL and NRCS. By 2001.)

Step 3 Construct GIS layers and associated data base files (DBF) of riparian and wetlands within the Basin. Add these layers to the Tillamook Coastal Watershed Resource Center for access by all interested parties. (TCWRC. By 2002.)

Where

Watershed-wide.

Lead Agencies

DSL and Tillamook County.

Other Partners

NRCS, ODFW, DLCD, Environmental Protection Agency (EPA), COE, USFS, BLM, local governments, watershed councils, private landowners, agencies implementing Jobs in the Woods program.

Anticipated Costs

DSL: Crew of 2 and supervisor: $36,250 for 3-month project. Construction of GIS layers and DBF $2,500.

[2] Cowardin, L., V. Carter, G. Golet, and E. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States.* FWS/OBS-79/31. U.S. Fish and Wildlife Service. Cowardin *et al.* developed a classification for the inventory of wetlands and deepwater habitats of the United States. Wetlands are defined by plants (hydrophites), soils (hydric soils), and frequency of flooding.

Monitoring

Track CCMP objectives:

- Enhance 750 acres of tidal wetland by 2010.
- Enhance 100 acres of freshwater wetland by 2010.

Regulatory Issues

DSL requirements for protocol.

Related Actions

HAB-01	Characterize Riparian and Instream Habitat
HAB-03	Prioritize Upland Protection and Enhancement Sites
HAB-04	Prioritize Floodplain/Lowland Protection and Enhancement Sites
HAB-05	Protect and Enhance Upland Riparian Areas
HAB-06	Protect and Enhance Lowland Riparian Areas
HAB-08	Protect and Enhance Freshwater Wetland Habitat
HAB-09	Control Livestock Access to Streams
HAB-10	Stabilize Streambanks Using Alternatives to Riprap
HAB-11	Encourage Protection and Enhancement on Private Lands
HAB-15	Revise Local Ordinances to Increase Protection of Riparian Areas, Wetlands, and Instream Habitat
WAQ-01	Define, Implement, and Enforce Pollution Prevention and Control Measures on Agricultural Lands
WAQ-08	Ensure Adequate Urban Runoff Treatment and Retention
WAQ-10	Implement Temperature Management Strategies
WAQ-11	Implement Suspended Sediments Management Strategies
SED-03	Reduce Risks in Landslide-Prone Areas
FLD-02	Implement Watershed Drainage Modification Projects
OPSW:	DSL-8, 16, 17, 18, 19, 21. ODF-13S, 24S, 27S, 28S ODOT-15, 19

HAB - 03 Prioritize Upland Protection and Enhancement Sites

What

Identify high priority riparian and instream habitats for protection and/or enhancement. Define criteria to guide protection and enhancement activities and maintain a list of potential sites. Update protection and enhancement criteria and prioritization list yearly.

Why

A prioritized list of protection and enhancement sites simplifies site selection and allows funding agencies to quickly implement projects.

How

(Who.When.)

Prioritize riparian and instream enhancement projects to address watershed functions needed to support healthy watersheds, such as water quality, water quantity, improved channel complexity, floodplain interaction, and quality of riparian vegetation.

Step 1 Review current ODFW prioritization list based on "North Coast Stream Project Guide to Restoration Site Selection Phase II" (Thom and Moore, 1997). See "Potential Instream Enhancement Sites" in Appendix G. (Performance Partnership. 1999, ongoing.)

Step 2 Prioritize watersheds, applying an ecosystem approach such as the Bradbury Framework[3]. Protect intact aquatic ecosystems identified as aquatic diversity areas (Oregon American Fisheries Society [AFS]), key watersheds (Forest Ecosystem Management Team [FEMAT]), and/or core areas (ODFW). See Appendix E, OPSW Key Watersheds and Aquatic Diversity Areas, and Appendix F, OPSW Core Areas. (Performance Partnership. By 2000.)

Step 3 Prioritize additional river reach sites. (ODFW. By 2001.)

The ODFW uses selected parameters for instream areas, to prioritize site-selection including:

- core area,
- close proximity to spawning, summer rearing and winter rearing habitats (within several miles),
- stream gradient (<5%),
- channel width (<12 meters),
- valley shape (moderate, not steep or 'V' shaped),
- water quality (*e.g.* temperature) (See DEQ temperature monitoring results and 303(d) list),
- water supply (adequate in summer),
- good fish access (no barriers),

[3] Bradbury *et al*. 1995. *Handbook for Prioritizing Watershed Protection and Restoration to Aid Recovery of Native Salmon.* For example, Willa Nehlsen used the Bradbury approach to identify the Wilson, Trask, and Kilchis Rivers as high priority watershed in her 1997 report, *Prioritizing Watersheds in Oregon for Salmon Restoration.*

- water diversions screened.

For riparian enhancements, additional criteria include:

- debris torrent-impacted streams and
- downstream and downslope of landslide-prone areas.

Where Prioritize Watershed-wide above 500 feet elevation.

Lead Agency Performance Partnership

Other Partners ODFW, USFWS, NMFS, ODF, BLM, USFS, NRCS, SWCD, North Coast Ecosystem Workforce Initiative, watershed councils, DEQ, Tillamook County, landowners.

Anticipated Costs $150 per stream mile x 200 miles = $30,000.

Monitoring Coordinate with CCMP objectives:

- Enhance 200 miles of forested riparian habitat to healthy riparian condition by 2010.
- Enhance 100 miles of upland instream habitat by 2010.

Regulatory Issues None.

Related Actions

HAB-01	Characterize Riparian and Instream Habitat
HAB-02	Assess and Map Riparian and Wetland Habitat
HAB-04	Prioritize Floodplain/Lowland Protection and Enhancement Sites
HAB-05	Protect and Enhance Upland Riparian Areas
HAB-07	Protect and Enhance Instream Habitat
WAQ-10	Implement Temperature Management Strategies
SED-03	Reduce Risks in Landslide-Prone Areas
FLD-02	Implement Watershed Drainage Modification Projects
OPSW:	ODF-17S, 20S, 34S, 35S
	DSL-21
	USFWS-5

HAB - 04 Prioritize Floodplain/Lowland Protection and Enhancement Sites

What

Develop and maintain a high priority list of potential habitat protection and enhancement projects in the floodplain/lowland area. Analyze and update the prioritization list each year as part of the Performance Partnership budget cycle.

Initial prioritization will focus on protecting and restoring rearing habitat, which is the weakest link in the coho and chum life cycles. Additional considerations are landowner willingness and socio-economic factors such as the limited availability of farmland.

Why

A prioritized list of protection and enhancement sites simplifies site selection and allows funding agencies to quickly implement projects.

How (Who. When.)

Step 1 Review and maintain current prioritization action list. (See "Potential Instream Enhancement Sites" in Appendix G.) (Performance Partnership. 1999.)

Step 2 Apply an ecosystem approach such as the Bradbury Framework[2,3] (Performance Partnership. 2000.) to:

- prioritize watersheds (Wilson, Kilchis, and Trask rivers represent current high priority watersheds);
- protect OPSW core areas and aquatic diversity areas; and
- enhance connectivity among existing habitats.

Step 3 Prioritize additional sites and river reaches. (ODFW. 2001.) Important criteria for lowland site selection include:

- near existing high quality instream and/or riparian habitat;
- within or immediately adjacent to a 303(d) listed stream reach;
- provides habitat for federal or state listed sensitive species;
- potential habitat or existing core area for salmonids;
- adjacent to functional instream habitat;
- established native riparian trees present;
- planned, active protection in place for adjacent upland areas;
- located on perennial stream;
- Best Management Practices (BMPs) in use on adjacent farmlands;
- landowner committed to riparian habitat improvement; and
- multiple benefits for habitat, water quality, erosion, and flood protection.

Where

Lower rivers and sloughs Watershed-wide.

Lead Agency Performance Partnership.

Other Partners ODFW, USFWS, NMFS, ODF, NRCS, SWCD, North Coast Ecosystem Workforce Initiative, watershed councils, DEQ, Tillamook County.

Anticipated Costs $150 per mile for additional ODFW assessments x 500 miles = $75,000.

Monitoring Implementation monitoring.

Track CCMP objectives:

- Enhance 500 miles of riparian habitat in the 0B500' elevation band to healthy riparian condition by 2010.
- Enhance 100 acres of freshwater wetland by 2010.
- Upgrade 50% of all tide gates by 2010.
- Reduce instream temperatures to meet salmonid requirements.
- Reduce instream suspended sediments to meet salmonid requirements.

Regulatory Issues Department of State Lands Fill/Removal Permits.
Section 404 of the Clean Water Act regarding fill activities.
Tillamook County Land Use Ordinance and Comprehensive Plan.

Related Actions

HAB-01	Characterize Riparian and Instream Habitat
HAB-06	Protect and Enhance Lowland Riparian Areas
HAB-08	Protect and Enhance Freshwater Wetland Habitat
HAB-09	Control Livestock Access to Streams
HAB-10	Stabilize Streambanks Using Alternatives to Riprap
HAB-11	Encourage Protection and Enhancement on Private Lands
HAB-15	Revise Local Ordinances to Increase Protection of Riparian Areas, Wetlands, and Instream Habitat
WAQ-01	Define, Implement, and Enforce Pollution Prevention and Control Measures on Agricultural Lands
WAQ-08	Ensure Adequate Urban Runoff Treatment and Retention
WAQ-10	Implement Temperature Management Strategies
WAQ-11	Implement Suspended Sediments Management Strategies
SED-03	Reduce Risks in Landslide-Prone Areas
FLD-02	Implement Watershed Drainage Modification Projects
OPSW:	DSL-21

HAB - 05 Protect and Enhance Upland Riparian Areas

What

Protect existing high quality upland riparian areas. Diversify the tree species composition of riparian areas located in uplands (above 500 feet elevation) through planting/interplanting of other native riparian species, especially conifers. Increase conifer stocking on historic conifer sites and promote growth of conifers by appropriate management in RMAs. Establish a multi-disciplinary process to plan and evaluate hardwood conversion activities. See "OPSW Plan Actions" in Appendix D.

Implement prioritization list from HAB-03; analyze and update the habitat prioritization list each year as part of the Performance Partnership budget cycle.

Why

The presence of conifers in upland riparian stands enables those stands to later supply conifer stems to the stream channel as large wood. ODFW rated large conifer tree stocking in riparian areas "poor" on 94% of the stream miles surveyed. Diversification of the species composition leads to diversity in the organic matter input to the stream, and better quality riparian habitat. While conifer planting may be beneficial in the long run, it is an experimental technique that needs further development, monitoring, and adaptive management.

How (Who.When.)

Step 1 Work to preserve riparian conifers in core areas.[4] Follow guidelines described in the Oregon Plan (OPSW) for voluntary measures in core areas, including relocating in-unit leave trees to riparian areas during harvest operations to maximize their benefit to salmonids while recognizing operational constraints, other wildlife needs, and specific landowner concerns. Assist with promoting the OPSW restoration guidelines. (ODF and private landowners. Ongoing.)

Step 2 Identify and protect existing high-quality riparian areas in the uplands through strengthened management practices during timber harvest operations, written agreements with landowners, or purchase of easement. (ODF and private landowners. 2000.)

Step 3 Define the need for additional conifer sources at the watershed scale (ODFW and ODF. 2000.):

- Determine how and when conifer plantings would alleviate any shortage of large wood sources in the Watershed.
- Identify near-term effects on water quality.
- Evaluate impacts on other resource goals.
- Determine optimal locations based on core areas, site conditions, and disturbance regime.

[4] The BLM and USFS are governed by the Northwest Forest Plan, adopted in 1994. It and their Land Use Planning and Management Documents prescribe BMPs to conserve listed species.

Step 4 Design and implement projects to replace alder and other hardwoods with conifers using ODF/ODFW approved methods[5]. (ODF and other landowners. Ongoing.)

Step 5 Continue site monitoring. (ODF. Ongoing.)

Where Watershed-wide above 500 feet elevation.

Lead Agencies ODF, OFIC.

Other Partners ODFW, NMFS, USFWS, BLM, USFS, timber companies, watershed councils, small wood lot owners, DEQ.

Monitoring Track CCMP objective:

- Enhance 200 miles of forested riparian habitat to healthy riparian condition by 2010.

Coordinate with ODF/OPSW monitoring program, including:

- ODF 10S X Forest Practices Monitoring Program
- ODF 11S X Monitoring RMAs under FPA
- ODF 13S X Storms of 1996 Monitoring Project
- ODF 23S X BMP Compliance Audit Program
- ODF 25S X Fish Presence/Absence Surveys

Anticipated Costs Implementation costs: $16,860 per mile x 200 miles = $3,372,000.

Regulatory Issues FPA, CWA, ESA.
OWEB and state agency grants for stream restoration projects must be consistent with restoration guidelines developed for the Oregon Plan.

Related Actions

HAB-01 Characterize Riparian and Instream Habitat
HAB-02 Assess and Map Riparian and Wetland Habitat
HAB-03 Prioritize Upland Protection and Enhancement Sites
HAB-06 Protect and Enhance Lowland Riparian Areas
HAB-07 Protect and Enhance Instream Habitat
WAQ-10 Implement Temperature Management Strategies
WAQ-11 Implement Suspended Sediments Management Strategies
SED-03 Reduce Risks in Landslide-Prone Areas

[5] OPSW Action ODF 8 guidelines limit hardwood conversion to conifer sites where current RMA conifer basal area is less than half of that required by stream size and stream type under the general water protection rules. No more than half of the total stream length within the harvest unit may be converted and the conversion blocks may not exceed 500 feet in width. The conversion blocks must be separated from each other by a minimum of a 200-foot retention block where the general vegetation retention prescription is applied. This management measure includes modifications of applications within Oregon Plan-identified core areas. In lieu of the standard procedures within the rules, hardwood conversions within core areas will be subject to additional review and will require a site specific plan to be submitted and reviewed.
NOTE: Activities on BLM and USFS lands are governed by the Northwest Forest Plan, adopted in 1994.

SED-04 Ensure Sufficient Resources to Enforce Forest Practices Act

EDU-01 Develop and Implement an Oregon State University Extension Watershed Masters Series

OPSW: ODF-5S, 7S, 8S, 10S, 11S, 17S, 19S, 20S, 22S, 33S, 54S, 55S, 61S, 62S

ODFW-IB3, IVB2

OPRD-2

Healthy Versus Unhealthy Riparian Condition

Figure 4-4.

HAB - 06 Protect and Enhance Lowland Riparian Areas

What

Protect existing high quality lowland riparian areas. Enhance lowland/floodplain riparian areas adjacent to streams, rivers, wetlands and other water bodies to a healthy riparian condition (HRC) that supports a number of important ecological functions, including habitat for fish and wildlife.

Healthy riparian areas are characterized by the following conditions:

- ***Structure and species composition.*** The riparian area supports a diverse plant community in two or more layers (trees, shrubs/groundcover) dominated by native species (See list, Appendix N) suited to the particular site. Where conditions are suitable, native conifers are the dominant tree species. Understory vegetation is dominated by native species characteristic of the area.
- ***Vegetative cover.*** Vegetative cover within the riparian area is at least 90%, with no more than 10% in bare soil or impervious surface.
- ***Width.*** The width of the riparian area is sufficient to fulfill the purposes of management for Healthy Riparian Condition (see below). Determination of the appropriate width will be made by qualified agency personnel in consultation with the land owner. Minimum widths will vary, depending on site-specific conditions and the requirements of applicable funding and regulatory programs.
- ***Stream shading.*** The active channel is at least 75% shaded[6] when deciduous trees have leaves.
- ***Floodplain connectivity.*** The stream and floodplain are actively connected, with overbank flows during a 22-year flood event.
- ***Bank stability.*** Streambanks are stable during a two-year flow event without the use of rip-rap or other artificial structure. Streambanks show little or no change in bank gradient in 2-year flow events, or within two seasons of normal flow events.

Why

Streamside areas in Healthy Riparian Condition, serving the following management purposes:

- create shade to reduce instream water temperatures;
- produce woody debris and detritus (small sticks, leaves, and such) that contribute to habitat values for fish and wildlife;
- filter out excess sediments and organic material, as well as pesticides and other pollutants in surface runoff;
- stabilize the streambank.

[6] Site method, or as needed to meet TMDL, water quality requirements.

How (Who.When.)

Step 1 Identify existing and/or potential high-quality riparian areas in the floodplain as described in HAB-01 and HAB-04. (ODFW and Performance Partnership. By 2000.)

Step 2 Protect high quality areas with voluntary agreements, easements, or outright purchase. (Performance Partnership and OWJV. Ongoing.)

Step 3 Deliver an educational program to landowners and interested members of the public. Assist with promoting the OPSW restoration guidelines. Develop maps and brochures about projects being planned or implemented. (SWCD, NRCS, ODA. By 2000.)

Step 4 Implement highest priority projects, but work with willing landowners whenever possible. Plantings should average 50 miles per year, with 250 miles by 2005. (SWCD, NRCS. Complete 500 miles by 2010.)

Step 5 Monitor the project before and after planting. Use citizen monitoring and photo documentation. (NRCS, SWCD. Ongoing.)

Where

Watershed-wide up to 500 feet elevation.

Lead Agencies

NRCS, SWCD, and ODA.

Other Partners

DSL, Tillamook County Planning Department, watershed councils, ODFW, USFWS, ODF, DEQ, Oregon Wetlands Joint Venture.

Anticipated Costs

Enhancement costs per foot of riparian area average: $1.45 for fencing, $0.35–$0.60 for tree planting, $0.32 for water line and off-stream watering, $0.12 for design, and $0.256–$0.852 for land costs. Costs depend on width of buffer: 15= buffer = total of 900 acres; 50= buffer = 3,000 acres (source: SWCD). Total Costs: $6,589,000B$8,823,000. Protection costs: site-specific for land, other from above as needed.

Monitoring

Conduct aerial survey every 5 years.

Implement field surveys.

Track CCMP objective:

- Enhance 500 miles of riparian habitat in the 0–500’ elevation band to healthy condition by 2010.

Regulatory Issues

Senate Bill 1010.
DSL Removal-Fill law requires native woody species for revegetation**.**
Endangered Species Act Consultation.
OWEB and state agency grants for stream restoration projects must be consistent with restoration guidelines developed for the Oregon Plan.

Related Actions

HAB-01	Characterize Riparian and Instream Habitat
HAB-02	Assess and Map Riparian and Wetland Habitat
HAB-04	Prioritize Floodplain/Lowland Protection and Enhancement Sites
HAB-09	Control Livestock Access to Streams
HAB-11	Encourage Protection and Enhancement on Private Lands
HAB-12	Sponsor Native Vegetation Planting Day
HAB-14	Ensure Minimum Streamflows
EDU-01	Develop and Implement an Oregon State University Extension Watershed Masters Series
WAQ-10	Implement Temperature Management Strategies
WAQ-01	Define, Implement, and Enforce Pollution Prevention and Control Measures on Agricultural Lands
WAQ-02	Implement Voluntary Farm Management Plans
WAQ-08	Ensure Adequate Urban Runoff Treatment and Retention
OPSW:	ODF-5S, 7S
	ODA-1
	ODFW-IVB2

Figure 4-5.

Figure 4-6.

Figure 4-7.

HAB - 07 Protect and Enhance Instream Habitat

What

Protect and restore complex, properly functioning, productive instream habitat throughout the Watershed. Adopt or modify existing state laws or local ordinances to better regulate and minimize removal or relocation of stream gravels which may be existing or potential spawning habitat for anadromous salmonids. Assist with promoting the OPSW restoration guidelines. In selected, site-specific locations, add large wood, (root wads, logs, etc.), boulders, rock barbs, or other structures to improve channel habitat quality and productivity. Use ODFW habitat selection criteria[7] to define high-priority enhancement sites. See HAB-01 and HAB-03. Encourage private landowners to place large wood in streams during forest operations as defined in the Oregon Plan. Enhance future large wood supplies by retaining in-unit leave trees (75% conifer), snags, and downed wood within and along Riparian Management Areas during forest harvest operations. See "OPSW Actions" in Appendix D.

Design projects to enhance habitat attributes such as:

- salmonid spawning and rearing habitat,
- channel form,
- complexity,
- aquatic roughness,
- channel substrate, and
- fish passage.

Why

Rivers and streams are dynamic systems whose beds and banks constantly change in response to hydraulic and erosive forces of water. These forces interact with basin geomorphology and riparian vegetation to form the instream conditions that determine the stream's ability to support fish and other aquatic organisms. Instream management activities will improve the structural characteristics of streams in order to improve habitat productivity in the short term. Aquatic habitat will improve over the long term in response to improvements in riparian conditions.

How (Who.When.)

Step 1 Revise local ordinances to increase protection of riparian areas and instream habitat. See HAB-15. (Tillamook County and city governments. 1999.)

Step 2 Protect existing high quality instream habitat through voluntary agreements, land purchase, or easement. (Performance Partnership, OFIC, and OWJV. Ongoing.)

Step3 Review and maintain current list of key watersheds and aquatic diversity areas. See HAB-03 and Appendices E and F. (Performance Partnership. 1999.)

[7] BLM and USFS lands are subject to the process discussed in their Land Management Plans, which are compatible with ODFW criteria.

Step 4 Update and expand list of priority sites, using ODFW guidelines.[8] (Performance Partnership. Ongoing.)

Step 5 Implement projects, using ODF/ODFW guidelines.[9] (ODF, ODFW, TBWC. Ongoing.)

Step 6 Monitor site for improvements. Consider DEQ macroinvertebrate surveys. (ODFW. Ongoing.)

Where Watershed-wide.

Lead Agencies Performance Partnership, Tillamook County, incorporated cities.

Other Partners ODFW, ODF, DSL, DEQ, ODA, NRCS, SWCD, watershed councils, NMFS, USFWS, BLM, USFS, private landowners.

Anticipated Costs $10,000–$50,000 per project; 100 projects in 10 years = $1,000,000–5,000,000.

Monitoring Coordinate with ODFW Aquatic Inventory Project Surveys.

Track CCMP objective:

- Enhance 100 miles of upland instream habitat by 2010.

OPSW tracking objectives for "instream roughness."

Regulatory Issues DSL Removal Fill Law.
Endangered Species Act Consultation.
OWEB and state agency grants for stream restoration projects must be consistent with restoration guidelines developed for the Oregon Plan.

Related Actions

HAB-01	Characterize Riparian and Instream Habitat
HAB-03	Prioritize Upland Protection and Enhancement Sites
HAB-04	Prioritize Floodplain/Lowland Protection and Enhancement Sites
HAB-10	Stabilize Streambanks Using Alternatives to Riprap
HAB-15	Revise Local Ordinances to Increase Protection of Riparian Areas, Wetlands, and Instream Habitat
SED-02	Implement Practices That Will Improve Sediment Storage and Routing
OPSW:	DOGAMI-1, 4, C-1 DSL-1, 2, 3, 4, 9, 10, 12, 13, 26, 27 ODF-5S, 11S, 21S, 30S, 31S, 33S, 34S, 35S, 55S, 58S, 61S ODFW-IB3, IVA5, IVB2, IVB3, IVC1, IVC2, IVC4, IVC5, IVC6 ODOT-1, 7 OPRD-1, 2 WRD-S-1, 22 DEQ-4S

[8] Thom and Moore, 1997. North Coast Stream Project Guide to Restoration Site Selection, Phase II. See list, Appendix G of this report.
[9] ODF/ODFW, 1995. A Guide to Placing Large Wood in Streams.

HAB - 08 Protect and Enhance Freshwater Wetland Habitat

What

Protect existing high quality wetlands through regulations, easements, or outright purchase. The County will update a list of significant wetlands for protection. Enhance wetlands in selected upland and floodplain areas. Develop and implement plans for constructed wetlands on agricultural lands. Design agricultural wetlands to filter surface flows, store floodwaters, and provide off-channel habitat for salmonids pursuant to ODA approval of constructed wetlands for runoff treatment. Protect and/or enhance significant wetland sites that contain, provide, or are designated as:

- within the 100-year floodplain;
- sensitive, threatened, or endangered species;
- a Natural Heritage Site;
- an Uncommon Wetland Plant Community in Oregon (see Appendix G of the Oregon Freshwater Wetland Assessment Methodology, OFWAM);
- Essential Fish Habitat as established in Amendment 14 to the Pacific Coast Salmon Plan (National Marine Fisheries Service, 1998);
- a Significant Goal 5 or 17 Resource (see Oregon Department of Land Conservation and Development Goal 5 and 17 and their respective Administrative Rules);
- a bog, fen, wetgrass prairie, vernal pool, mature swamp, or other sensitive, rare, or irreplaceable wetland type;
- a state or federal Wild and/or Scenic Waterway (see Oregon State Parks Administrative Rules);
- Outstanding Resource Waters (Chapter 340 Division 41 Section 026(1)(a) (DENS);
- an existing stream or wetland mitigation or enhancement site;
- a reference site as applied in the Hydrogeomorphic (HGM) Wetland Assessments for Oregon;
- within a watershed with streams on the State 303(d) list; and
- mitigation benefits to reduce the effect of the discharge of contaminants identified under state or federal authorities (*e.g.* CERCLA).

Why

Wetlands provide key habitat for a wide range of species and provide valuable ecological functions to reduce flood impacts. They trap sediment, fertilizers, pathogens, chemicals, and metals before these contaminants reach streams and rivers. They also offer important connecting corridors for wildlife and provide food and refuge for many aquatic species including salmon. In these ways, wetlands provide important benefits for all four TBNEP priority problems: habitat, water quality, sedimentation, and flooding.

How (Who.When.)

Step 1 Protect any known high quality wetlands through voluntary agreements, easements, or outright purchase. (Performance Partnership and OWJV. Ongoing.)

Step 2 Update wetland inventory and identify high-priority projects for protection and enhancement. See HAB-02. (DSL and Tillamook County. 2000.)

Step 3 Develop riparian, wetland, and water quality seminars for landowners and the public. Develop maps and brochures that describe projects planned or implemented. (Performance Partnership. By 2000.)

Step 4 Implement selected wetland enhancement projects on relevant agricultural, forest, urban, and residential lands. (Performance Partnership, NRCS, SWCD, OWJV. Ongoing.)

Step 5 Monitor baseline and changing conditions. Work with citizen volunteers and use photo monitoring when possible. Formal monitoring protocol should include measurements of hydrology, water quality, soil characteristics, vegetation characteristics, and fish and wildlife. (NRCS and SWCD. Ongoing.)

Where

Watershed-wide.

Lead Agency

Performance Partnership.

Other Partners

DSL, ODFW, USFWS, NRCS, SWCD, North Coast Ecosystem Workforce Initiative, watershed councils, Oregon Wetlands Joint Venture.

Anticipated Costs

Created wetlands: engineering X $5B25,000 per project; construction X $5-50,000/project; plus land purchase and easement costs.

Protection projects: land/easement purchase or rental costs

Monitoring costs

Seminar costs

Monitoring

NRCS and SWCD will monitor wetland protection and enhancement on agricultural lands; ODF on forest lands; Tillamook County and incorporated cities on residential lands. DSL will monitor through inventory and permitting processes.

Track CCMP objective:

- Enhance 100 acres of freshwater wetland by 2010.

Regulatory Issues

DSL Removal-Fill Law.
SB 1010 Agricultural Water Quality Management Area Plan.
Forest Practices Act of 1971, as amended.
Endangered Species Act consultation.

Related Actions

HAB-02	Assess and Map Riparian and Wetland Habitat
HAB-04	Prioritize Floodplain/Lowland Protection and Enhancement Sites
HAB-11	Encourage Protection and Enhancement on Private Lands
HAB-19	Protect and Enhance Tidal Marsh
HAB-21	Modify Ineffective Tide Gates and Floodplain/Lowland Culverts
HAB-24	Reconnect Sloughs and Rivers to Improve Water Flow
OPSW:	DEQ-10S, 12s DSL-8, 16, 17, 18, 19 ODF-28S ODFW-IVB2 ODOT-15, 19

Figure 4-8.

HAB - 09 Control Livestock Access to Streams

What

Install fencing along streams and rivers or implement appropriate measures to control livestock access to streams and riparian vegetation. Comply with agricultural pollution prevention and control measures (PCMs) specified by SB1010. Develop off-stream water sources for livestock where needed. Manage riparian vegetation whenever possible to achieve healthy riparian condition.

Why

Livestock access to streams leads to fecal contamination of the water, erosion of the streambank, and loss of riparian vegetation. Through fencing, providing off-stream water for livestock, and restoring riparian vegetation these livestock impacts will be minimized.

How (Who. When.)

Step 1 Continue/strengthen current fencing and planting programs. (SWCD/NRCS and TCCA. Ongoing.)

Step 2 Continue education outreach on water quality to livestock owners. (OSU Extension Service, with input from ODA. Ongoing.)

Step 3 Identify and prioritize new sites for fencing, planting, and off-stream watering. (SWCD and Performance Partnership. Ongoing.)

Step 4 Implement all appropriate measures to control livestock access to streams to contribute to achieving water quality and riparian goals. Work with landowners to select sites and secure funds. Livestock access to streams controlled on at least 80% of priority riparian areas, identified in Step 3, by 2010. (SWCD, NRCS, and TCCA. Ongoing.)

Step 5 Document and monitor fencing sites. Use photos to show changes. (SWCD, NRCS, and TCCA. Ongoing.).

Where

Livestock grazing areas throughout Watershed, mostly lowlands.

Lead Agencies

SWCD, NRCS, ODA.

Other Partners

Oregon State University (OSU) Extension, livestock owners, TCCA, ODFW, FSA, DEQ, Oregon Wetlands Joint Venture.

Anticipated Costs

Construction costs per foot of riparian habitat average: $1.45 for fencing, $0.35–$0.60 per foot for tree planting, $0.32 per foot for water line and off-stream watering, $0.12 per foot for design, and $0.256–$0.852 per foot for land costs. Costs dependent on width of buffer: 15= buffer = 900 acres; 50= buffer = 3,000 acres. (Source: SWCD). Total Costs: $6,589,000B$8,823,000.

Monitoring

Coordinate with riparian aerial surveys and NRCS/SWCD field assessments.

Track CCMP objective:

- Achieve Senate Bill 1010 compliance among 100% of livestock operations by 2010.

Regulatory Issues

ODA SB 1010 Plan.
Voluntary Water Quality Farm Plans.
County Ordinances.

Related Actions

HAB-04	Prioritize Floodplain/Lowland Protection and Enhancement Sites
HAB-06	Protect and Enhance Lowland Riparian Vegetation
HAB-07	Protect and Enhance Instream Habitat
WAQ-01	Implement Agricultural Pollution Prevention and Control Measures
WAQ-02	Implement Voluntary Farm Management Plans
WAQ-10	Implement Temperature Management Strategies
OPSW:	ODA1
	ODF5S, 7S
	ODFW-IVB2

HAB - 10 Stabilize Streambanks Using Alternatives to Riprap

What

Plan new bank stabilization projects to minimize use of riprap. Use alternative methods where possible to stabilize banks; allow riprap only as a last alternative. Alternative stabilization methods include barbs, bioengineered bank stabilization, and native plantings. If riprap must be used, then develop and use techniques for riprap installation which provide interplanting with riparian vegetation and aquatic habitat (pools and riffles, small off-channel areas, etc.) in addition to controlling bank erosion.

In designating bank stabilization projects, consider alternatives in the following order (best alternative first):

1. Avoid stabilization and remove any at-risk structures;
2. Stabilize using only plant materials suitable to project location;
3. Stabilize using predominantly plant materials suitable to project location, but supplement with rock for additional necessary structural integrity, with appropriate mitigation;
4. Stabilize using predominantly rock for necessary structural integrity but supplement with plant materials suitable to project location, with appropriate mitigation; and
5. Stabilize using only rock for necessary structural integrity, while providing aquatic habitat with appropriate mitigation.

Why

Riprap is used as a site-specific erosion control technique. Most riprap-only installations severely limit riparian vegetation, and remove the connection between the riparian area and the water. Riprap can also result in increased bank erosion upstream or downstream of the site. Alternatives to riprap provide bank stabilization while retaining habitat and may be less expensive to install and maintain. Alternative stabilization methods must be determined on a site by site basis.

How (Who.When.)

Step 1 Plan projects on a site-specific basis in consultation with ODFW and NRCS/SWCD. Prioritize the projects based on erosion, sedimentation, habitat, and water quality values, and implement the highest priority projects first. (NRCS and SWCD, Performance Partnership. By 2000, ongoing.)

Step 2 Deliver a riparian seminar series to landowners and interested members of the public. Develop maps, brochures, and signs for educational purposes. (Performance Partnership. By 2000.)

Step 3 Monitor sites before and after bank stabilization projects. Use photos to document changes. (NRCS and SWCD. Ongoing.)

Where

Watershed-wide.

Lead Agency SWCD and NRCS.

Other Partners Performance Partnership, DSL, DEQ, Tillamook County Department of Community Development, watershed councils, landowners.

Anticipated Costs $10,000–$50,000/project x 50 projects = $500,000–$2,500,000.

Monitoring Coordinate with CCMP objectives:

- Enhance 100 miles of upland instream habitat by 2010.
- Enhance 500 miles of riparian habitat in the floodplain/lowlands.

Regulatory Issues Removal/Fill Law, ORS 196.800B196.990.
Department of State Lands OAR 141-085-005B141-085-0090.
Tillamook County development permits.
ODFW In-water work period.

Related Actions

HAB-03	Prioritize Upland Protection and Enhancement Sites
HAB-04	Prioritize Floodplain/Lowland Protection and Enhancement Sites
HAB-07	Protect and Enhance Instream Habitat
OPSW:	ODF-5S, 7S
	ODFW-IB3

HAB - 11 Encourage Protection and Enhancement on Private Lands

What

Expand existing economic and tax incentives into new programs. Encourage private landowners to participate in habitat protection and enhancement through market-based incentives, conservation easements, cost-share programs, education, and technical assistance. Help landowners gain grants to support correction of high-priority fish passage barriers. Balance the value of the incentive with the actual benefit to society.

Current methods to assist and encourage private efforts in riparian areas include:

- purchase conservation easements on lands deemed important for their current or potential habitat value;
- expand cost-sharing programs;
- provide property tax incentives for lands not used for economic activity; and
- encourage protection and enhancement of freshwater and tidal wetlands through federal and state programs.

Why

Sustainable conservation and enhancement activities should be linked to actual land values and lost production. Realistic incentives will encourage landowners and other stakeholders to participate in conservation projects. See HAB-13.

How (Who.When)

Step 1 Summarize and synthesize relevant information to help landowners meet or exceed environmental standards. Include information on stream-crossing standards for fish passage, and the importance of protecting and restoring riparian and wetland habitat. Provide information on easements, tax incentives, cost-share programs, and grants. Develop and deliver a riparian seminar to landowners and discuss conservation options. (ODF/ODFW. 2000.)

Step 2 Partner with private timber companies and Oregon Forest Industries Council (OFIC) to accept and implement Core Area Voluntary Management Measures contained in the Oregon Plan. (ODF and OFIC. 2000.)

Step 3 Support and implement federal and state conservation programs (SWCD, NRCS, ODF, DSL, and ODFW. Ongoing.) including:

- Wetlands Reserve Program (USDA);
- Conservation Reserve Program (USDA);
- Conservation Reserve Enhancement Program (USDA);
- Wildlife Habitat Incentives Program (WHIP) (USDA);
- Environmental Quality Incentive Program (EQIP) (State of Oregon, USDA);

- Partners for Wildlife (USFWS);
- Wetland Mitigation Banking Revolving Fund (DSL);
- Forest Incentives Program (ODF);
- Landowner Stewardship Award (ODF);
- Riparian Tax Incentive Program (ODFW);
- Stewardship Incentives Program (ODF).

Step 4 Purchase conservation easements on lands included on the prioritized conservation/enhancement list described in HAB-03 and HAB-04. Transfer the management of the easements and any purchased lands to a land trust with sufficient funds for management. (Performance Partnership and OWJV. Ongoing.)

Step 5 Review land taxes to consider tax incentives related to habitat protection and/or enhancement. (Tillamook County. 2000.)

Where Watershed-wide. Site-specific based on results from HAB-03 and HAB-04.

Lead Agencies SWCD, ODF, ODFW.

Other Partners NRCS, Tillamook County, ODFW, OSU Extension, watershed council, Conservation organizations, Oregon Wetlands Joint Venture, USFWS, OFIC, landowners.

Anticipated Costs
0.5 FTE TBPP staff time for one year = $25,000.
Easement and land purchases.
Tax incentives.

Monitoring Implementation monitoring. Number and size of conservation/enhancement projects implemented.

Regulatory Issues
Tax codes.
ESA Consultation.

Related Actions

HAB-05	Protect and Enhance Upland Riparian Areas
HAB-06	Protect and Enhance Lowland Riparian Vegetation
HAB-07	Protect and Enhance Instream Habitat
HAB-13	Increase Incentive Program Payments
HAB-19	Protect and Enhance Tidal Marsh
HAB-21	Remove or Modify Ineffective Tide Gates and Floodplain/Lowland Culverts
WAQ-01	Define, Implement, and Enforce Pollution Prevention and Control Measures on Agricultural Lands
CIT-06	Establish a Land Trust or Conservation Organization
CIT-01	Implement an Oregon State University Extension Watershed Masters Series
OPSW:	ODA-1 ODF-5S, 7S, 8S, 30S, 31S, 55S, 56S, 58S, 60S ODFW-IB3, IVA6, IVA7, IVB2, IVB3, IVB6 OMB-1

WRD-S-17, 29

HAB - 12 Sponsor a Native Vegetation Planting Day

What

There have been many riparian planting efforts throughout the Watershed, some of which have involved school or community groups. The various forest management agencies, along with the TBNEP, will establish a Watershed-wide riparian planting day. Agencies currently involved in riparian planting will work with the watershed councils to plan the events and provide trees for planting.

Why

Broad community involvement in riparian planting projects increases community pride, fosters a sense of stewardship in the participating public, and gives land owners the inspiration, knowledge, and help to plant trees on their land. Well-publicized, organized tree planting projects can plant thousands of trees in a short time at minimal cost.

How (Who.When.)

Step 1 Plan specific riparian, wetland or other natural area planting projects with public involvement in mind. Watershed councils will develop projects from information in their action plans, and SWCD is already working with riparian landowners to develop streambank enhancement projects. (Watershed councils and SWCD. Ongoing.)

Step 2 Create and distribute a brochure on the propagation and planting of Coast Range native species. (TBWC. By 2000.)

Step 3 Secure funding to purchase trees and minimal equipment (shovels, planting buckets). (TBWC and SWCD. Ongoing.)

Step 4 Plan and implement at least two planting days per year and advertise this information through newspapers, radio, watershed council meetings, cable television, the Internet, and through outreach to service clubs (Kiwanis, Elks), schools, and youth groups, such as the Oregon Youth Conservation Corps (OYCC), Boy Scouts, and Girl Scouts. (TBWC. Ongoing.)

Step 5 Implement planting projects using SWCD staff and watershed council volunteers to train citizen volunteers in planting techniques. (TBWC. Ongoing.)

Step 6 Implement post-project monitoring. Identify volunteers, work with lead resource agencies to develop/train at least one volunteer monitoring team (volunteer and/or paid/stipend to watershed council) within the local community. Establish photo points to document changes. (TBWC. By 2000.)

Where

Watershed-wide.

Lead Agencies Watershed councils.

Other Partners SWCD, civic groups such as Boy Scouts, school groups, ODF, Bureau of Land Management (BLM), USFS, commercial nurseries (donate culled plants).

Anticipated Costs $2,500 per year for trees, other plants, equipment.
TBWC and agency staff time.

Monitoring Track CCMP objectives:

- Enhance 200 miles of forested riparian habitat to healthy riparian condition by 2010.
- Enhance 500 miles of riparian habitat in the 0–500' elevation band to healthy condition by 2010.
- Enhance 100 acres of freshwater wetland by 2010.
- Enhance 750 acres of tidal wetland by 2010.

Regulatory Issues None.

Related Actions

HAB-05 Protect and Enhance Upland Riparian Areas
HAB-06 Protect and Enhance Lowland Riparian Vegetation
OPSW: ODFW-IVB2

HAB - 13 Increase Incentive Program Payments

What

Increase the lease payments made through incentive programs such as Conservation Reserve Enhancement Program (CREP), Environmental Quality Incentive Program (EQIP), Wildlife and Habitat Incentives Program (WHIP), and Wetlands Reserve Program (WRP) to bring them closer to the potential economic return of the land.

Why

Current USDA incentive programs pay lease rates for withdrawn lands that are far below the economic return that the land could provide if it was kept in production. Landowners are reluctant to lease their land to conservation programs if they can make more money by keeping it in production.

How

(Who.When.)

Step 1 Conduct an economic analysis of land use values, rents, and costs.
Quantify benefits and costs of riparian enhancement. Determine fair market values for easements, rents, and purchases. (NRCS. By 2000.)

Step 2 Communicate findings and recommendations to legislators, USDA and other program managers, and legislative staff for agencies and industry groups. Align program payments with actual land values. (Performance Partnership. By 2000.)

Step 3 Identify additional non-federal funds to supplement land conservation payments. (Performance Partnership. Ongoing.)

Step 4 Align conservation payments with actual land values and implement relevant programs, including but not limited to: (USDA. By 2002.)

- Conservation Reserve Enhancement Program (CREP);
- Conservation Reserve Program (CRP);
- Wildlife and Habitat Incentives Program (WHIP);
- Environmental Quality Incentive Program (EQIP); and
- Wetlands Reserve Program (WRP).

Where

Watershed-wide, up to 500 feet elevation.

Lead Agency

NRCS, FSA.

Other Partners

SWCD, dairy farmers, small landowners, OWEB, State of Oregon (CREP).

Anticipated Costs

Cost to replace feed lost by taking pasture out of production: approximately $1000/year/acre.
Woodland cost: site-specific, dependent on current value of land and

timber.
Staff cost: NRCS 0.5 FTE=$25,000.

Regulatory Issues Modify federal allocation formula and available budget for programs.

Related Actions

HAB-11	Encourage Protection and Enhancement on Private Lands.
SED-01	Implement Road Erosion and Risk Reduction Projects Practices
SED-02	Implement Practices That Will Improve Sediment Storage and Routing
OPSW:	ODA-1
	ODFW-IVB6

HAB - 14 Ensure Minimum Streamflows

What

Ensure minimum habitat flows for high-priority streams. Locate and rectify unauthorized diversions and assure that authorized diversions are in compliance with their water withdrawal right or permit. Develop/implement conservation practices for agricultural and urban areas that increase the efficiency of water use. Where appropriate, purchase/lease water rights for instream flows. Oregon Water Resource Department (OWRD) will manage and certify Instream Water Rights (IWR) to protect streamflows.

Why

Salmonids require adequate water during low flow periods. Adequate water ensures thermal mass to prevent high temperatures. Salmonids also use intermittent streams as rearing areas during the rainy season. Minimum flows ensure adequate rearing habitat in the lowlands. Private individuals have protested many state applications for water rights.

How (Who.When.)

Step 1 Identify high-priority streams for habitat and water quality (temperature) protection. (See HAB-03 and HAB-04.) (Performance Partnership. By 1999.)

Step 2 Maintain and update OWRD/ODFW map of known water diversions. Share the map with Watershed Council and integrate it into GIS database. (OWRD/ODFW. By 2001.)

Step 3 Locate unauthorized diversions and take corrective action. Halt all unauthorized diversions. (OWRD. By 2005.)

Step 4 Purchase and/or lease instream water rights for high-priority streams. See map, Figure 4-9. (ODFW. Ongoing.)

Step 5 Continue hydrology monitoring. Maintain minimum streamflows defined by the Oregon State Game Commission and Water Resources Department. (OWRD. Ongoing.)

Where

Watershed-wide.

Lead Agency

OWRD.

Other Partners

ODFW, DEQ, Oregon Water Trust.

Anticipated Costs

Staff: OWRD X 0.5 FTE for five years = $125,000.
Instream water right purchases and leases.

Monitoring

CCMP Monitoring Objective:

- Enhance 100 miles of upland instream habitat by 2010.
- Reduce instream temperatures to meet salmonid requirements.

Regulatory Issues

Total Maximum Daily Loads.

Related Actions

WAQ-10 Implement Temperature Management Strategies
HAB-07 Protect and Enhance Instream Habitat
OPSW: DEQ-1S, 7S, 14S
ODF-14S
ODFW-IVA3, IVA8
WRD-S-1, 2, 4, 6, 8, 9, 10, 12, 13, 14, 15, 16, 17, 19, 20, 21, 22, 29

Flow Restoration Priorities

Figure 4-9.

HAB-15 Revise Local Ordinances to Increase Protection of Riparian Areas, Wetlands, and Instream Habitat

What

Strengthen county and municipal ordinances protecting key habitat. Improve current ordinances by enhancing enforcement and public information, restricting uses permitted in key habitat areas, or by establishing or increasing buffer areas. Improve connection to and consistency with existing Federal and State laws, including the Forest Practices Act, the Removal-Fill Law, SB 1010, and SB 502, which gave primary authority to ODA to regulate farming practices for the purposes of protecting water quality. Improve consistency among County and incorporated cities' ordinances.

Why

Current regulations and enforcement procedures do not effectively prevent degradation of key habitat features. More effective enforcement will aid accurate evaluation of existing regulations. However, improved understanding of the connectivity and sensitivity of these habitats suggests that larger buffers and a broader range of protected habitats are needed to maintain watershed functions and meet CCMP goals.

Activities such as gravel removal, hardened river or stream crossings and extensive riprap bank stabilization can, and often do, have negative impacts on instream habitat. Features providing increased structure and diversity to the river channel and estuary, such as large wood, should be retained wherever possible.

Improved regulations will aim to preserve habitat features providing stream shading, cover from predators, sediment and floodwater retention, and a healthy foodweb for plants, insects and fish.

How (Who.When.)

Step 1 The County will develop draft changes to its riparian, instream, and wetland protection ordinances for public review and input. (Tillamook County. By 2000.)

Step 2 Adopt revised program for protection of riparian resources, significant wetlands and habitat, and in-stream habitat. (Tillamook County and municipalities. By 2002.).

Step 3 Implement HAB-16 (Performance Partnership. By 2001.)

Where

Watershed-wide on rural residential and urban lands (those not regulated by ODA or ODF).

Lead Agency

Tillamook County Commissioners and city councils of City of Tillamook, Bay City, and Garibaldi.

Other Partners

Performance Partnership, OSU Extension Service.

Anticipated Costs

0.5 FTE County staff time: $25,000 per ordinance.
City staff costs: .1 FTE each.

Regulatory Issues

Statewide Planning Goal 5: Natural Resources.

Statewide Planning Goal 16: Estuarine Resources.

Statewide Planning Goal 17: Shorelands.

Removal-Fill Law (ORS 196.800B196.990).

City and County ordinances.

Rules for Issuance and Enforcement of Removal-Fill Permits (OAR 141-85-005 to OAR 141-85-660.

SB 1010 Agricultural Water Quality Management Plans.

SB 502 gives primary authority to ODA to regulate farming practices for the purposes of protecting water quality. Several laws limit the ability of local jurisdictions to regulate farm practices:

- ORS 561.191
- ORS 30.930B937
- PRS 215.253

Forest Practices Act gives authority to ODF on forest lands.

Related Actions

HAB-06 Protect and Enhance Lowland Riparian Areas

HAB-07 Protect and Enhance Instream Habitat

HAB-08 Protect and Enhance Freshwater Wetland Habitat

HAB-16 Effectively Enforce Laws and Regulations

WAQ-08 Ensure Adequate Urban Runoff Treatment and Retention

SED-06 Develop, Implement, and Enforce a Stormwater Management Ordinance

OPSW: DEQ-10S
DSL-1, 2, 8, 9, 10, 12, 13, 14, 16, 17, 18, 19, 26, 27, 33
DLCD-2
ODF-8S, 11S, 17S, 20S, 21S, 27S, 28S, 29S, 34S
DOGAMI-1, 4, C1
ODFW-IVB2
WRD-S-7, 25

HAB-16 Effectively Enforce Laws and Regulations

What

Prevent habitat loss through effective enforcement of the existing county, state, and federal regulations. Effectively enforce regulation(s) regarding draining and filling of wetlands, and tree and vegetation removal in riparian areas. Educate the judiciary and public about these regulations, and the environmental impacts of violations, and strengthen the current penalties for violations. Increase the visibility of enforcement officials and state agency participation in enforcement programs. Develop an integrated enforcement network that includes staff and resources from regulatory and resource agencies and local governments.

Why

The protection of existing habitat is a high priority for the CCMP. Yet, the local and state agencies lack sufficient resources to adequately enforce land use regulations. Citizens need to better understand the negative impacts of certain actions on the ecosystem. County fines do not effectively prevent vegetation removal or promote replanting. State agencies with enforcement mandates are stretched too thin and often have inadequate local presence. Stationing additional state personnel in the County would allow each agency to more efficiently enforce its own regulations and mandates and to coordinate enforcement activities with other agencies.

How (Who.When.)

Step 1 Organize a task force of enforcement agency representatives and citizens to review enforcement mandates, identify gaps, share information, and report suspected illegal actions. Develop an integrated enforcement network. (Performance Partnership. 2000.)

Step 2 Pursue adding agency staff where enforcement gaps exist. (OSP, ODFW, ODA, DEQ, ODF, OWRD, DSL, NMFS. 2001.).

Step 3 Educate local judiciary and the public about the importance of laws affecting wetland, riparian, and instream areas, and the costs and consequences of habitat loss and over-fishing. See HAB-15, HAB-27. (Performance Partnership. By 2000.)

Step 4 Develop a Web page that outlines important land use laws and regulations, the citizen complaint process, and contact people or offices. Include information on how and where to fish legally and properly dispose of litter and body wastes. Update the Web page regularly. (Performance Partnership. By 2001.)

Where

Watershed-wide.

Lead Agency

Performance Partnership.

Other Partners

Tillamook County Commissioners and Department of Community Development, city councils and planning commissions for City of

Tillamook, Bay City, and Garibaldi; Oregon State Police (OSP), ODA, ODF, BLM, USFS, DSL, ODFW, NMFS, schools, OSU Extension.

Anticipated Costs

1.0 FTE agency staff costs for one year = $50,000.
0.25 FTE TCPP staff for one year = $12,500.
Web page development (ODFW, TCWRC staff time): $2,500.
Other public information efforts.

Regulatory Issues

Clean Water Act.
Senate Bill 1010.
County ordinances.
Endangered Species Act.
Fisheries laws.
Forest Practices Act.

Related Actions

HAB-15	Revise Local Ordinances to Increase Protection of Riparian Areas, Wetlands, and Instream Habitat
HAB-27	Effectively Enforce Fishing Regulations
SED-04	Ensure Sufficient Resources to Enforce Forest Practices Act
FLD-05	Regulate New Construction and Development in the Floodplain
CIT-01	Implement an Oregon State University Extension Watershed Masters Series
OPSW:	ODF-10S, 20S, 21S, 27S, 28S
	ODFW-IIID1S, IVA1, IVB2, IVC5
	WRD-S-7, 25

HAB - 17 Characterize Estuarine and Tidal Habitats

What

Manage and update databases and map for estuarine habitats. Maintain a GIS database to support the estuarine monitoring program.

Why

Habitat protection and enhancement is essential to the recovery of depressed species. Loss of estuarine and tidal habitat are key factors in the decline of salmonids migrating to and from the ocean. Shellfish and other aquatic organisms depend on good water quality and suitable bottom conditions. Quality habitat often improves water quality and reduces erosion and sedimentation.

How (Who.When.)

Step 1 Maintain GIS databases for:

- salmonid utilization of migration, spawning, and rearing habitats, especially tidal sloughs (ODFW. By 2002.);
- water quality in Bay and sloughs (DEQ. Annually.);
- eelgrass beds (Performance Partnership. 2002.);
- benthic invertebrates, including burrowing shrimp and clams (Performance Partnership. By 2002.);
- oyster leases (ODA. Ongoing.);
- tidal wetlands (Tillamook County. By 2000.);
- tide gates and culverts (Performance Partnership. 2002.);
- Bay bathymetry (COE. 2002.); and
- Bay substrate types. (Performance Partnership. 2002.)

. *Step 2* Identify and map high priority protection and enhancement sites. See HAB-18. (Performance Partnership. Annually.)

Step 3 Integrate new habitat data from other studies, including information about fish, waterfowl, and human uses. (Performance Partnership. Ongoing.)

Where

Estuary-wide, tidal areas, sloughs.

Lead Agencies

Performance Partnership.

Other Partners

ODFW, USFWS, ODA, NRCS, ODF, DEQ, Tillamook County, DSL.

Anticipated Costs

Staff time. 0.5FTE for 10 years = $250,000.

Monitoring

Use data to track CCMP objectives:

- Enhance 750 acres of tidal wetland.
- Upgrade 50% of all tidegates by 2010.
- No net decline in eelgrass beds.
- Achieve water quality standards in the rivers and Bay by 2010.

Regulatory Issues

Endangered Species Act.
Statewide Land Use Planning Goal 16.

Related Actions

HAB-01	Characterize Riparian and Instream Habitat
HAB-15	Revise Local Ordinances to Increase Protection of Riparian Areas, Wetlands, and Instream Habitat
HAB-19	Protect and Enhance Tidal Marsh
HAB-20	Protect and Enhance Eelgrass Habitats
HAB-22	Enhance Large Wood in Estuary
HAB-23	Update the Estuary Plan
HAB-29	Implement Essential Fish Habitat Mandates
WAQ-12	Evaluate Shellfish Growing Area Classifications
OPSW :	ODF-23S, 28S
	DEQ-10S
	DSL-8, 16

HAB - 18 Prioritize Tidal Sites for Protection and Enhancement

What

Develop and maintain a prioritized list of habitat protection and enhancement projects in the estuary. Analyze relevant data and update the habitat prioritization list each year as part of the Performance Partnership budget cycle. Initial prioritization will focus on protecting and restoring rearing habitat in tidal sloughs and wetlands, now the weakest link in the coho and chum life cycles. Tidal protection and/or enhancement projects will focus on:

- existing high-quality sloughs with healthy riparian condition and frequent water exchange;
- sloughs with potential for good tidal exchange (for fish access);
- sloughs with tide gates and/or culverts blocking large areas of potential habitat;
- wetlands connected to sloughs; and
- rivers and sloughs with very poor water quality (bacteria, temperature, dissolved oxygen [DO], total suspended solids [TSS]).

High priorities for estuarine protection and/or enhancement include:

- eelgrass beds close to rearing habitat (upper Bay),
- marginal agricultural land behind dikes in former tidal wetlands,
- areas with large wood,
- Bayocean Spit, and the Three Graces.

Why

A prioritized list of high priority protection and enhancement projects will streamline funding and coordinate all projects.

How (Who.When.)

Step 1 Assemble relevant data and maps. See HAB-17. (ODFW and Performance Partnership. Annually.)

Step 2 Convene task force to prioritize protection and enhancement opportunities. (DLCD and Performance Partnership. By 2000, annually.)

Step 3 Discuss protection and enhancement opportunities with willing landowners. (NRCS/SWCD, DLCD, OWJV, TBWC. Ongoing.)

Step 4 Submit task force recommendations to Stewardship Council. (Performance Partnership. By 2000, annually.)

Where

Estuary-wide, tidal areas, sloughs.

Lead Agencies

Performance Partnership.

Other Partners

ODFW, USFWS, NMFS, ODA, DSL, Tillamook County, NRCS.

Anticipated Costs

Staff time: 0.25 FTE, $12,500.

Monitoring

Support CCMP objectives:

- Enhance 750 acres of tidal wetland by 2010.
- Upgrade 50% of tide gates by 2010.
- No net decline in eelgrass beds.
- Achieve water quality standards in the rivers and Bay by 2010.

Regulatory Issues

Endangered Species Act.
Statewide Land Use Planning Goal 16.

Related Actions

HAB-19	Protect and Enhance Tidal Marsh
HAB-20	Protect and Enhance Eelgrass Habitats
HAB-21	Modify Ineffective Tide gates and Floodplain/Lowland Culverts
HAB-22	Enhance Large Wood in Estuary
HAB-24	Reconnect Sloughs and Rivers to Improve Water Flow
HAB-26	Prevent Introduction and Control Exotic Species
FLD-04	Update Existing Floodplain Map
OPSW :	DSL-8, 16
	DLCD-3

HAB - 19 Protect and Enhance Tidal Marsh

What

Protect existing high-quality saltmarsh through ordinances, easements, and outright purchase, if necessary. Purchase land or obtain easements on marginal diked agricultural lands and subsequently breach dikes to enhance tidal marsh acreage. Protect and/or enhance newly accreted saltmarsh through acquisitions or easements.

Why

Rearing habitat in the lowlands is one of the critical factors limiting salmonid production, particularly for coho salmon. Restoring off-channel rearing habitat in the tidal areas would increase salmonid productivity for the basin as a whole. Habitat for other aquatic dependent species would also be provided.

How (Who.When.)

Step 1 Protect existing high-quality saltmarsh and newly accreted saltmarsh through stronger County ordinances. See HAB-23. (Tillamook County. 1999.)

Step 2 Prioritize a list of potential protection and enhancement sites based on ecological value and economic/social feasibility. See map and ranking table in Appendix I for diked areas assessed while developing scientific and technical prioritization criteria and process. (Performance Partnership. By 2000, annually.)

Initial site selection criteria[10] include :

- ***Wetland structure.*** Length and complexity of historic and/or existing channel;
- ***Salmonid utilization probability***. Length of stream reach upstream from the dike with good spawning, rearing, and or migration habitat for chum and coho;
- ***Salmonid rearing landscape.*** Shortest distance to nearest good habitat type; including low saltmarsh, high saltmarsh, and dense eelgrass;
- ***Water quality indicators.*** Measures of bacteria and other non-point source pollution; and
- ***Enhancement feasibility.*** Competing human uses of the area.

Step 3 Contact landowners in the optimal locations and determine which ones are interested in sale of land or easements. (Performance Partnership, SWCD, OWJV. Ongoing.)

[10] Simenstad *et al.* 1999. *Assessment of Potential Dike-Breach Restoration of Estuarine Wetlands in Tillamook Bay, Oregon.* Prepared by Charles Simenstad and Blake Feist of the Wetland Ecosystem Team, School of Fisheries, University of Washington; Janet Morland of the Wetlands Office, Oregon Division of State Lands; and Philip B. Williams of Philip Williams and Associates for the Tillamook Bay National Estuary Project, Garibaldi, OR.

Step 4 Purchase lands/easements and implement projects on high-priority sites. Enhance 750 acres of tidal marsh by 2010. (Performance Partnership, OWJV. Ongoing.)

Step 5 Consider land trust options. Evaluate feasibility of creating local or regional land trust and make recommendations. See CIT-06. (Performance Partnership. 2000.)

Step 6 Begin post-project monitoring plan. Work with citizen volunteers and use photo documentation to show changes at enhancement sites. Update County wetland maps. See HAB-01. (Tillamook County. 2000.)

Where

Estuary-wide. See Appendix I for prioritization study list.

Lead Agencies

Performance Partnership and the Oregon Wetlands Joint Venture (OWJV).

Other Partners

ODFW, USFWS, DLCD, DSL, Tillamook County, ODA, watershed councils, NRCS.

Anticipated Costs

$4,000/acre for 750 acres = $3,000,000.

Monitoring

Track CCMP objective:

- Enhance 750 acres of tidal wetland by 2010.

Regulatory Issues

Clean Water Act.
Endangered Species Act.
State Removal/Fill law, ORS 196.800B196.990.
ORS 274.085 provides that purchases of land, whether submerged, submersible, or formerly submerged/submersible, require a determination by the State Land Board.
Department of State Lands OAR 141-085-005B141-085-0090.
ODFW In-water Work Period.

Related Actions

HAB-17	Characterize Estuarine and Tidal Habitats
HAB-21	Remove or Modify Ineffective Tide Gates and Floodplain/Lowland Culverts
FLD-02	Implement Watershed Drainage Modification Projects
CIT-06	Establish a Land Trust or Conservation Organization
OPSW:	ODFW-IVB2
	DEQ-10S
	DLCD-3
	DSL-8, 16

HAB - 20 Protect and Enhance Eelgrass Habitats

What

Protect existing eelgrass beds for their value as an important habitat and food source for a variety of estuarine organisms. Encourage estuary users to avoid activities harmful to seagrasses. Monitor eelgrass abundance, distribution, and condition to document long-term changes. Evaluate intertidal and subtidal activities in eelgrass areas in response to new information.

Why

Eelgrass and other seagrasses provide valuable habitat for fish and other estuarine organisms. Eelgrass offers refuge and food sources for fish, shellfish, invertebrates, and birds. Activities associated with human use of the estuary, and degradation of water quality from sediments, nutrients, and turbidity negatively impact seagrass abundance.

How Who.When.)

Step 1 Continue applied research into the interactions between eelgrass, oysters, and burrowing shrimp. See Chapter 10, Monitoring and Research Needs. Include shrimp control/eelgrass planting component in research plan. (Performance Partnership. Through 2002.)

Step 2 ODA and other natural resource agencies will review research results and shellfish farming operations to determine the effect of farming activities on eelgrass. Apply research results to new intertidal and subtidal leases to minimize impacts on eelgrass beds. Report to Performance Partnership. (ODA. By 2002.)

Step 3 Cooperate with the shellfish farming organizations to develop best management practices for shellfish farming operations. Recommend BMPs and report to Performance Partnership. (Performance Partnership and private growers. By 2000.)

Step 4 Identify areas for possible eelgrass planting and/or burrowing shrimp control. See HAB-17 and HAB-25. (Performance Partnership. Annually.)

Step 5 Monitor long-term changes in eelgrass beds. (Performance Partnership. Aerial flyovers by 2001 and 2006.)

Where

Estuary-wide, focusing on those areas where eelgrass currently grows. See shellfish management area map, Figure 2-5, in Chapter 2, State of the Bay.

Lead Agencies

ODA, Performance Partnership.

Other Partners

OSU Extension, ODFW, DSL, PCSGA and other shellfish growers' groups, Tillamook County, USFWS, and other members of the Oyster Interagency Workgroup, North Coast Ecosystem Workforce Initiative, watershed councils, COE, DSL, DLCD, and Port of Garibaldi.

Anticipated Costs

Monitoring and research costs:

Ecological Interactions Among Eelgrass, Oysters and Burrowing Shrimp study X $25,000 per year for 4 years = $100,000.

MSS Imaging X $30,000 every 5 years.

Monitoring

Track CCMP objectives:

- No net decline in eelgrass beds.
- Monitor oyster, eelgrass, and burrowing shrimp interactions.

Coordinate with monitoring programs:

- Ecological Interactions Among Eelgrass, Oysters, and Burrowing Shrimp.
- Submerged Aquatic Vegetation Survey

Regulatory Issues

ODA intertidal/subtidal leasing program.

To categorize areas where oyster harvest should be limited or excluded, Statewide Planning Goal 16 (Tillamook County, DLCD).

Endangered Species Act.

Related Actions

HAB-17	Characterize Estuarine and Tidal Habitats
HAB-25	Control Burrowing Shrimp Populations
HAB-26	Prevent Introduction and Control Exotic Species
WAQ-11	Implement Suspended Sediments Management Strategies
OPSW:	ODFW-IVB2
	DLCD-3

HAB - 21 Remove or Modify Ineffective Tide Gates and Culverts

What

Remove or upgrade tide gates on sloughs and drainage ditches and replace impassable culverts in floodplain, lowland, and other non-forested areas of the watershed. Prioritize enhancement sites based on the following criteria:

- fish access to valuable habitat,
- good water column exchange to maintain or improve water quality, and
- facilitating drainage during and after high water.

Remove or upgrade tide gates wherever practical and beneficial, based on potential habitat and water quality benefits and landowner willingness. Rely on voluntary approach with landowner education from SB 1010 planning process. Enable fish and other aquatic life movement through the tide gates when field inundation not a problem.

Provide information to landowners and city and county road departments about stream crossing standards for fish passage. When designing culvert repairs on non-forest and private roads, consider alternatives in the following order (best alternative first):

- Abandon dike or crossing and reestablish natural stream bed;
- Build a bridge designed to withstand 100-year flood;
- Construct bottomless arch culvert (designed to withstand 100-year flood);
- Install conventional culvert designed for effective fish passage and able to withstand 100-year flood;
- Fish-friendly tide gates.

Why

The Botkin Report[11] identified "impediment construction" as a major factor leading to the decline of salmonids in western Oregon. Of the 532 fish presence surveys ODFW conducted in the Oregon coastal basins during the 1995 survey season, 14.8% of the confirmed end of fish use was due to human barriers and road culverts made up the largest percentage of the barriers (96%). The Oregon Plan objectives include elimination of artificial obstructions to fish passage necessary to access key habitat for critical life stages of salmonids.

Culverts and (in the lowlands) tide gates often prevent migrating and foraging salmonids from accessing potential spawning, rearing, and winter habitat. Lost access has additional effects, such as loss of genetic diversity and loss of nutrients (from the carcasses of anadromous

[11] Botkin, D., K. Cummins, T. Dunne, H. Regier, M. Sobel, and L. Talbot. 1995. *Status and future of salmon of western Oregon and northern California: Findings and options.* The Center for the Study of the Environment, Santa Barbara, California.

spawning adults) to upstream reaches. Human-caused barriers, especially tide gates, also hinder water column exchange, thus limiting water and habitat quality. Juvenile salmonids, particularly Chinook and chum salmon, depend on freshwater and brackish tidal marshes during the first months of their lives. A network of tide gates throughout the basin's floodplain/lowlands prevents tidal flows from inundating pastures. Some of these tide gates are no longer utilized or are in poor repair, and some are causing problems by backing up water flow during high water events. Installing improved tide gates and redesigning culverts for fish passage or substituting bridges or bottomless arch culverts could ease both fish access and water quality problems. Landowner involvement and citizen monitoring save money, provide practical information, and foster support for research and for resource enhancement and management.

How (Who.When.)

Step 1 Maintain a GIS database of tide gates and culverts. Prioritize potential enhancement sites, based on habitat values and willing landowners. See "Tide Gate Database" in Appendix H. (Performance Partnership. Annually.)

Step 2 Survey culverts and tide gates and identify potential habitat values to be enhanced by an upgrade. Identify fish presence and measure DO. (ODFW. 2000.)

Step 3 Develop a seminar describing tide gate and culvert functions, locations, and fish benefits resulting from upgrade and/or modification. (Tillamook Bay Watershed Council. 2000.)

Step 4 Implement tide gate and culvert projects. (Performance Partnership, SWCD. Ongoing.)

Step 5 Monitor effectiveness. Use citizen volunteers to identify fish behind upgraded tide gates and culverts and measure DO. (TBWC. 2000.)

Where

Watershed-wide, up to 500 feet elevation. See Appendix H, Tide Gate Data Base, for tide gate habitat potential evaluation.

Lead Agencies

SWCD and Performance Partnership.

Other Partners

ODA, DSL, ODFW, ODOT, DEQ, Tillamook County, NRCS, watershed councils, diking districts, COE, Oregon Wetlands Joint Venture, OWEB, TCCA, landowners.

Anticipated Costs

$7,000 for each new tide gate including construction costs.
Target of 25 tide gates = $175,000
Costs for culvert upgrades are site-specific.

Monitoring

Citizen monitoring for fish presence and DO.
Upgrade 50% of all tide gates by 2010.
Monitor OPSW objectives, including:

- Remedy 15% of the significant human-created impediments to fish passage in coastal streams per biennium.

Regulatory Issues

SB 1010.
DSL/COE Removal–Fill Permits.
ODFW In-Water Work Period.
Department of State Lands ORS 196.800B196.900 and OAR 141-085-005B141-085-0090.

Related Actions

HAB-07	Protect and Enhance Instream Habitat
HAB-19	Protect and Enhance Tidal Marsh
HAB-24	Reconnect Sloughs and Rivers to Improve Water Flow
SED-01	Implement Road Erosion and Risk Reduction Projects
SED-05	Reduce Sedimentation from Non Forest Management Roads
FLD-02	Implement Watershed Drainage Modification Projects
OPSW:	ODFW-IVB2, IVC1
	ODF-1S, 2S, 16S
	FHWA-1

Figure 4-10.

HAB - 22 Enhance Large Wood in the Estuary

What

Increase the amount of large wood in the intertidal and subtidal areas of the Bay. Develop an ordinance to prevent or restrict the removal of wood from the Bay and surrounding shoreline by private citizens. Place large wood in the lower portions of rivers and in the Bay. Develop guidelines and criteria for wood placement in estuaries.

Why

Large wood is valuable habitat for many estuarine species, including Chinook and chum salmon, contributing to the base of the estuarine and near-shore food web and providing cover from predators for juvenile fish.

How Who.When.)

Step 1 Develop an ordinance to protect wood in estuaries and along shorelines. See HAB-15. (Tillamook County. By 2001.)

Step 2 Develop criteria and guidelines for placing large wood in estuaries to improve salmonid habitat. (ODFW and DSL By 2000.)

Step 3 Prioritize wood placement sites. See HAB-18. (ODFW and DSL. By 2001.)

Step 4 Develop monitoring protocols and sampling procedures for estuarine fish abundance and distribution[12]. Consider citizens and fishing guides as volunteer monitors. (ODFW. By 2002.)

Step 5 Place large wood in selected habitats as pilot projects. For better fish refuge and to keep the structure in place, use whole trees with branches and root wads. Place 25 wood structures by 2005. (ODFW/ODF and DSL. Ongoing.)

Step 6 Continue estuarine monitoring to determine effectiveness of placed large wood as fish habitat. (Performance Partnership and ODFW. By 2002.)

Where

Lower estuary.

Lead Agencies

Performance Partnership.

Other Partners

ODFW, DSL, DLCD, Tillamook County, Ports of Garibaldi and Tillamook, ODF, Tillamook Bay Watershed Council.

[12] See Ellis 1998. *Tillamook Bay Fish Use of the Estuary*. TBNEP.

Anticipated Costs

$2,500 per project, 30 projects = $75,000.

Monitoring

Track CCMP objective:
Achieve ODFW wild fish production and escapement goals by 2010.

Regulatory Issues

DSL Removal-Fill Permit
ODFW In-Water Work Period

Related Actions

HAB-17	Characterize Estuarine and Tidal Habitats
HAB-18	Prioritize Tidal Sites for Protection and Enhancement
SED-02	Implement Practices That Will Improve Sediment Storage and Routing
OPSW:	ODFW-IVB2, IVA5
	ODF-28S
	DLCD-3

HAB - 23 Update the Estuary Plan and Zoning

What

Update the Tillamook Bay Estuary Plan contained in the Tillamook County Comprehensive Plan, and update the zoning and coordinating agreements with the cities of Garibaldi, Bay City, and Tillamook, to reflect the changes.

Why

The current estuary management plan is based on data and concepts developed in the late 1970s. The TBNEP sci/tech program has assembled important new data and tools to use to improve the plan. Ongoing research, advances in our understanding of estuarine habitats, and the evolution of critical issues point to the need to update the Estuary Plan to meet current management challenges.

How (Who. When.)

Step 1 Characterize estuarine and tidal habitats. Update bathymetry, and estuarine-use information on TCWRC GIS database. See HAB-17. (Tillamook County. By 2000.)

Step 2 Prioritize estuarine sites for protection and enhancement. See HAB-18. (Performance Partnership. By 2001.)

Step 3 Protect estuarine resources through review and revision of estuary zoning, development standards, and restoration and mitigation components of Estuary Plan based on Performance Partnership priorities developed according to HAB-18 and HAB-19. (Tillamook County. By 2002.)

Step 4 Request Tillamook County to rezone Bayocean Spit from Recreation Management to Recreation Natural, and to craft a regulation (if necessary) to protect the Three Graces rocky intertidal zone. (Performance Partnership. By 2001.)

Where

Estuary-wide.

Lead Agency

Tillamook County.

Other Partners

DLCD, ODFW, DSL, ODA, USFWS, NMFS, cities of Tillamook, Bay City, and Garibaldi.

Anticipated Costs

Staff time: Tillamook County X 0.5 FTE = $25,000.

Monitoring

Institutional monitoring: Revised Comprehensive Plan Goal 16 Element by 2002.

Related Actions

HAB-17 Characterize Estuarine and Tidal Habitats
HAB-18 Prioritize Tidal Sites for Protection and Enhancement
OPSW: None

Figure 4-11. Map of current estuary zoning.
Source: The Oregon Estuary Plan Book. 1987. Oregon Department of Land Conservation and Development.

HAB - 24 Reconnect Sloughs and Rivers to Improve Water Flow

What

Reestablish hydrologic connections between sloughs and rivers and increase water flows through lowland sloughs, rivers, floodplain, and the estuary. Increase water exchange to improve dissolved oxygen and aquatic habitat. Consider appropriate digging, dredging, gravel removal, tide gate replacement, and/or streambank modification to improve flows and to reopen blocked or diked sloughs. Develop and use a computer model to predict the impacts of possible hydrologic modifications and to identify projects with the greatest benefits for water quality, fish access, and flood control. Monitor changes in water quality, fish use, and flood impacts.

Why

Fish and other aquatic organisms use sloughs, off-channel alcoves, and marsh areas for feeding, resting, and growing. To achieve optimal benefits, all aquatic habitats should be connected throughout the Watershed. Too often, gravel, silt, culverts, dikes or levees, tide gates, and/or other blockages restrict water flow. As a result, sloughs have poor water quality and limited fish access. In addition, blocked or disconnected sloughs and wetlands lose their ability to receive and slow flood waters and to distribute water more evenly throughout the lowland/floodplain. By opening up certain connections between sloughs, rivers, riparian wetlands, and the estuary, hydromodification projects can improve fish habitat while reducing flood impacts. However, due to the complex water flows through lowland areas and potential impacts to human life and property, all decisions should be based on state-of-the-art computer models and careful analysis.

How (Who.When.)

Step 1 Complete the COE feasibility study for flood control. Develop a hydrologic and hydraulic model for the Watershed. Simulate alternative flows and changes to the floodplain in response to hydrologic modifications. See FLD-01. (COE. By 2000.)

Step 2 Select and conduct pilot projects to improve water movement and water column exchange on sloughs, which earlier had natural connections to main rivers. (FEMA and COE. By 2001.)

Step 3 Monitor changes in hydrology, DO, and biological communities in reconnected sloughs and adjoining streams. (DEQ. Ongoing.).

Step 4 Select and plan future projects. Prepare hydromodification plan for review by Performance Partnership. (Tillamook County and COE. By 2002.)

Step 5 Reconnect, and/or otherwise modify river channels, sloughs, and/or other water bodies to improve water quality and floodplain hydrology. (COE and Tillamook County. 2003.)

Where Lowland floodplain rivers and sloughs.

Lead Agency COE.

Other Partners FEMA, DEQ, Tillamook County, DSL.

Anticipated Costs Study costs: $3,000,000 for COE hydrologic model and feasibility study.
Implementation costs: $250,000B2,000,000 per project.

Regulatory Issues DSL Fill/Removal Law.
Endangered Species Act consultation.
ODFW in-water work window.

Monitoring Track CCMP objectives:

Meet water quality standards in rivers and the Bay by 2010.

Complete 20 projects within the two years following adoption of hydrodynamic model which:

- measurably reduce runoff rate in the Watershed's uplands (increase interflow and ground water recharge, thereby reducing stream temperatures and increasing summer flows);
- improve drainage characteristics in the Watershed's lowlands (*e.g.*, connect sloughs and rivers to reduce stagnation in sloughs);
- increase floodplain storage capacity in the Watershed's lowlands (*e.g.* setback levees create opportunity for sediment deposition and increased riparian area), and
- improve the natural environment's capacity to withstand or benefit from flood events.

Related Actions

HAB-04	Prioritize Floodplain/Lowland Protection and Enhancement Sites
HAB-06	Protect and Enhance Lowland Riparian Areas
HAB-21	Remove or Modify Ineffective Tide Gates and Floodplain/Lowland Culverts
FLD-01	Develop a Hydrologic and Hydraulic Model
FLD-02	Implement Watershed Drainage Modification Projects
OPSW:	ODFW-IVB2

HAB - 25 Control Burrowing Shrimp Populations

What

Using appropriate control methods, reduce burrowing shrimp densities in selected areas where they are having a negative impact on the habitat and survival of other species.

Why

Burrowing shrimp can adversely impact eelgrass beds and other beneficial habitats in the Bay. They limit the overall productivity of the commercial shellfish industry and recreational shellfish production and harvest.

How (Who.When.)

Step 1 Determine appropriate method to be used to control burrowing shrimp. (OSU Extension and shellfish farmers. Ongoing.)

Step 2 Facilitate a seminar that addresses shrimp/oyster/eelgrass interactions, shrimp control methods, and estuarine ecology. Intended audience includes various estuary users, natural resource policy makers, and other interested citizens. (OSU Extension Service. By 2001.)

Step 3 Plan, prioritize, and implement shrimp control projects for areas where shrimp are seriously impacting conditions for growth and survival of eelgrass, clams, oysters, and other benthic organisms. (Performance Partnership, DSL, DLCD. By 2001.)

Step 4 Carry out post-control monitoring to measure effectiveness of any control measure. Work with volunteers and use photo monitoring when appropriate. (Performance Partnership, ODFW. 2001.)

Step 5 Continue to investigate new control methods. (OSU Extension Service, shellfish farmers. Ongoing.).

Where

Estuary areas where shrimp are seriously impacting conditions for growth and survival of eelgrass, clams, oysters, and other benthic organisms.

Lead Agency

Oregon State University (OSU) Extension Service.

Other Partners

ODFW, Tillamook County, ODA, DSL, oyster growers, commercial shrimp harvesters, recreational and commercial clam harvesters.

Anticipated Costs

Study costs: $250,000 over four years.

Monitoring

Coordinate with:

- Burrowing shrimp/oyster/eelgrass study
- Aerial eelgrass survey every five years
- Benthic surveys.

Regulatory Issues

Incidental mortality of non-target species (ODFW).
Substrate alteration permits required (DSL).

Related Actions

HAB-20 Protect and Enhance Eelgrass Habitats
HAB-18 Prioritize Tidal Sites for Protection and Enhancement
HAB-29 Implement Essential Fish Habitat Mandates
OPSW: None

HAB - 26 Prevent Introduction and Control Exotic Species

What

Prevent introduction of and/or control invasive exotic species injurious to native populations and their habitat. These include but are not limited to: French and Scotch brooms (upland terrestrial); smooth cordgrass (*Spartina alterniflora*) and other *Spartina* species; purple loosestrife (emergent marsh); water milfoil (sloughs); and varnish clam (estuary and tidal marsh), green crab (*Carcinus maenus*), Chinese mitten crab; and zebra mussel (freshwater). Determine those non-native species most likely to be introduced to the Watershed and take precautionary measures to reduce the likelihood of their introduction.

Why

Exotic species can aggressively invade key habitat, displacing native species, altering the environment, and reducing habitat values. A 1996 survey of benthic invertebrates[13] found eight introduced or cryptogenic species. ODFW discovered green crabs in the Bay in the summer of 1997.

How (Who.When.)

Step 1 Assemble a list of all invasive species known to be in the Tillamook Basin or expected to migrate into the area soon. Review their effects on native species and habitat values. (Performance Partnership. By 2000, updated annually.)

Step 2 Develop a specific control plan for each high-risk species. (Performance Partnership. By 2001.)

Step 3 Conduct a seminar that identifies important exotic species and reviews procedures to minimize their impact on the Watershed. (Performance Partnership. By 2001.)

Step 4 Upon detection of a high-risk exotic species, implement the control plan. (ODFW, ODF, ODA. Ongoing.)

Where

Watershed-wide.

Lead Agency

Tillamook County Performance Partnership.

Other Partners

ODFW, ODA, SWCD, OSU Extension Service, watershed councils, USFS, BLM, USFWS, public and private landowners.

Anticipated Costs

0.25 FTE agency staff time for five years = $62,500.
Weed control costs.
Estuary users' costs of compliance with new controls.

[13] Golden *et al.* 1998. *A Biological Inventory of Benthic Invertebrates in Tillamook Bay.* ODFW for TBNEP.

Regulatory Issues

EPA regulations regarding herbicide or pesticide use.
County weed control ordinance.
Oregon noxious weed regulations, Chapter 570.
ORS penalties for improper application of pesticides.

Monitoring

Coordinate with:

- Benthic Invertebrate Inventory.
- Benthic Macroinvertebrate Monitoring (Rivers)
- Tidal Wetland Assessments.
- Riparian Assessment.

Related Actions

HAB-05	Protect and Enhance Upland Riparian Areas
HAB-06	Protect and Enhance Lowland Riparian Areas
HAB-08	Protect and Enhance Freshwater Wetland Habitat
HAB-19	Protect and Enhance Tidal Marsh
HAB-20	Protect and Enhance Eelgrass Habitats
OPSW:	ODFW-IC4 ODF-12S, 29S

HAB - 27 Effectively Enforce Fishing Regulations

What

Increase enforcement activities related to all fishery laws and regulations. Enforce existing fishery laws to protect salmon, steelhead and trout. Increase education efforts to better inform fishermen and shellfish harvesters of relevant regulations before they break those regulations.

Why

Violations of commercial and recreational fishery laws contribute to overharvesting problems and prevent assessment of the effectiveness of management actions. Current regulations have been established to promote a viable fishery while ensuring sustainable populations of current and future fishery stocks.

How (Who.When.)

Step 1 Organize a coordinating group of enforcement agency representatives to share information with Oregon State Police (OSP) fish and wildlife troopers on suspected illegal actions regarding fisheries regulations. (OSP. By 1999.)

Step 2 Secure additional funding for OSP so that adequate personnel are available to enforce fisheries regulations. (OSP. By 2001.)

Step 3 Develop and implement a program that better educates the public. (ODFW. By 2002.)

Where

Watershed-wide.

Lead Agencies

ODFW and OSP.

Other Partners

Tillamook County, Marine Board, US Coast Guard (USCG), TCWRC, ODA.

Anticipated Costs

Staff time: 1.0 FTE for five years = $250,000.
Web page: $2,500.

Related Actions

HAB-16 Effectively Enforce Laws and Regulations
OPSW: ODFW-IIID1S, IVA1
OMB3

HAB - 28 Evaluate Commercial and Sport Fishing Practices

What

Evaluate the impact of commercial and sport fishing on stocks of salmonids and clams. Based on community input, consider limitations on season, gear, location, license fees, and/or target species. Investigate and encourage alternate gear to commercially target more abundant species such as tuna or mackerel. Evaluate various methods of reducing impacts of sport harvesting of salmonid species.

Possible management options include:

- ban catch and release fishery for salmonids,
- ban fishing in critical spawning areas, close certain river reaches to fishing,
- restrict fishing for salmonids to the Bay during certain periods.

The ODFW could modify some fisheries practices on a trial basis and monitor the results.

Why

Mortality due to commercial and sport fishing is another factor in decline in fish populations. Changes in fishing rules may be required to enhance depleted salmonid stocks. Based on commission hearings and citizen input, ODFW revises estuary and sport angling regulations every four years. The ODFW reviews commercial fishing rules each year in the 0B3 mile zone, which includes estuaries. The PFMC reviews regulations in the 3B200-mile zone. ODFW will next revise sport angling regulations in 2001. The process will include public meetings in summer 2000 and a commission hearing in fall 2000. The process allows fishing rule changes for Tillamook Bay and its rivers. (ODFW. 2001.)

How (Who.When.)

Step 1 Establish a working group to evaluate current regulations and practices. Include stakeholders and the public. (TBWC. By 2000.)

Step 2 The working group recommends changes in existing regulations and practices and outlines a monitoring plan. (TBWC. 2000.)

Step 3 Submit the recommendations to ODFW commission for consideration. (TBWC. 2001.)

Where

Watershed-wide.

Lead Agency

Tillamook Bay Watershed Council.

Other Partners

ODFW, Pacific Fisheries Management Council, fishermen's groups, fisheries service industries, professional guide groups, and other interested parties.

Anticipated Costs

Staff time: ODFW: 0.25 FTE for one year = $12,500.

Regulatory Issues

NMFS consultation under the Endangered Species Act for activities that may adversely affect Essential Fish Habitat.

Monitoring

Achieve Oregon Department of Fish and Wildlife (ODFW) wild fish production and escapement goals by 2010.

Related Actions

HAB-16 Effectively Enforce Laws and Regulations

HAB-30 Support the Oregon Plan for Salmon and Watersheds

OPSW: ODFW-IIIA2, IIIA3, IIIC2S, IIIB1S

HAB - 29 Implement Essential Fish Habitat Mandates

What

Review and implement recommendations from the Pacific Fishery Management Council (PFMC) to identify Essential Fish Habitat, and Division of State Lands (DSL) to reduce adverse impacts and enhance Salmonid Fish Habitat. Adopt regional Essential Fish Habitat (EFH) standards and identify those areas designated to be EFH.

Why

The federal Magnuson-Stevens Fisheries Conservation Management Act requires the PFMC to identify activities that may result in adverse impacts to salmonid Essential Fish Habitat. The PFMC must also consult with those undertaking those types of activities in order to help them avoid or minimize impacts to that habitat and, where possible, to foster enhancement of degraded habitats. DSL is now defining Essential Salmonid Habitat for Pacific Northwest salmonids. In addition, DSL will revise general authorization (GA) rules for gravel removal and for removal and disposal of sediment behind tide gates.

How (Who. When.)

Step 1 Review the recommendations from the PFMC regarding salmon Essential Fish Habitat in the Tillamook Basin. Identify Essential Fish Habitat in the Tillamook Bay Watershed. (Performance Partnership. By 2001.)

Step 2 Integrate PFMC Essential Fish Habitat and DSL Essential Salmonid Habitat definitions into habitat prioritization process described in HAB-03, HAB-04, and HAB-17. (Performance Partnership. By 2001.)

Step 3 Integrate Essential Fish Habitat parameters into the monitoring plan. (Performance Partnership. By 2001.)

Lead Agency

Tillamook County Performance Partnership.

Other Partners

DSL, ODFW, Tillamook County, ODA, watershed councils, land owners and managers.

Anticipated Costs

Staff time: 0.25 FTE: $12,500.

Monitoring

Coordinate with monitoring programs:

- ODFW Aquatic Inventory Project surveys.
- Submerged Aquatic Vegetation Survey.
- Tidal Wetland Assessments.
- Fish Use of the Estuary.

Regulatory Issues

NMFS consultation under the Endangered Species Act for activities that may adversely affect Essential Fish Habitat.

Related Actions

HAB-03 Prioritize Upland Protection and Enhancement Sites
HAB-04 Prioritize Floodplain/Lowland Protection and Enhancement Sites
HAB-05 Protect and Enhance Upland Riparian Areas
HAB-06 Protect and Enhance Floodplain/Lowland Riparian Areas
HAB-07 Protect and Enhance Instream Habitat
HAB-08 Protect and Enhance Freshwater Wetland Habitat
HAB-15 Revise Local Ordinances to Increase Protection of Riparian Areas, Wetlands, and Instream Habitat
HAB-18 Prioritize Tidal Sites for Protection and Enhancement
HAB-19 Protect and Enhance Tidal Marsh
HAB-20 Protect and Enhance Eelgrass Habitats
HAB-22 Enhance Large Wood in the Estuary
HAB-26 Prevent Introduction and Control Exotic Species
WAQ-12 Evaluate Shellfish Growing Area Classifications
OPSW: ODFW-IVB2, IA1, IB1, IB2, IB3
ODF-16S, 24S, 25S, 32S, 57S
DSL-3, 4, 15, 31

HAB - 30 Support the Oregon Plan for Salmon and Watersheds

What

Support the Oregon Plan for Salmon and Watersheds (OPSW) and integrate the CCMP implementation strategy into OPSW measures and programs. Support OPSW initiatives to restore natural fish production and monitor fish populations and their habitat. Implement OPSW recommend-actions regarding harvest, hatcheries, predation, and watershed councils.

Coordinate CCMP monitoring with OPSW state programs and integrate common methods and databases. Integrate state agency programs and OPSW actions into the CCMP action plan. See "OPSW Actions" as listed in Chapter 3, Management Framework, and cross-referenced in the Action Plans. For a comprehensive summary of applicable Steelhead Supplement Actions, see Appendix D.

Why

The Oregon Plan seeks to empower the residents and industries of Oregon to restore their salmonid populations, promoting public stewardship of lands and involvement in natural resource decision making. This results in more sustainable use and direct benefits to the people who rely on the resources.

The State of Oregon developed the OPSW in response to declining salmon populations and a possible federal listing under the Endangered Species Act. The Tillamook Bay NEP began prior to the OPSW and followed a unique course in developing the CCMP. Although the OPSW and CCMP are organized differently, they share similar goals, objectives, and actions. Nonetheless, additional work remains to tightly integrate both plans into a cohesive whole.

How (Who.When.)

Step 1 Support the OPSW through letters of support and citizen and agency endorsements. Assist with promoting the OPSW restoration guidelines. (Performance Partnership. Ongoing.)

Step 2 Review agency commitments to the OPSW and align relevant actions with the CCMP. Work with agencies to refine agency commitments and budgets as needed. (Performance Partnership. By 2000.)

Step 3 Coordinate the CCMP monitoring strategy with standard OPSW assessments, surveys, and protocols. Use OPSW programs to maintain long-term monitoring in Tillamook Bay Watershed. (Performance Partnership. Ongoing.)

Step 4 Coordinate with agencies and other parties in implementation of the OPSW. (Performance Partnership. Ongoing.)

Where

Watershed-wide.

Lead Agency

Performance Partnership.

Other Partners	Tillamook County, federal agencies, state agencies, watershed councils.
Anticipated Costs	Performance Partnership staff time X .5FTE for 10 years = $250,000.
Monitoring	Achieve Oregon Department of Fish and Wildlife (ODFW) wild fish production and escapement goals by 2010.
Regulatory Issues	Endangered Species Act.
Related Actions	All actions in the CCMP and OPSW.

CHAPTER

5

WATER QUALITY Action Plan

Priority Problem

Bacteria and other pathogens from both point and non-point sources present a principal water quality problem. Bacterial pollution threatens public health through the ingestion of contaminated shellfish and water, or direct water contact. It also results in frequent closure of commercial shellfish harvesting areas. Many stream reaches do not meet water quality criteria for bacteria or temperature, and exceed recommended concentrations of suspended solids. Dissolved oxygen concentrations meet water quality standards in most areas of the Watershed except in lowland sloughs, where significant oxygen depression has been observed. Nutrient concentrations do not appear to adversely impact water quality except in lowland sloughs. No acute or chronic affects from toxic substances have been observed or monitored.

Goal

Promote Beneficial Uses of the Bay and Rivers

Bacteria contamination affects shellfish and water contact uses. Actions to reduce bacteria and other pathogens in the Bay and rivers will reduce closures of shellfish beds and lower risks to public health.

Goal

Improve Farm Management Practices

When not properly managed, storm runoff and process water from farms carries contaminants into surface water. These contaminants include bacteria, pathogens, and organic matter that deplete oxygen, raise turbidity, and cause other adverse impacts on water quality. Improving management practices on agricultural and rural lands will enhance water and habitat quality, and in many instances, improve farm productivity.

Goal

Assess and Upgrade Wastewater Treatment Infrastructure

With or without pretreatment, wastewater discharged directly into the Bay reduces water quality in the Bay. Significant sources of wastewater include treatment plants, industrial facilities, on-site disposal systems, and other sources. Assessing the treatment capacity of industrial, municipal, and residential sources will better focus resources on upgrading inadequate wastewater infrastructure.

Goal **Assess and Upgrade Urban Non-Point Runoff Treatment Infrastructure**

Nonpoint source pollution from urbanized areas significantly degrades water quality. The most common water quality alterations include increased bacteria, nutrients, sediments, and temperature. Upgrading the infrastructure available to control nonpoint source runoff will increase water quality throughout the Watershed.

Goal **Reduce Instream Temperatures to Meet Salmonid Requirements**

Many stream reaches in the Tillamook Bay Watershed do not meet water quality standards for temperature. Past and present human activities and many types of land and water uses have individually and cumulatively altered the aquatic environment for salmonids. Improving riparian buffer function and ensuring sufficient streamflow will provide the most effective ways to reduce instream temperatures over the long term.

Goal **Reduce Instream Suspended Sediments to Meet Salmonid Requirements**

Past and present human activities and land uses have individually and cumulatively increased sediment loading in the environment used by salmon. Reducing instream sediments will improve the productivity of spawning salmonids, survival of juveniles, and availability of prey.

Objectives

Achieve water quality standards for bacteria in the rivers and Bay by 2010[1]

Document at least a 25% reduction in bacteria loads to rivers, with apparent trends by 2005 and statistically significant results by 2010

Achieve at least a 25% reduction every four years in the number of days that the rivers are not in compliance with water quality standards for bacteria

Achieve in-stream temperatures that meet salmonid requirements by 2010[2]

Achieve in-stream suspended sediment concentrations that meet salmonid requirements by 2010[3]

Implement all appropriate measures contributing to water temperature and riparian vegetation goals by 2005

Document at least a 25% reduction in total suspended solids loads to rivers, with apparent trends by 2005 and statistically significant results by 2010

Achieve Senate Bill 1010 compliance among 100% of livestock operations by 2010

Inspect every CAFO annually by 2004

End wastewater treatment plant failures by 2002

Control runoff from all construction and development in urban areas by 2003(Erosion and Sedimentation objective)

Footnotes

1a. **Freshwater bacteria standard.** A 30-day log mean of 126 *E. coli* per 100 milliliter (ml) based on a minimum of five samples with no single sample exceeding 406 organisms per 100 ml.

1b. **Shellfish water bacteria standard.** A fecal coliform geometric mean or median of 15 or more samples shall not exceed 14 organisms per 100 ml, with not more than 10% of the samples exceeding 43 organisms per 100 ml.

2. **Freshwater temperature standard.** The average of the daily maximum water temperature over a moving seven day period shall not exceed 17.8°C (64°F).

3a. **Suspended sediment concentrations.** Average sediment concentrations will not exceed the following values over the specified times.

Measured as:	Hourly	Daily	Weekly	Monthly
TSS (mg/L)	1100	40	7	1
Turbidity	455	25	5	3

In addition, no source may increase suspended sediments concentrations by more than 10%.

3b. The target total suspended solids (TSS) levels were obtained from the following document, Channel Suspended Sediment and Fisheries: A Synthesis for Quantitative Assessment of Risk and Impact by Charles Newcombe and Jorgen Jensen in the

North American Journal of Fisheries Management Volume 16, November 1996.

Water Quality Action Plan

WAQ-01 Define, Implement, and Enforce Pollution Prevention and Control Measures on Agricultural Lands
WAQ-02 Implement Voluntary Farm Management Plans
WAQ-03 Implement Revised Confined Animal Feeding Operation (CAFO) Inspection Procedure
WAQ-04 Use Farm-Specific Agronomic Rates for Nutrient Management
WAQ-05 Provide Farm Management Training Programs
WAQ-06 Ensure Adequate Wastewater Treatment Capacity
WAQ-07 Expand Sewer Network
WAQ-08 Ensure Adequate Urban Runoff Treatment and Retention
WAQ-09 Ensure Properly Functioning On-Site Sewage Disposal Systems
WAQ-10 Implement Temperature Management Strategies
WAQ-11 Implement Suspended Sediments Management Strategies
WAQ-12 Evaluate Shellfish Growing Area Classifications
WAQ-13 Update Shellfish Management Plan Closure Criteria

NRCS moon table

WAQ-01 Define, Implement, and Enforce Pollution Prevention and Control Measures on Agricultural Lands

What

Define, implement and enforce any measures and/or avoidances necessary to prevent or control agricultural water pollution in the Tillamook Bay Watershed. Complete the North Coast Basin SB 1010 Plan.

Why

The North Coast Basin SB 1010 Agricultural Water Quality Management Area Plan shall comprehensively outline measures that will be taken to prevent and control water pollution from agricultural activities and soil erosion on agricultural and rural lands not in commercial forestry. A description of the pollution prevention and control measures (PCMs) deemed necessary to meet water quality goals and standards will be included in the plan.

PCMs are mandatory land conditions that can be achieved through flexible management solutions. Farmers may review their operations to determine if they are in compliance with PCMs. They may then develop their own site-specific strategy, comprising a mix of conservation practices, to meet those conditions, while improving farm efficiency and productivity. The North Coast Basin SB 1010 Plan and rules, currently being drafted, are the primary mechanisms to achieve conservation practices to meet PCMs. The voluntary water quality farm plan, designed to better address water quality and habitat issues, is outlined in WAQ-02.

How (Who.*When.)**

Step 1 Complete the North Coast Basin SB1010 Plan. (ODA. 1999.) The TBNEP recommends that, at a minimum, the local SB 1010 advisory committee define PCMs to ensure that landowners shall:

- restore/maintain riparian buffers on streams and potential fish-bearing ditches to a healthy riparian condition (HRC)[1];
- restore/maintain wetland areas to their natural condition within the economic objectives of the farm operation;
- maintain adequate pasture growth near riparian areas throughout the wet season to filter surface runoff;
- control livestock access to streams, wetlands, and ditches: provide off-stream watering facilities, salt sources, and additional shade as necessary;
- refrain from/minimize stream channel modifications that adversely affect fish and wildlife habitat (*e.g.*, stream cleaning, diking, dredging, channelizing, or bank armoring);

[1]See Chapter 4: Key Habitat, HAB-06, for a definition of healthy riparian condition and zones.

* Coordinating entity; ensures that identified partners are on schedule.

** By end of named year.

- minimize the number and size of stream crossings;
- design and construct stream crossings to withstand 25-year flood events with minimum disturbance of in-stream habitat;
- design and operate irrigation systems to minimize over-application;
- ensure that adequate manure storage facilities exist to provide flexibility in selecting dry periods for manure spreading;
- apply and store manure so that surface waters are not contaminated;
- keep records that indicate the quantity, location, and times of manure application;
- incorporate soil and manure testing into the record management system; and
- maintain tide gates in good operating condition.

Step 2 Promote and implement voluntary farm management plans that address prohibited and required conditions for agricultural and rural lands as required by SB 1010. See WAQ-02. (Landowners. By 2010, ongoing.)

Step 3 Enforce PCMs according to the provisions and civil penalties defined in Section 8 of SB 1010. (ODA. Ongoing.)

Where All agricultural lands in the Watershed.

Lead Agency ODA.

Other Partners Livestock operation managers, NRCS, TCCA, Oregon Dairy Farmers Association (ODFA), DEQ.

Anticipated Costs 1.0 FTE ODA staff for five years = $250,000.
Local Advisory Committee X time voluntary.

Monitoring Track CCMP objective:

- Achieve SB 1010 compliance among 100% of livestock operations by 2010.

Regulatory Issues SB 1010, CWA.

Related Actions

WAQ-02	Implement Voluntary Farm Management Plans
WAQ-03	Implement Revised CAFO Inspection Procedure
WAQ-04	Use Farm-Specific Agronomic Rates for Nutrient Management
HAB-09	Control Livestock Access to Streams
OPSW	ODA-1, 2 DEQ-1S, 6S, 9S, 11S, 14S, 20S DLCD-1

WAQ-02 Implement Voluntary Farm Management Plans

What

Develop and implement voluntary farm management plans to better address water quality and habitat issues. Include the Pollution Prevention and Control Measures (PCMs) required by the Senate Bill 1010 Water Quality Management Area Plan.

Why

The SB 1010 Plan gives ODA the authority to develop basin agricultural/livestock management plans to protect water quality (see WAQ-01). Individual voluntary farm water quality plans provide the guidance for landowners to reduce water quality impacts of their land use and comply with the PCMs in the North Coast Basin SB 1010 Plan. Agricultural practices can significantly impact water quality and watershed health, and the implementation of voluntary farm water quality plans will greatly reduce negative impacts.

How (Who.When.)

Step 1 Develop, update, and implement voluntary farm management plans that meet the minimum standards for PCMs identified in WAQ-01 for all CAFOs and other farm and livestock landowners or managers in the Watershed. Update 20 CAFOs per year and 30 other operations per year, until all farms in the Watershed have voluntary farm management plans. (SWCD. By 2008.)

Step 2 Support ODA, SWCD, and NRCS in their efforts to provide voluntary farm management plans to all agricultural landowners in the Watershed. Identify and secure cost-share opportunities to design and implement the voluntary plans. (Performance Partnership. Ongoing.)

Where

All agricultural operations in the Watershed.

Lead Agency

SWCD.

Other Partners

NRCS, ODA, agricultural/livestock operation managers, TCCA, ODFA, OSU Extension Service, OWRD.

Anticipated Costs

NRCS X 1 engineer and 3 farm plan writers at $50,000 each for 8 years (total $1.6 million) to write farm plans for 77 CAFO farms that don't currently meet SB1010 requirements, plus 237 other farms.
Cost of implementing conservation practices X site specific X see USDA Natural Resource Conservation Service Field Office Technical Guide.

Monitoring

Track CCMP objective:

- Achieve SB 1010 compliance among 100% of livestock operations by 2010.

Regulatory Issues

SB 1010 Plan shall identify the necessary pollution prevention and control measures.

Related Actions

HAB-09	Control Livestock Access to Streams
HAB-10	Stabilize Streambanks Using Alternatives to Riprap
HAB-19	Protect and Enhance Tidal Marsh
WAQ-01	Define, Implement, and Enforce Pollution Prevention and Control Measures on Agricultural Lands
OPSW	ODA-1, 2
	DEQ-6S, 9S, 10S, 20S
	DLCD-1

WAQ-03 Implement Revised Confined Animal Feeding Operation (CAFO) Inspection Procedure

What

Increase the efficiency of the ODA CAFO inspection process and the percentage of CAFOs in compliance with their permits.

Why

Confined Animal Feeding Operations (CAFOs) produce large amounts of manure and can contribute bacteria to streams and the Bay. Although in 1997/1998 ODA significantly increased its CAFO inspection staff and capability, not all CAFOs can be inspected annually, as only one CAFO inspector is covering nearly 200 CAFOs in a 5-county area (including Tillamook County). Frequent inspections encourage operators to improve farm management and meet CAFO permit requirements. The ODA is currently reviewing the CAFO inspection program, using technical expertise from throughout the State, including representatives from the Tillamook Bay Watershed.

How (Who.When.)

Step 1 Prioritize CAFO inspections to target areas with the highest concentrations of bacteria. Recent studies[2] show high concentrations in the Tillamook, Trask, and Wilson River basins. (ODA.1999.)

Step 2 Support ODA's CAFO technical review team by including local agricultural representatives in the review process. (OSU Extension Service, NRCS. Ongoing.)

Step 3 Pursue additional funding for the ODA's CAFO program from which ODA can hire an additional CAFO inspector to locate in the Watershed. (Performance Partnership. By 2000.)

Step 4 Pursue achieving annual announced inspections of 100% of CAFOs. (ODA. By 2004.)

Step 5 Promote the following initiatives in a revised CAFO inspection program (Performance Partnership. By 2000.):

1) Conduct aerial surveys after storms twice annually;

2) Conduct unannounced inspections at 10% of CAFOs annually. Prioritize based on aerial surveys and/or complaints.

Step 6 Respond to complaints and where necessary develop and insure implementation of correction plans in a timely manner. (ODA. Ongoing.)

Where

All CAFOs in the Watershed.

[2] Sullivan, T., J. Bischoff, K. Vache. 1998. *Results of Storm Sampling in the Tillamook Bay Watershed*. E&S Environmental Chemistry. Prepared for the Tillamook Bay National Estuary Project, Garibaldi, OR.

Lead Agency ODA.

Other Partners NRCS, SWCD, OSU Extension Service, livestock operation managers.

Anticipated Costs
1 additional CAFO inspector at $50,000 per year.
OSU Extension Service X 0.25 FTE of dairy agent time.
Cost of flyovers: $5,000 per year.

Monitoring
Coordinate with riparian and wetland aerial surveys.
Track CCMP Objective:

- Inspect every CAFO annually by 2004.

Regulatory Issues State legislation determines CAFO inspection process and related funding.

Related Actions

HAB-16	Effectively Enforce Laws and Regulations
OPSW	ODA-2
	DEQ-6S, 9S, 10S
	DLCD-1

WAQ-04 Use Farm-Specific Agronomic Rates for Nutrient Management

What

Use farm-specific agronomic nutrient uptake rates to develop procedures in voluntary farm management plans that improve the operators' ability to apply nutrients to the land at agronomic capacity.

Why

Livestock manure has been identified as a contributor of bacteria to streams and the Bay. Effective manure and nutrient management can significantly improve water quality and watershed health. Currently, local farmers use agronomic rates based on literature values from outside the County. If farmers use data from their own farms, they will maximize forage production with minimal environmental impact, and reduce chemical fertilizer usage.

How (Who.When.)

Step 1 Collect nutrient cycling data in the Tillamook Bay Watershed to determine local agronomic rates, and demonstrate this process through seminars, on-farm talks, and newsletter articles so Basin farmers can track nutrients on their farms by 2001. Incorporate the new agronomic rate information into USDA NRCS Field Office Technical Guides and OSU Extension guidelines by 2003. (OSU Extension Service and NRCS. By 2003.)

Step 2 Include soil testing requirements in the voluntary farm management plan to monitor soil fertility and provide guidance for future manure and/or nutrient application timing, location, and rates so that agronomic capacity (or other specified loading rates) are not routinely exceeded. (NRCS. 2002.)

Step 3 Promote documentation of management practices as part of all voluntary farm management plans. Without accurate records farmers cannot document the effectiveness of their management practices. (ODA, SWCD, and NRCS. 2005.)

Step 4 Tie application of manure on all farms to agronomic capacity in order to improve nutrient use and efficiency and reduce bacteria transport to waterways (already required for CAFOs). (ODA. 2003.)

Where

All agricultural operations in the Watershed.

Lead Agencies

NRCS, ODA, SWCD, OSU Extension Service.

Other Partners

Livestock operation managers, DEQ.

Anticipated Costs

Initial study $30,000.
Farm operator time to keep records.
Soil tests: $100 per test.

Monitoring

Track CCMP Objective:

- Document at least a 25% reduction in bacteria and sediment loads to rivers with apparent trends by 2005 and statistically significant results by 2010.

Regulatory Issues

SB 1010.
State legislation determines permitted CAFO requirements. Change will require new legislation.

Related Actions

WAQ-01	Define, Implement, and Enforce Pollution Prevention and Control Measures on Agricultural Lands
WAQ-02	Implement Voluntary Farm Management Plans
WAQ-05	Provide Farm Management Training Programs
OPSW	DEQ-6S, 9S, 10S, 20S
	DLCD-1

WAQ-05 Provide Farm/Livestock Management Training Programs

What

Provide training to farm/livestock managers on the effects of management practices on water and habitat quality.

Why

Farm/livestock managers and workers have a tremendous impact on the natural system through their daily activities. Subtle improvements in the way managers conduct their operations can improve both the environment and farm productivity. Educational programs may be voluntary, tied to incentive programs, or tied to permit violations. Oregon State University Extension Service, NRCS, and others already have materials which can serve as the basis for educational programs.

How (Who.When.)

Step 1 Identify or design farm management curricula suitable for the Tillamook Bay Watershed / North Coast Basin. Conduct on-farm discussions about nutrient management. Offer farm management classes in the County. Document training for 50 farm managers per year. (OSU Extension. By 2000.)

Step 2 Add certification requirements and financial incentives through independent organizations to farm management education. (OSU Extension, ODFA, and Cattlemen's Association. 2002.)

Step 3 Increase recognition for farms whose managers and workers receive training (*e.g.,* SWCD Conservation Farmer of the Year, land posted, Headlight-Herald articles, etc.) (SWCD. By 2000.)

Step 4 Pursue mandatory training as part of the enforcement process for farm managers who violate water quality standards. This could include one-on-one education with an inspector or proof of attendance at a local farm management class/training within a specified period of time. Document a decreasing trend in permit violations over 10 years. (ODA. By 2001, ongoing.)

Where

N/A.

Lead Agencies

OSU Extension Service.

Other Partners

ODA, NRCS, SWCD, TCCA, Oregon Dairy Farmers' Association and other farm groups, livestock operation managers.

Anticipated Costs

OSU Extension X 0.25 FTE OSU Extension agent X $12,500 per year.

Monitoring

Track CCMP objective:

- Achieve SB 1010 compliance among 100% of all livestock operations by 2010.

Regulatory Issues

SB 1010 Agricultural Water Quality Management Area Plan.

Related Actions

WAQ-01	Define, Implement, and Enforce Pollution Prevention and Control Measures on Agricultural Lands
WAQ-02	Implement Voluntary Farm Management Plans
WAQ-03	Implement Revised CAFO Inspection Procedure
WAQ-04	Use Farm-Specific Agronomic Rates for Nutrient Management
CIT-01	Develop and Implement an Oregon State University Extension Watershed Masters Series
OPSW	ODA-1, 3 DEQ-9S, 10S DLCD-1

WAQ-06 Ensure Adequate Wastewater Treatment Capacity

What

Ensure adequate wastewater treatment plant (WTP) capacity and treatment as defined by each facility's current NPDES permit. Planning should include estimates of long-term population growth and upgrades needed to ensure future capacity needs. Ensure that wastewater treatment plant discharge meets instream and Bay water quality standards and that the discharge structure does not impede fish passage.

Why

When WTP capacity is exceeded, wastewater is either moved to some location and stored, discharged directly into the receiving water body without treatment, or rushed through the facility too quickly to be treated adequately. These activities contribute to increased bacteria concentrations and other pollutants in the Bay.

Few community members understand the waste stream, the importance of a fully functioning WTP, or their impact on that system. Community education helps deter mistreatment of the system by users. Because WTP upgrades are often funded by bond measures, community members and local decision-makers should understand more about WTP function.

How (Who.When.)

Step 1 Develop, promote, and deliver on-site WTP education program (tour) for children and adults that explains the waste stream (on-site disposal systems, city sanitary sewers, landfills, recycling, etc.) and the function of WTP in that process. County 5th graders should each tour a WTP and understand the waste stream as part of the school curriculum. (WTPs, Tillamook County, and schools. By 2000, ongoing.)

Step 2 Update or develop all public facilities plans. Public facilities (water and sewer) are regulated by Planning Goal 11 and OAR 660-11. A public facilities plan must be created and adopted before WTP can be upgraded. Plans should include a needs assessment, analysis of current capabilities, and prediction of future requirements. (Tillamook County and city governments. By 2002.)

Step 3 Based on public facilities plans, upgrade WTPs as appropriate. Obtain low interest revolving loans through DEQ and other sources for WTP and infrastructure upgrades. (Tillamook County and city governments. By 2010.)

Step 4 Review all WTP discharge mixing zones biennially. Document any water quality concerns such as chlorine or ammonia toxicity, temperature increases, or low dissolved oxygen. Determine the need to include seafood processor discharges in mixing zone assessments. (WTPs and DEQ. By 2002.)

Step 5 Require an annual facility summary report that describes capacity issues, maintenance concerns, future growth estimates, and funding needs. (WTPs, Tillamook County and city governments, and DEQ. By 1999, ongoing.)

Step 6 Conduct complete laboratory inspections by DEQ personnel to ensure that proper laboratory quality assurance and quality control procedures are being performed. (DEQ. By 2000, ongoing.)

Where Wastewater Treatment Plants of: Cities of Tillamook, Bay City, and Garibaldi; TCCA; Port of Tillamook Bay; and Pacific Campground.

Lead Agencies Tillamook County and city governments, WTPs, incorporated cities.

Other Partners DEQ, Performance Partnership, elementary schools.

Anticipated Cost

Construction: current upgrades X Garibaldi $4.5 million for WTP upgrade/expansion, plus ongoing work on infiltration problems. Cost of upgrades to meet developing TMDLs unknown.

Educational component: WTPs X Program development and tours; Schools X transportation costs, $4,000/20 years.
Personnel: DEQ X 0.25 FTE to conduct inspections, $125,000.
Facility plans: site and project specific.
Discharge mixing zone studies: $25,000B$50,000 each.

Monitoring Track CCMP objective:

- End WTP failures by 2002.

Regulatory Issues May require passage of bonds.
Oregon Statewide Planning Goal 11 and OAR 660-11

Related Actions

WAQ-07	Expand Sewer Network
WAQ-08	Ensure Adequate Urban Runoff Treatment and Retention
SED-06	Develop, Implement, and Enforce a Stormwater Management Ordinance
CIT-01	Implement an Oregon State University Extension Watershed Masters Series
OPSW	DEQ-1S, 6S, 9S, 10S, 11S, 14S, 15S

WAQ-07 Expand Sewer Network

What

Expand City of Tillamook sewerage network to entire Urban Growth Boundary (UGB) and encourage those with on-site disposal systems (OSDSs) to convert to sewer.

Why

Tillamook's UGB extends some distance to the east beyond the current city limit and sewer system. This is an area designated for relatively high density urban development, but limited by high ground water and reliance on on-site sanitation. This can pose a threat to water quality and human health, and limit economic development opportunities. Extension of public sewer would address existing sanitation problems and provide for needed development in an appropriate area.

How (Who.When.)

Step 1 Developers near Tillamook now pay the costs of extending the system to their site and work with the City to establish system development charge credits as part of the capital project plan. Future ordinance will assist by forming reimbursement districts to repay the developer when intermediate property owners connect to the system. (Developers and City of Tillamook. Ongoing.)

Step 2 The City of Tillamook will procure funding to continue expansion of sewer service throughout the UGB, whenever and wherever possible as funding sources become available. (Tillamook city government. By 2005.)

Step 3 Evaluate opportunities to expand sewer systems outside designated UGBs of the three incorporated cities in the Watershed. (City governments. 2003.)

Step 4 Where failing septic systems pose a health hazard, cities will require connections to sewer systems as per state law. Develop an appropriate ordinance, as allowed by ORS standards. See WAQ-09 for on-site disposal system action. (DEQ and city governments. By 2001.)

Where

Urban areas throughout the Watershed (Tillamook, Bay City, and Garibaldi).

Lead Agency

Tillamook city government.

Other Partners

Developers, DEQ, Tillamook County Department of Community Development, DLCD.

Anticipated Costs

Construction costs: $300,000 to sewer 1,500 linear feet.
$1,500,000–1,800,000 to sewer entire remaining Tillamook UGB (~3 square miles).
Staff time: 0.5 FTE City Manager and Public Works Director.

Monitoring

Track CCMP objectives:

- Achieve water quality standards for bacteria in the rivers and Bay by 2010.
- Document at least a 25% reduction in bacteria loads to rivers, with apparent trends by 2005 and statistically significant results by 2010.
- Achieve at least a 25% reduction every four years in the number of days that the rivers are not in compliance with water quality standards for bacteria.

Regulatory Issues

May require bond passage.

Related Actions

WAQ-06	Ensure Adequate Wastewater Treatment Capacity
WAQ-08	Ensure Adequate Urban Runoff Treatment and Retention
WAQ-09	Ensure Properly Functioning On-Site Sewage Disposal Systems
OPSW	DEQ-6S, 9S, 10S, 19S WRD-S-9

WAQ-08 Ensure Adequate Urban Runoff Treatment and Retention

What

Assess and upgrade urban non-point runoff treatment infrastructure and preserve and enhance natural landscape features that improve water quality. Protect these features and their function through the urban planning process. Protect the natural integrity of water bodies and natural drainage systems during site development and building of roads, highways, and bridges. Reduce the amount of contaminants reaching Tillamook Bay via surface water.

Why

Recent studies conducted by TBNEP and DEQ have identified urban sources as important contributors to water quality problems in the Tillamook Bay Watershed. Non-point runoff from urban (commercial, industrial, and residential) lands can transport sediments, and contaminants such as bacteria, suspended solids, oil and grease, and nutrients, to surface waters. It can also elevate water temperature. Storm water systems should be modified to better filter and retain runoff. Maintaining and enhancing landscape features such as riparian areas, wetlands, natural drainage ways, and ground permeability will reduce contaminant loading and peak flow to surface waters.

How (Who.When.)

Step 1 Quantify the contribution of contaminants (TSS, bacteria, nutrients, temperature) from urban storm water discharge to surface waters. Urban areas include the cities of Tillamook, Bay City, and Garibaldi. (DEQ. By 2002.)

Step 2 Identify natural landscape features that protect water quality. Prioritize areas for enhancement, protection and/or possible acquisition. Update zoning maps. (County and cities. By 2001.)

Step 3 Implement projects to control pollution from non-point sources. See related actions HAB-01, 02, 04, 06, 08, and 15 for project details. (DEQ, county and city governments. By 2003.)

Step 4 Develop and enforce an ordinance that minimizes the use of impervious surfaces and favors onsite retention or treatment of storm water over downstream water treatment facilities. (Tillamook County and city governments. By 2002.)

Step 5 Develop and enforce an ordinance that sets protection of riparian, wetland, and natural drainage functions as a priority for new construction. See HAB-15. (Tillamook County and city governments. By 2002.)

Step 6 Develop and implement sanitation standards, as well as erosion control requirements for construction sites as defined in the CZARA Section 6217(g). (Tillamook County and city governments. By 2002.)

Where Urban areas of the Watershed (Tillamook, Bay City, and Garibaldi).

Lead Agencies Tillamook County Commissioners and city councils of Bay City, Garibaldi and City of Tillamook.

Other Partners DEQ, DSL, landowners, developers.

Anticipated Costs Engineering studies: $25,000B$50,000 each.
Construction: $10,000B$100,000.
Municipal planning and ordinance development: 0.5 FTE.
Developers will be responsible for much of the cost.

Monitoring Track CCMP objectives:

- Achieve water quality standards for bacteria in the rivers and Bay by 2010.
- Document at least a 25% reduction in bacteria loads to rivers, with apparent trends by 2005 and statistically significant results by 2010.
- Achieve at least a 25% reduction every four years in the number of days that the rivers are not in compliance with water quality standards for bacteria.
- Control runoff from all construction and development in urban areas by 2003.

Regulatory Issues CZARA Section 6217(g).
Phase II storm water requirements under the Clean Water Act will require construction site erosion control permits on sites one acre and larger in the next two years.

Related Actions

WAQ-06	Ensure Adequate Wastewater Treatment Capacity
SED-06	Develop, Implement, and Enforce a Stormwater Management Ordinance
OPSW	DEQ-5S, 6S, 9S, 10S, 15S, 19S, 20S DLCD-1, 5

WAQ-09 Ensure Properly Functioning On-Site Sewage Disposal Systems

What

Install new on-site disposal systems (OSDSs) in accordance with DEQ regulations. Test old OSDSs and upgrade where necessary. Provide adequate disposal systems for construction sites and boaters.

Why

Fecal coliform contamination of Tillamook Bay is due, in part, to failing OSDSs. On-site sewage disposal systems provide adequate treatment of domestic wastewater, provided they function properly and are not overly concentrated in one area. The proliferation of septic systems poses two problems: (1) increased potential for system failure, and (2) concentrations beyond the carrying capacity of the local hydrologic system. Inadequate temporary facilities at construction sites and for boaters may also contribute to bacteria loading during certain times of the year.

Insufficient data prevent a precise determination of the relative contribution of septic systems, individually or as a whole, to the Bay's water quality problems. However, recently-conducted studies using antibiotic resistance have identified human fecal bacteria as an important component of the total bacteria load in river and Bay waters. Transient boaters and other users of the Bay, rivers, and Watershed also need to dispose properly of body wastes in order to prevent disease transmission.

How (Who.When.)

Step 1 Maintain qualified County staff to administer DEQ on-site inspection program. (Tillamook County. Ongoing.)

Step 2 Conduct annual OSDS surveys using Shoreline Sanitation Survey methods. Conduct comprehensive surveys on one sub-basin each year, inspecting each at least once every six years. (Tillamook County. Complete new shoreline survey by 2005.)

Step 3 Coordinate education efforts with the surveys. Print brochures that explain the use, maintenance, and repair of OSDSs. (Tillamook County. Begin 2000, ongoing.)

Step 4 Implement CZARA 6217(g) Guidance Management Measures for OSDSs. (Tillamook County. By 2002.)

Step 5 Institute an ordinance that requires OSDS inspection with sale of property in the County. (Tillamook County. By 2002.)

Step 6 Encourage all property owners within the City of Tillamook UGB to connect to a public sewer system. (Performance Partnership. Ongoing.)

Step 7 Where appropriate, annex properties with failing OSDSs to the sewer system through ORS health hazard standards. See WAQ-07. (Tillamook County. Ongoing.)

Step 8 Reduce contamination from body wastes by installing a second floating head in Tillamook Bay during peak fishing season and reminding boaters to use this facility, or the Port of Garibaldi pump-out for their on-board toilets. Educate hunters, anglers, and other Bay and Watershed users about proper disposal of body wastes. (Port of Garibaldi. By 2001.)

Step 9 Require temporary restroom facilities on all construction sites where public facilities are not located nearby. (Tillamook County, city governments. By 2001.)

Where Watershed-wide.

Lead Agencies Tillamook County and Performance Partnership.

Other Partners ODA, DEQ, Oregon Marine Board, city governments, Port of Garibaldi, real estate sector, landowners.

Anticipated Cost Surveys: $30,000 each.
Brochure development/updating: $1,000/year.
Ordinance development: $25,000.
Sewer annexations: $2,000–10,000 per parcel.
Floating head: $50,000/year.
0.5 FTE DEQ staff cost for 10 years = $250,000.

Monitoring Track CCMP objectives:

- Achieve water quality standards for bacteria in the rivers and Bay by 2010.
- Document at least a 25% reduction in bacteria loads to rivers, with apparent trends by 2005 and statistically significant results by 2010.
- Achieve at least a 25% reduction every four years in the number of days that the rivers are not in compliance with water quality standards for bacteria.
- End wastewater treatment plant failures by 2002.
- Control runoff from all construction and development in urban areas by 2003.

Regulatory Issues Coastal Zone Management Act (CZMA) 6217(g), city and County ordinances, County budget.

Related Actions

WAQ-06	Ensure Adequate Wastewater Treatment Capacity
WAQ-07	Expand Sewer Network
WAQ-08	Ensure Adequate Urban Runoff Treatment and Retention
OPSW	DEQ-6S, 9S, 10S, 14S, 17S, 19S, 20S

OMB-2
DLCD-5

WAQ-10 Implement Temperature Management Strategies

What

Develop and implement temperature management plans for streams with segments on the 303(d) list. See list, Appendix A, or map, Figure 2-6.

Why

Water temperature is a key habitat element for salmonids. Maintaining stream temperature regimes similar to that in which salmonids have evolved and historically thrived is very important if Oregon is to succeed in maintaining and restoring salmonid populations. Riparian shade, which is poor in lowland areas, is a key factor in stream temperature moderation. Riparian trees also supply large wood for improving stream complexity, which also moderates water temperatures. DEQ currently lists several stream segments in the Tillamook Bay Watershed as water quality limited for temperature. Species affected by high temperatures include coho salmon, listed by NMFS as Threatened (63 FR 13347, Aug. 10, 1998), and steelhead.

Temperature regimes influence migration, egg maturation, spawning, incubation success, growth, inter-and intraspecific competitive ability, and resistance to diseases and pollutants. Increased temperature can worsen the synergistic effects of dissolved oxygen, pH, salinity, photoperiod, and chemicals on fish reproduction and survival. Water temperature correlates highly with instream flow and loss of riparian vegetation. Temperature is especially a problem in Tillamook Bay tributaries during critical low flows (July through September) each year.

How (Who.When.)

Step 1 Using the TMDL process, identify those stream segments where rapid heating occurs X especially for salmonid rearing, spawning, and migration areas X and prioritize for restoration. (DEQ. By 2000.)

Step 2 Complete an analysis of instream flows on Tillamook Bay tributary streams to determine flow and temperature relationships. Develop hydrodynamic models to demonstrate this relationship. See HAB-09 and FLD-01. (OWRD and DEQ. By 2002.)

Step 3 Analyze methods by which diversions can be returned to tributary streams. Analyze water rights not currently in use that can be converted to instream rights. Identify and prohibit unpermitted withdrawals. (OWRD. By 2002.)

Step 4 Assess the role of forest practices in temperature listings. If current forest practices may be linked to temperature problems, request the Board of Forestry to "direct (a) task force to analyze conditions within the Watershed and recommend watershed-specific practices to ensure water quality achievement or species maintenance." (According to FPA [OAR 629-635-120(3)]). (Performance Partnership. 2002.)

Step 5 Develop and deliver outreach tools that present water quality information and monitoring results in the Watershed. Outreach tools may include: a Web site; articles in local newspapers and water bills; KB12 curriculum development; and adult classes for watershed councils, etc. (TBCC, Performance Partnership. By 2001.)

Step 6 Plan, assist with funding, and coordinate efforts to meet temperature TMDLs by fostering healthy riparian condition, enhancing instream flows and instream habitat, and other activities as needed (see cross-referenced actions below). (Performance Partnership and DEQ. By 2002.)

Where Watershed-wide, with 303(d) listed streams as priority.

Lead Agencies DEQ, OWRD.

Other Partners ODF, ODFW, BLM, USFS, USFWS, NMFS, NRCS, SCWD, TBCC, Performance Partnership.

Anticipated Costs Instream flow study costs: OWRD and ODFW, 1.0 FTE each, $200,000. On-the ground costs: site-specific.

Monitoring Track CCMP objective:

- Achieve in-stream temperatures that meet salmonid requirements by 2010.

Regulatory Issues SB 1010, Forest Practices Act (FPA), Endangered Species Act (ESA), Oregon Plan, Clean Water Act (CWA), CZMA 6217(g).

Related Actions

HAB-05 Protect and Enhance Upland Riparian Areas
HAB-06 Protect and Enhance Floodplain/Lowland Riparian Areas
HAB-07 Protect and Enhance Instream Habitat
HAB-25 Reconnect Sloughs and Rivers to Improve Water Flow.
SED-02 Implement Practices That Will Improve Sediment Storage and Routing
WAQ-06 Ensure Adequate Wastewater Treatment Capacity
OPSW DEQ-1S, 2S, 6S, 15S, 19S
ODF-8S, 19S, 20S, 21S, 22S
WRD-S-1, 2, 4, 6, 8, 12, 14, 15, 16, 17, 20, 21, 22, 29
ODFW-IVA3, IVA8
BLM/USFS-14
NOAA/NMFS-41

WAQ-11 Implement Suspended Sediments Management Strategies

What

Develop suspended sediments management plans for streams on the 303(d) list. See Appendix A. Identify those stream segments, especially for core and essential fish areas, where excessive suspended sediments occur and prioritize for restoration by 2000. Implement all enhancement activities by 2010. Regularly monitor suspended sediment loading in rivers and streams as an indicator of overall erosion, and of success in controlling erosion.

Why

Excessive suspended sediments in the water or excessive fines embedded in stream gravels impact aquatic biota, especially salmonid species, in various stages of their life histories. Excess sediment can clog gills, reduce a fish's ability to locate prey, cause fish to leave or avoid an area, suffocate eggs, and reduce oxygen availability. Total suspended solids (or turbidity based on site-specific statistical analyses of the relationship between TSS and turbidity) is one of the few ways that sediment loading can be monitored accurately.

How (Who.When.)

Step 1 Using the TMDL process and water quality storm monitoring data, identify stream segments where excessive suspended sediments or turbidities occur and prioritize sites for enhancement. (DEQ. By 2001.)

Step 2 Implement site-specific enhancement activities at sites from the prioritized list. Assist with promoting the OPSW restoration guidelines. See NRCS list of conservation practices in Table 5-1. (Performance Partnership. By 2002.)

Step 3 Develop and deliver outreach tools that present information and results regarding sediments in the Watershed. Outreach tools may include: a Web site; articles in local newspapers, water, or power bills; KB12 curriculum development; and adult TBCC classes for watershed council members. (OSU Extension, TBCC, Performance Partnership. Initiate in 2000, ongoing.)

Step 4 Develop and conduct suspended sediment monitoring in the Tillamook Bay Watershed to evaluate the effectiveness of enhancement activities. (DEQ. 2000, ongoing.)

Where

Watershed-wide, with 303(d) listed streams as priority.

Lead Agency

DEQ.

Other Partners

ODF, ODFW, BLM, USFS, NOAA, NMFS, USFWS, NRCS, SWCD, TBCC, Performance Partnership.

Anticipated Costs

0.5 FTE DEQ staff costs for plan administration and monitoring 10 years = $250,000.

$50,000 for study.

Construction, protection/enhancement projects: site specific.

0.25 FTE TBPP staff outreach, class development/delivery: at $12,500/year.

Monitoring

Track CCMP objective:

- Achieve in-stream suspended sediment concentrations that meet salmonid requirements by 2010.
- Control runoff from all construction and development in urban areas by 2003.

Regulatory Issues

Clean Water Act.

Endangered Species Act.

Coastal Zone Management Act 6217(g).

Senate Bill 1010.

Forest Practices Act.

Related Actions

HAB-05	Protect and Enhance Upland Riparian Areas
HAB-06	Protect and Enhance Floodplain/Lowland Riparian Areas
HAB-07	Protect and Enhance Instream Habitat
HAB-09	Control Livestock Access to Streams
HAB-10	Stabilize Streambanks Using Alternatives to Riprap
HAB-11	Encourage Protection and Enhancement on Private Lands
HAB-12	Sponsor a Native Vegetation Planting Day
HAB-15	Revise Local Ordinances to Increase Protection of Riparian Areas, Wetlands, and Instream Habitat
SED-01	Implement Road Erosion and Risk Reduction Projects
SED-02	Implement Practices That Will Improve Sediment Storage and Routing
SED-03	Reduce Risks in Landslide-Prone Areas
SED-05	Reduce Sedimentation from Non-Forest Management Roads
OPSW	DEQ-1S, 2S, 5S, 6S, 12S, 19S DSL 6 ODF-15S ODFW-IVA5, IVA6 NOAA/NMFS-41

WAQ-12 Evaluate Shellfish Growing Area Classifications

What

Evaluate shellfish growing area classifications and update the shellfish management plan on a continual basis to correlate water quality with shellfish sanitation.

Why

The FDA sets standards and provides guidance to manage shellfish growing areas. ODA administers the local management plan for shellfish growing. Based on water quality sampling and shellfish meat data, ODA defines three areas for shellfish harvest:

- conditionally approved,
- restricted, and
- prohibited.

ODA and DEQ collect Main Bay bacteria and (bio)toxin samples to support mandates of the National Shellfish Sanitation Program and NPDES permits, respectively.

By the end of 1998, the various agencies had collected much new data about bacterial concentrations in the Bay. These data include:

- ODA/DEQ monthly water quality monitoring in shellfish growing areas;
- ODA intensive monitoring under adverse conditions;
- ODA shellfish sanitary survey every 12 years;
- Tillamook County shoreline septic tank study;
- TBNEP storm runoff data; and
- DEQ wastewater treatment plant data (NPDES permits).

See Chapter 10, Monitoring and Research Needs, for more information.

ODA will use these and other relevant data to reevaluate the shellfish growing area classifications. This evaluation could result in increased or decreased areas with restrictive classifications, and subsequently increased (or decreased) overall shellfish harvest levels.

How (Who.When.)

Step 1 Evaluate the current shellfish growing area classifications in Tillamook Bay based on updated ODA shellfish sanitary survey data. See related action WAQ-09. (ODA. By 2000.)

Step 2 Redraw classification boundaries for shellfish harvest in Tillamook Bay, if appropriate. (ODA. By 2000.)

Step 3 Continue upgrading the shellfish waters monitoring strategy, including the addition of more sampling stations in the actual harvesting areas. (ODA. Ongoing.)

Where	Estuary-wide. Sanitary surveys conducted for properties within 500 feet of a mapped stream, Watershed-wide.
Lead Agency	ODA.
Other Partners	DEQ, FDA, shellfish harvesters/growers.
Anticipated Cost	0.15B0.25FTE ODA staff time for one year = $7,500B12,500.
Monitoring	Implementation.
Regulatory Issues	OAR 603-100-010B603-100-030 and OAR 340-41-0215 (2)(e and f) (North Coast). FDA National Shellfish Sanitation Program.
Related Actions	WAQ-13 Update Shellfish Management Plan Closure Criteria HAB-18 Prioritize Tidal Sites for Protection and Restoration

WAQ-13 Update Shellfish Management Plan Closure Criteria

What

Update the shellfish management plan closure criteria to more accurately reflect public health risks associated with bacterial water pollution.

Why

The Bay is closed to shellfish harvest closure about 90 days per year as a result of sampling studies (or trends) that indicate that during certain rainfall or river stage conditions the Bay water quality does not comply with the FDA fecal coliform standards for commercial shellfish growing areas. Harvesting may also be closed for other reasons, such as presence of biotoxins or chemicals. Closures cause economic disruption to shellfish growers.

The current shellfish plan was adapted in 1991 as a state (ODA) response to federal (FDA) studies of water column bacteria and oyster meats in the 1970s. The current plan links shellfish closures to rainfall and river flow, which may not accurately portray bacterial concentrations in the Bay. Tillamook Bay is now divided into five shellfish management areas. ODA allows no harvesting from prohibited areas and harvest from conditional areas only when these zones are open. All conditionally approved areas close when the Wilson River rises to 7 feet, (or 25,000 cubic feet per second) and reopen five days after the river peaks. The Cape Meares area reopens seven days after the river peaks, or seven days after it rains more than one inch in 24 hours.

Better information about main Bay bacterial concentration, fate, and distribution should allow ODA officials to reevaluate shellfish closure and reopening criteria to make sure they reflect water quality and human health. The evaluation could result in fewer (or more) closure days per year and subsequent increases (or losses) in net revenue to shellfish growers.

How (Who.When.)

Step 1 Use statistically rigorous methodologies on recently collected data to determine which parameters (river stage heights, bacteria loading by river, extent of contamination in shellfish meats, WTP loading during storm events, CAFO data, precipitation, antecedent weather conditions, ground saturation, etc.) provide closure and opening criteria for Tillamook Bay that assure the area complies with the shellfish standard when in the "open status" and protects shellfish consumers. (ODA and DEQ. By 2000, ongoing.)

Step 2 Use statistically rigorous methodologies and recently collected data to determine which parameters best describe the appropriate length of closure for predictable closure conditions in Tillamook Bay. Continue to meet FDA requirements for interstate trade in

shellfish meats (230 FCB/100 grams of meat). (ODA. By 2000, ongoing.)

Step 3 Reevaluate sampling strategies and station locations based on recently collected data and hydrology information, and redefine if appropriate. (ODA and DEQ. 1999, ongoing.)

Step 4 Revise shellfish closure criteria. (ODA. By 2000.)

Where Estuary-wide.

Lead Agency ODA.

Other Partners DEQ, FDA, shellfish harvesters/growers.

Anticipated Costs 1.0 FTE ODA/DEQ staff time = $50,000 per year.
$25,000 per year for surveys, monitoring, and data analysis.

Monitoring Implementation.

Regulatory Issues OAR 603-100-010B603-100-030, OAR 340-41-0215 (2)(e and f) (North Coast).
FDA National Shellfish Sanitation Program.

Related Actions WAQ-12 Evaluate Shellfish Growing Area Classifications

CHAPTER

6 EROSION & SEDIMENTATION Action Plan

Priority Problem

Erosion and sedimentation in the Watershed and Bay can adversely impact the human and natural environment. Impacts may include the loss of spawning and rearing habitat in both fresh and salt water, degradation of other estuarine habitats, changes in the Bay's depths and water circulation patterns, and flooding.

Goal

Reduce Sediment Risks from Forest Management Roads

Many roads in the Tillamook Watershed were built prior to current design standards and pose a number of sediment and other risks to salmonids. Such roads have been identified as a leading potential source of increased sediment. Road surfaces, cut and fill slopes, and ditches are generally chronic sediment sources, and poorly designed culverts frequently block fish passage. Failures of road crossing fills or cut and fill slopes produce episodic sediment runoff, usually related to very large precipitation events. Regular maintenance of all roads and upgrading or decommissioning older forest management roads will reduce sediment loading to streams in the Watershed.

Goal

Reduce the Adverse Impacts of Rapidly Moving Landslides

Rapidly moving landslides (debris flows) are natural events that most commonly occur during high duration and intensity rainfall events on slopes steeper than 65%. Vegetation removal may impact debris flows by changing their timing, size, and composition, reducing the value of debris flow deposits in providing fish habitat. Forest practices that maintain the vegetation components that affect either the timing or structural elements of debris flows will reduce the adverse impacts downstream.

Goal

Improve Channel Features to Improve Sediment Storage and Routing

Channel features, such as large wood and form (*e.g.*, channel development) have been modified by human activities in ways that may be adversely affecting sediment storage and routing, and therefore fish habitat. Historically, large wood stored and sorted sediment in the stream channel, creating complex pools with a variety of substrate conditions. Channels also migrated across the floodplain. Dikes, roads, and other

development now confine many channels, so that sediments are no longer spread across the floodplain. Rather, they are transported more rapidly through the system and may accumulate more rapidly in the lower reaches of the Watershed. Increased large wood supply and retention and floodplain connectivity will improve sediment storage and routing functions.

Goal **Reduce the Adverse Impacts of Erosion and Sedimentation from Developed and Developing Areas**

Roads and other hardened surfaces contribute to surface water runoff, increasing stream power and bank erosion. Road and building construction and other activities associated with development can also increase erosion by exposing unprotected soil and disrupting natural drainage patterns. Careful erosion controls on construction and development sites will reduce the contribution of sediment from urban areas.

Goal **Reduce the Adverse Impacts of Erosion and Sedimentation from Agricultural Areas**

Erosion in agricultural lowlands typically takes two forms: streambank cutting, and sheet and rill erosion. Streambank erosion is the more prevalent of the two types. Increased bank erosion is commonly associated with the removal of riparian vegetation. Cattle accessing streambanks can also increase erosion when their hooves break up the soil matrix and remove vegetation. Sheet and rill erosion can contribute significant amounts of sediment, including organic material (*e.g.* leaves and other detritus, and livestock feed, bedding and manure), in localized areas. Improved riparian condition and farm management practices will reduce sedimentation from agricultural areas.

Objectives

Upgrade 1,400 miles of forest roads on state and private lands by 2010.

Decommission 50 miles of forest management road by 2010.

Conduct regular road maintenance activities on all 2,000 miles of forest management roads.

Control runoff from all construction and development in urban areas by 2003.

Enhance 200 miles of forested riparian habitat to healthy riparian condition by 2010. (Habitat Objective)

Enhance 500 miles of riparian habitat in the 0–500' elevation band to healthy condition by 2010. (Habitat Objective)

Enhance 100 miles of upland instream habitat by 2010. (Habitat Objective)

Enhance 750 acres of tidal wetland by 2010. (Habitat Objective)

Achieve instream suspended sediment concentrations that meet salmonid requirements by 2010. (Water Quality Objective)

Document at least a 25% reduction in total suspended solids loads to rivers, with apparent trends by 2005 and statistically significant results by 2010. (Water Quality Objective)

Erosion and Sedimentation Action Plan

SED-01 Implement Road Erosion and Risk Reduction Projects
SED-02 Implement Practices That Will Improve Sediment Storage and Routing
SED-03 Reduce Risks in Landslide-Prone Areas
SED-04 Ensure Sufficient Resources to Enforce Forest Practices Act
SED-05 Reduce Sedimentation from Non-Forest Management Roads
SED-06 Develop, Implement, and Enforce a Stormwater Management Ordinance
***
HAB-05 Protect and Enhance Upland Riparian Areas
HAB-06 Protect and Enhance Lowland Riparian Vegetation
HAB-07 Protect and Enhance Instream Habitat
HAB-09 Control Livestock Access to Streams
***
WAQ-11 Implement Suspended Sediments Management Strategies
***
FLD-02 Implement Watershed Drainage Modification Projects

SED-01 Implement Road Erosion and Risk Reduction Projects

What

Identify, prioritize, and implement improvements of road elements such as road fills, stream crossings, and surface problems to reduce sediment runoff risk and improve fish passage and habitat. These improvements will reduce the risk of adverse watershed effects associated with "legacy" roads by reducing landslide and washout potential; improving drainage and sediment control; and removing barriers to fish passage.

Why

Many forest roads built prior to the current BMPs or development of the Oregon Forest Practices Act pose increased risk of excessive sediment to fish habitat. These roads are the principal contributors of human-caused sediment runoff in forest areas as well as major barriers to fish passage. Upgrading substandard roads can reduce sediment production and input to streams, benefiting fish and other aquatic life, and reducing the total amount of sediment transported to the lower rivers and Bay. Industrial, federal,[1] and State Forest landowners are implementing a voluntary program to identify and address risks from roads (OPSW workplans ODF-1S and 2S, described in Appendix D), and to evaluate the adequacy of fish passage criteria (ODF-16S). OPSW objectives call for elimination of artificial obstructions to fish passage as necessary to access key habitat for critical life stages of salmonids.

How (Who.* When.)**

Step 1 Assess forest roads on federal, state, and private lands. Use road survey protocol developed jointly by ODFW, ODF, OSU, and OFIC. Assess similar roads in other ownership (*e.g.*, agricultural roads, non-paved county roads) as appropriate. (ODF and OFIC on forest lands, TCPP on non-forest lands. All roads by 2003.)

Step 2 Develop a list of priority sites for road upgrade work. Emphasize road systems constructed prior to current forest practice standards and road systems in core areas. (ODF and Performance Partnership. Annually.)

Step 3 Design and implement actions and maintenance practices to reduce road-related risk. Follow Oregon Forest Practice Administrative Rules (629-625-000 through 629-625-650) and the Road Management Guidebook developed by ODF. Explore cooperative agreements between adjacent landowners as a way to reduce the number of forest roads. (ODF and OFIC. Ongoing.)

Step 4 Vacate unneeded roads and stabilize abandoned forest roads. Modify roads that will be unused for some time (decades) to reduce erosion while protecting much of the initial investment in their layout and construction. (ODF and OFIC. 50 miles by 2010.)

[1] BLM and USFS fish passage, road and landslide assessment criteria come from the 1994 Northwest Forest Plan and their Land Management Planning Documents. They include BMPs for road building, maintenance, upgrading, and decommissioning.

* Coordinating entity; ensures that identified partners are on schedule.

** By end of named year.

Step 5 Evaluate road improvement effectiveness in reducing sediment production and improving fish passage. Adjust site selection criteria, upgrade techniques, BMPs, and maintenance activities, based on evaluations of upgraded roads. (ODF. By 2001, ongoing.)

Step 6 Implement the ODF compliance auditing program to determine the level of compliance with forest practices road maintenance rules. Use this information to determine if actions are needed to improve compliance and identify how compliance problems are best resolved. (ODF. By 2000, ongoing.)

Step 7 Facilitate grants to assist landowners in reducing road-related risks. (ODF/TCPP. By 2000, ongoing.)

Where Watershed-wide.

Lead Agency ODF on forest lands, TCPP on non-forest lands.

Other Partners Private landowners, OFIC, small woodland owners, Tillamook County, cities, federal landowners, OSU Extension, State Lands Board, DSL, watershed councils, OWEB, USFWS, NMFS, BLM, USFS, Fish Restoration and Enhancement Board, FEMA (Project Impact), COE.

Anticipated Costs

Planning costs: ODF – 2FTE for planning, $50,000 each per year; other owners, $100,000.
Upgrade roads: $3–7 million/year over 10 years.
Decommissioning: $50,000 per year over 5 years.
Compliance audit: covered under SED-02.
Maintenance: $2B4 million/year

Monitoring

Track CCMP objectives:

- Upgrade 1,400 miles of forest roads on state and private lands by 2010.
- Decommission 50 miles of forest management road by 2010.

OPSW monitoring programs:

- ODF-10S Forest Practices Monitoring Program
- ODF-13S Storms of 1996 Monitoring Project
- ODF-23S BMP Compliance Audit Program
- ODF-25S Fish Presence/Absence Surveys and Fish Population Surveys

Regulatory Issues Forest Practices Act.

Related Actions

HAB-21	Modify Ineffective Tide Gates and Floodplain/Lowland Culverts
SED-04	Ensure Sufficient Resources to Enforce Forest Practices Act
SED-05	Reduce Sedimentation from Non-Forest Management Roads
OPSW:	ODF-1S, 2S, 5S, 10S, 13S, 15S, 16S, 23S, 25S, 34S, 35S, 36S, 59S
	ODOT-8
	DEQ-1S, 5S, 6S
	DSL-6
	ODFW IB4, IVC1, IVC6

SED-02 Implement Practices That Will Improve Sediment Storage and Routing

What

Implement practices that retain additional vegetation along streams and promote restoration of floodplain function. Steps outlined in this action address relevant upland forest practices and will go beyond current FPA requirements. Steps in HABs 06, 07, 08, and 24 and FLD-02 and 05 will address floodplain function in lowland/floodplain areas.

Why

These practices alter the rate of sediment transport downstream and improve instream habitat. Improved forest management practices have already reduced the adverse impacts from erosion and sedimentation, and increased the potential for future recruitment of large wood to streams. Nonetheless, restoring sediment storage and routing functions in the fluvial system will require substantial time and effort.

Because the State Forest constitutes approximately 64% of the forested lands in the Tillamook Bay Watershed, the major responsibility for this action will fall on ODF in developing its Northwest Oregon State Forests Management Plan and implementing OPSW programs (summarized in Appendix D). BLM and USFS programs are specified in the Northwest Forest Plan, adopted in 1994 in response to ESA listing of the northern spotted owl, and their Land Management Planning Documents. Private industry groups will demonstrate benefits and work to provide incentives to private landowners as well.

Incentive programs can provide private landowners flexibility and creativity in their approach to improving environmental conditions, and balance the burden of environmental restoration more fairly between private individuals and the public.

How (Who.When.)

Step 1 Actively implement measures in the Oregon Plan that retain additional vegetation or will improve the loading of large wood in streams. (ODF and private landowners. Ongoing.)

Step 2 Actively support adoption and implementation on State Forest lands of water quality strategies and stand structure targets. (Described on page V-97, V-37 of the April 1998 draft of the Northwest Oregon State Forests Management Plan, respectively) (Performance Partnership. Ongoing.)

Step 3 Assist with promoting the OPSW restoration guidelines. Actively support and implement the North Coast Salmonid Habitat Restoration Project (OPSW workplan ODF5). 115 sites were located in the Tillamook Watershed in the first two years (See Appendix G and Figure 6-1). 61 potential project sites have been identified on Tillamook State Forest lands, with additional habitat projects to be identified on private lands beginning in 1999. (Performance Partnership [support] and ODF [implement]. Ongoing.)

Step 4 Implement OPSW workplan ODF8 on sites where the native tree community was conifer-dominated, but due to historical events have become hardwood-dominated. This measure allows disturbance to produce conditions suitable for the re-establishment of conifers without increasing summer water temperatures.[2] (ODF. Ongoing)

Step 5 Apply OPSW workplans ODF-18, 19, 20, 21, and 22 and other voluntary measures that private industry has developed to retain additional vegetation along stream channels. Demonstrate the benefits of more protective forest practices and provide other more direct incentives to private landowners to utilize those practices. Prepare summary report to Performance Partnership. (OFIC. By 2000.)

Where Forested areas, Watershed-wide.

Lead Agency ODF and OFIC.

Other Partners Private landowners, BLM, USFS, OWEB, Oregon Legislature, Performance Partnership.

Anticipated Cost ODF staff: $50,000/year.
Costs of incentives for private forest landowners are unknown and will depend on the nature of the programs yet to be identified.

Monitoring Track CCMP objectives:

- Enhance 200 miles of forested riparian habitat to healthy riparian condition by 2010.
- Enhance 100 miles of upland instream habitat by 2010.
- Enhance 500 miles of riparian habitat in the 0B500' elevation band to healthy condition by 2010.
- Enhance 100 acres of freshwater wetland by 2010.

ODF monitoring of forest practices, road, and temperature protection BMPs under the Oregon Plan. Monitor voluntary projects with the Oregon Plan Stream and Watershed Restoration Project Reporting Form.

Regulatory Issues The NMFS listed Coastal Coho as a threatened species under the Endangered Species Act on August 3, 1998. Management implications of that listing on Oregon=s forest practices regulations are still unknown.

[2] In situations where existing riparian vegetation is incapable of developing characteristics of a mature streamside stand in a "timely manner," the process will provide functional stream shade, some woody debris, and bank stability in the short term while creating conditions to attain desired future conditions more quickly than would otherwise be achievable under natural succession. See HAB-05 for conditions and restrictions.

Related Actions

HAB-05	Protect and Enhance Upland Riparian Areas
HAB-06	Protect and Enhance Lowland Riparian Areas
HAB-07	Protect and Enhance Instream Habitat
OPSW	ODF-5S, 7S, 8S, 18S, 19S, 20S, 21S, 22S, 27S, 30S, 31S
	DSL- 6

ODFW survey map

Figure 6-1.

SED-03 Reduce Risks in Landslide-Prone Areas

What

Encourage silvicultural practices likely to reduce adverse impacts from landslides.

Why

Landslides of the right size and frequency can enhance fish habitat by supplying large woody debris, leading to channel complexity. However, some land use practices may result in larger and more frequent slides that the rivers can handle. Many areas in the Coast Range have steep slopes and are susceptible to landslides. Activities that further steepen the land surface, concentrate water, or remove vegetation from these slopes can increase the risk, timing, and composition of landslides. Landslides which reach stream channels can deposit large quantities of sediment in streams, adversely impacting habitat over their course and downstream of the affected reach, or scouring all material from mountain stream channels.

Landslide risks associated with forest management roads are largely addressed through SED-01 and SED-05. This action focuses on harvest-related silvicultural practices. Encouraging retention of vegetation so that large wood is available to be delivered to channels can reduce adverse effects of landslides. When landslides do occur large woody debris can help retain and rework debris-torrent materials into productive fish habitat.

How (Who.When.)

Step 1 Continue ODF evaluation of risks to water and fish resources prior to approval of proposed harvesting operations on high risk sites under OAR 629-630-500. (ODF. Ongoing.)

Step 2 Complete ODF analysis of landslide and debris flow data from its "Storms of 1996" monitoring study and submit latest scientific findings and recommendations of the *Forest Practices Advisory Committee on Salmon and Watersheds* to the Board of Forestry for rule review. (ODF. By 1999.)

Step 3 Support implementation of silvicultural practices resulting in increased vegetation retention along streams, including Type N streams in especially high risk areas, through:

(1) adopt by 2000 and implement the NW Oregon State Forest Management Plan for State Lands (ODF. Ongoing.); and

(2) measures such as ODF 18, 19, 20, and 22 developed under the Oregon Plan in cooperation with OFIC for private lands. (ODF, OFIC and other private foresters. By 2001, ongoing.)

Where

Forest lands, Watershed wide.

Lead Agency

ODF.

Other Partners

OFIC, other private landowners, USFS, BLM, Tillamook County, ODFW, DLCD, and NMFS.

Anticipated Costs

Costs associated with decreased revenue from harvests.

Monitoring

Actions relating to ODF 18, 19, 20, and 22 will be monitored under the Oregon Plan.

Track CCMP objective:

- Enhance 200 miles of forested riparian habitat to healthy riparian condition by 2010.

Regulatory Issues

Oregon FPA Administrative Rules may be affected by Board of Forestry rule review and ESA salmon listing.

USFS and BLM activities are governed by the Northwest Forest Plan, which amended their Planning Documents.

Related Actions

SED-01	Implement Road Erosion and Risk Reduction Projects
SED-02	Implement Practices That Will Improve Sediment Storage and Routing
HAB-05	Protect and Enhance Upland Riparian Areas
OPSW	ODOT-8
	DEQ-5S, 6S
	DSL-6
	ODF-3S, 13S, 37S, 38S

SED-04 Ensure Sufficient Resources to Enforce Forest Practices Act

What

Maintain two Forest Practice foresters assigned to the Tillamook District for forest practices education, prevention and enforcement activities. Decrease the number of Forest Practices Act violations.

Why

ODF achieves FPA rule compliance through a program of rule education, technology transfer, and enforcement. Increased compliance with the laws and rules regulating timber lands in the Watershed will both improve environmental conditions and provide ODF with better feedback on the effectiveness and validity of current programs.

How (Who.When.)

Step 1 Maintain funding for two forest practice foresters. (ODF. By 2000, ongoing.)

Step 2 Implement the ODF compliance auditing program to obtain a statistically reliable sample of BMP compliance. Use this information to determine if actions are needed to improve compliance and identify how compliance problems are best resolved. (ODF. By 2000, ongoing.)

Where

Forest lands, Watershed-wide.

Lead Agency

ODF.

Other Partners

OWEB, OFIC.

Anticipated Cost

Staff time: ODF X Forest Practice foresters, 2.0 FTE, $50,000 each per year for 10 years ($1M). ODF has already budgeted this ongoing cost.

Monitoring

Implementation.

Regulatory Issues

Forest Practices Act.

Related Actions

SED-01	Implement Road Erosion and Risk Reduction Projects
SED-02	Implement Practices That Will Improve Sediment Storage and Routing
SED-03	Reduce Risks in Landslide-Prone Areas
OPSW	ODF-55S

SED-05 Reduce Sedimentation from Non-Forest Management Roads

What

State, federal, and local (County and city) road authorities will evaluate appropriate road activities and functions (*e.g.*, project development, construction, maintenance, and operations) for sedimentation effects and, wherever practicable, fish passage (See HAB-21). Identify potential impacts to receiving streams and develop best management practices (BMPs) to minimize those impacts to the maximum extent practicable.

Why

Paved, graveled, and unpaved roads may be significant sediment sources. Tillamook County and ODOT own and maintain 336 and 145 center lane miles, respectively. Legal jurisdiction of road authorities is limited to their operational right of way. Consequently road authorities have no legal authority over adjacent land uses. However, road authorities can reduce stream sediment impacts by ensuring that roads are designed and maintained to minimize erosion/sedimentation.

How (Who.When.)

Step 1 Review maintenance activities to identify potential impacts to receiving streams, and develop BMPs to minimize potential impacts. (Tillamook County. By 2001.)

Step 2 Ensure that road authority project development activities, construction, and long term development practices meet the guidance in Management Measures for Urban Areas, Construction Activities and Roads, Highways, and Bridges, as required under the CZARA, Coastal Nonpoint Pollution Control Program. (Tillamook County. By 2001.)[3]

Step 3 Conduct construction and project development reviews that identify impacts to receiving streams and habitat, and mitigate for unavoidable impacts. Include appropriate regulatory authorities *(e.g.*, ODFW, NMFS, COE, and DSL) in the review process. (Tillamook County and ODOT. By 2002, ongoing.)

Step 4 Evaluate the appropriateness of including the ODF Landslide Hazard Model in the County construction/development program. (Tillamook County. By 2000.)[4]

Step 5 Partner with DEQ to develop a statewide NPDES permit to meet the requirements of the Clean Water Act, including TMDL allocations. (ODOT. By 2001)

Where

Non-forest management roads: Watershed-wide.

[3] ODOT has participated in such a review in consultation with the Association of Oregon Counties and NMFS. The review resulted in the "Oregon Department of Transportation Maintenance Water Quality Best Management Practices Guide, November 1998."

[4] ODOT will incorporate the ODF Landslide Hazard Model into its natural resource mapping process in 1999.

Lead Agency Tillamook County.

Other Partners ODOT, Cities of Tillamook, Bay City, and Garibaldi, NMFS, DEQ, DSL, ODFW, COE.

Anticipated Cost Project costs are project-specific: at least 1.0 FTE for project development and review.

Monitoring Track CCMP objectives:

Achieve in-stream suspended sediment concentrations that meet salmonid requirements by 2010.

Control runoff from all construction and development in urban areas by 2003.

Regulatory Issues Clean Water Act.
Endangered Species Act.
DSL/COE Fill/Removal Permits.

Related Actions

SED-01 Implement Road Erosion and Risk Reduction Projects

OPSW: ODOT-3, 6, 8, 9
ODF-13S

SED-06 Develop and Implement a Stormwater Management Ordinance

What

Pass city and County ordinances regulating activities and urban land uses that can directly or indirectly increase sediment loading above normal levels. Require effective construction site erosion control on all urban construction sites in all Tillamook Bay Watershed jurisdictions.

Why

A comprehensive stormwater management ordinance will control direct and indirect sediment loads in urban areas. The effect on sediment production or transport from urban construction sites or developments can be significant, and disproportionate to size and area. Sediment transport rates from unprotected or disturbed soils vastly exceed those of vegetated or artificially-surfaced areas.

Effects on channel erosion from urban activities are related to an increase in peak stream flow, and hence a disturbance in the balance between erosion and deposition in a given stream reach. The width, depth, and meandering nature of a stream channel are in a dynamic equilibrium with the forces of the water that flow through the channel. An increase in the volume of water carried by the stream increases the erosive force in the stream channel. The result is often a streambank failure. Delaying the delivery of storm water from a site allows for solids in the storm water to settle out or be filtered out before they reach the stream. Also, peak stream flow and intensity of erosive forces are reduced.

How (Who.When.)

Step 1 Develop a model ordinance. (Tillamook County. By 2000.)

Step 2 Introduce model ordinance to local jurisdictions' planning commissions. (Tillamook County. By 2000.)

Step 3 Adopt stormwater management ordinances in the Watershed's three cities and Tillamook County. (Tillamook County and Cities of Tillamook, Bay City and Garibaldi. By 2001.)

Where

Tillamook County and incorporated cities of Bay City, Garibaldi, and Tillamook.

Lead Agencies

Tillamook County Board of Commissioners and city councils of Bay City, City of Tillamook, and Garibaldi.

Other Partners

Tillamook County DCD, local planning commissions and local legislative bodies, DLCD, DEQ.

Anticipated Cost

Cost for developing and adopting an ordinance: $25,000.
Continuing substantial costs for implementing ordinance.
Stormwater engineering studies: $25,000B$50,000 each.

Monitoring

Monitor CCMP objectives:

Achieve in-stream suspended sediment concentrations that meet salmonid requirements by 2010.

Control runoff from all construction and development in urban areas by 2003.

Regulatory Issues

Management measures required by Coastal Non-Point Pollution Control Program (CNPCP). Appropriate urban land use response to sediment TMDL and salmon habitat protection issues.

Phase II storm water requirements under the Clean Water Act will require construction site erosion control permits on sites one acre and larger in the next two years.

Related Actions

WAQ-08 Ensure Adequate Non-Point Urban Runoff Treatment and Retention

OPSW: DEQ-1S, 6S, 15S
DLCD-5

CHAPTER

7 FLOODING Action Plan

Priority Problem

The interaction of human activities with dynamic natural systems has increased the magnitude, frequency, and impacts of flood events. These events affect water quality through increased erosion and co-mingling of flood waters with industrial and agricultural products and waste products. Each time a significant flood occurs, water quality and aquatic wildlife are negatively impacted as contaminants enter the system.

Goal

Improve Floodplain Condition

Optimize the Watershed's hydrologic characteristics to move water from the uplands to the estuary decreasing conflicts with human habitation or development while improving the ecosystem. Specifically, identify, design, and implement projects that delay runoff (*e.g.,* flatten storm hydrographs), increase floodplain storage capacity, and facilitate drainage where appropriate. Each of these projects will be done in a manner that is consistent with fish and wildlife habitat restoration and enhancement.

Goal

Develop and Maintain a Comprehensive Floodplain Management Plan

Tillamook County has adopted a comprehensive Flood Hazard Mitigation Plan (FHMP) to guide floodplain management in the County. As specified in the FHMP, comprehensive floodplain management requires the incorporation of land use planning, structural and non-structural floodwater control, and event-response strategies. The intent is to reduce the risks to life and property and enhance natural floodplain function, including the restoration of wetland, riparian, and aquatic habitat. The FHMP will be coordinated with all habitat protection and restoration projects in the Watershed. The FHMP must comply with federal and state laws, local ordinances, and the CCMP.

Objectives

Implement a GIS-based, unsteady state hydrodynamic model by year 2001.

Complete 20 projects within the two years following adoption of hydrodynamic model which:

- measurably reduce runoff rate in the Watershed's uplands (increasing interflow and ground water recharge, thereby reducing stream temperatures and increasing summer flows);
- improve drainage characteristics in the Watershed's lowlands (*e.g.*, connect sloughs and rivers to enhance fresh water exchange in sloughs);
- increase floodplain storage capacity in the Watershed's lowlands (*e.g.,* set back levees to increase floodwater capacity, increase riparian area, and create opportunity for sediment deposition); and
- improve the natural environment's capacity to withstand and benefit from flood events.

Raise at least 60 houses at least 3 feet above the 100-year flood elevation by year 2001, and other houses as resources permit.

Construct 10 livestock and equipment pads in flood-prone areas by 2001 to reduce pollution from petrochemicals and animal wastes during major floods.

Secure and/or remove known hazardous chemicals from areas where they pose a real threat to water quality during flood events by 2005.

Flooding Action Plan

FLD-01 Develop a GIS-Based, Unsteady State Hydrodynamic Model

FLD-02 Implement Watershed Drainage Modification Projects

FLD-03 Elevate and/or Relocate Structures, Livestock and Equipment

FLD-04 Update Existing Floodplain Map

FLD-05 Regulate New Construction and Development in the Floodplain

FLD-06 Effectively Clear Mapped Lowland Floodways and Floodplains of Hazardous Materials

New flood map becomes available late this summer

Figure 7-1. Historic mapping of 1964 flood.

FLD-01 Develop a GIS-Based Unsteady State Hydrodynamic Model

What

Develop a comprehensive computer model of the Tillamook Bay Watershed which combines watershed hydrology with floodplain hydraulics and tidal influence. Use the model to update the Flood Insurance Rate Maps, to understand and predict river flows, develop ecosystem restoration and enhancement projects, and to investigate project proposals that will reduce future flood frequency and severity.

Why

A detailed computer model is an analytical tool to predict river flows and flood elevations for current and potential floodplain configurations. The model will help planners evaluate the feasibility of flow modification projects described in FLD-02.

How (Who.[1]When.[2])

The hydrodynamic model will be created as part of a COE feasibility study in the Tillamook Bay Watershed or as an effort of the Performance Partnership membership. Model results will help justify specific projects which the COE, the local sponsor, and other partners can undertake to reduce flood impacts and improve water quality in the Watershed.

Step 1 Implement the COE Feasibility Study. (COE. By 2000.)

Step 2 Assemble hydrologic and floodplain data required to complete a comprehensive flood model. (COE, SWCD, Performance Partnership. By 2000.)

Step 3 Build and verify the flood model through detailed measurements of rainfall and river stage. (COE or Performance Partnership. By 2001.)

Step 4 Identify projects that reduce flood impacts and improve aquatic habitat. (Performance Partnership, SWCD, Project Impact, COE. By 2001.)

Where

The model and supporting data must be housed locally. The most appropriate locations are the Tillamook Coastal Watershed Resource Center or the Tillamook County Soil & Water Conservation District.

Lead Agency

Tillamook County SWCD.

Other Partners

COE, Performance Partnership, Tillamook County, ODF, NRCS, ODFW, DEQ, DSL, OWRD, USF&W, DOGAMI, NOAA, Philip Williams & Associates, Danish Hydraulic Institute, Spencer Gross, Tillamook County Flood Control Group.

[1] Coordinating entity; ensures that identified partners are on schedule.
[2] By end of named year.

Anticipated Cost

Feasibility study: $3,000,000, including $500,000 for model development. A 50% local match is required, and although half of this may be in-kind services, this is still a serious obstacle for Tillamook County SWCD, the local sponsor. The Tillamook County Performance Partnership has requested financial assistance from the State.

Monitoring

Monitor CCMP objective:

- Implement a GIS-based unsteady state hydrodynamic model by year 2000.

Regulatory Issues

Permission to access private properties for floodplain survey.

Related Actions

FLD-02	Implement Watershed Drainage Modification Projects
FLD-04	Update Existing Floodplain Map
HAB-03	Prioritize Upland Protection and Enhancement Sites
HAB-04	Prioritize Floodplain/Lowland Protection and Enhancement Sites
HAB-18	Prioritize Tidal Sites for Protection and Enhancement
HAB-23	Update the Estuary Plan
HAB-24	Reconnect Sloughs and Rivers to Improve Water Flow
WAQ-06	Ensure Adequate Wastewater Treatment Capacity
WAQ-08	Ensure Adequate Urban Runoff Treatment and Retention
WAQ-12	Evaluate Shellfish Growing Area Classifications
WAQ-13	Update Shellfish Management Plan Closure Criteria
SED-06	Develop, Implement, and Enforce a Stormwater Management Ordinance
CIT-01	Implement an Oregon State University Extension Watershed Master Series
CIT-02	Implement Associate of Arts Oregon Transfer Degree in Environmental Studies
CIT-08	Sustain the Tillamook Coastal Watershed Resource Center

FLD-02 Implement Watershed Drainage Modification Projects

What

Implement hydromodification projects in the Watershed to improve local drainage, enhance floodplain storage function, and/or modify the upland's runoff characteristics. Select and design projects based upon their ability to reduce conflicts between natural floodplain action and human development while improving aquatic habitat and water quality.

Design projects to create an integrated, watershed-scale approach to flood mitigation. Flood management will be addressed in a comprehensive manner rather than in the traditional fragmented fashion. The COE and SWCD Tillamook Bay and Estuary, Oregon Feasibility Study; FEMA Project Impact; USFWS Integrated River Management Strategy for Oregon; and the Tillamook County Flood Hazard Mitigation Plan will identify in advance areas where specific repair activities are permitted, to avoid damaging habitat during crisis flood fighting and repairs.

Specific flood management projects will include the following where appropriate:

- reconnecting rivers and sloughs,
- setting back dikes and levees,
- breaching dikes or installing structures that effectively open the floodplain,
- slowing water flow through stream channel and riparian improvements,
- building spillways, and other drainage structures,
- raising and/or moving structures from the floodplain.

Why

Flooding is a unifying natural process for all three of the original TBNEP resource management priority problems X water degradation, erosion and sedimentation, and fish and wildlife habitat loss X contributing to both their quality and impairment. The Flood of 1996 focused attention on flooding. To resolve the flood problems in the Tillamook Bay area, and also to solve the original priority problems, management efforts will need to balance multiple objectives: to reduce flood related hazards and damages, while minimizing the potential long-term environmental impacts and economic costs of flood control and floodplain management practices.

How (Who.When.)

Projects may be selected based upon insights gained through the computer model of FLD-01 or from local experience with past floods. Pilot projects based on past floods may begin before the watershed models are operational. In any case, project design criteria are the same.

Step 1 Secure easements or other access to lands where projects could alleviate flooding. (Tillamook County and Performance Partnership. By 2001.)

Step 2 Design projects, carefully considering short- and long-term impacts. Emphasize water quality, natural resource values and flood mitigation. (COE. By 2001.)

Step 3 Implement hydromodification projects. (Tillamook County SWCD and COE. 20 projects by 2005.)

Where

Projects will be designed and implemented by the agency or entity that owns or manages the land in question. Example: The Partnership may work with the Tillamook County Public Works Department to prioritize, fund, and implement actions suggested by the COE Study.

Lead Agency

COE.

Other Partners

SWCD, Performance Partnership, FEMA Project Impact, NRCS, ODFW, NW Oregon RC&D, EDCTC, TCWRC, DEQ, DSL, OWRD, Tillamook County Flood Control Group.

Anticipated Cost

Plan development administration: $75,000.
Easements and implementation: unknown, site-specific.

Monitoring

Complete 20 projects within the two years following adoption of hydrodynamic model.

Regulatory Issues

Clean Water Act Section 404.
City and County Ordinances.
Oregon Removal/Fill Law ORS 196.800B196.990.
Endangered Species Act, including Biological Opinion and Finding of No Significant Impact (FONSI).

Related Actions

FLD-01	Develop a GIS-Based, Unsteady State Hydrodynamic Model
FLD-04	Update Existing Floodplain Map
HAB-01	Characterize Riparian and Instream Habitat
HAB-02	Assess and Map Riparian and Wetland Habitat
HAB-04	Prioritize Floodplain/Lowland Protection and Enhancement Sites
HAB-06	Protect and Enhance Lowland Riparian Vegetation
HAB-07	Protect and Enhance Instream Habitat
HAB-08	Protect and Enhance Freshwater Wetland Habitat
HAB-11	Encourage Protection and Enhancement on Private Lands
HAB-14	Ensure Minimum Stream Flows
HAB-17	Characterize Estuarine and Tidal Habitats
HAB-23	Update the Estuary Plan
HAB-24	Reconnect Sloughs and Rivers to Improve Water Flow
HAB-30	Support the Oregon Plan for Salmon and Watersheds
WAQ-10	Implement Temperature Management Strategies
WAQ-11	Implement Suspended Sediments Management Strategies
WAQ-13	Update Shellfish Management Plan Closure Criteria
SED-02	Implement Practices That Will Improve Sediment Storage and Routing
OPSW:	DEQ-4S, 6S DLS-9, 13, 26, 27 ODF-15S

FLD-03 Elevate and/or Relocate Structures, Livestock and Equipment

What

Reduce environmental damages and water pollution from flooding, and enable riparian enhancement. One effective method is to raise structures at least 3 feet above the 100-year flood elevation, incorporating hydraulically "invisible" foundation design. Another option is to relocate a structure to higher ground. If the owners are willing, flood-prone property can be purchased and permanently removed from eligibility for development. Livestock and equipment refuge areas (cow pads) can reduce damages and the potential for livestock and equipment to contaminate floodwaters. These pads are built high enough and large enough to provide adequate refuge for several days if necessary.

Why

Moving structures out of the floodplain offers many opportunities for habitat restoration and water quality improvement. Presently, many homes and businesses are inundated with sediment and contaminated waters during a flood. Elevating or relocating these structures eliminates these damages entirely. Livestock and equipment are a similar concern. Thousands of dairy cattle stood in flood water for 2 to 3 days during the floods of February 1996 and 700 died, with 600 injured or ill. Vehicles and equipment were also submerged and/or swept away. Economic damage and water contamination were undoubtedly severe. Cow and equipment pads minimize both problems.

Structural flood control projects now in place in Tillamook County do not adequately protect the Bay, people or their property. Further, these projects are expensive to build and maintain, and can do great harm to the natural environment and riverine function. The approach to repetitive flood damage now favored by the COE and the Federal Emergency Management Agency (FEMA) is to reduce the impacts of flooding, rather than try to control it.

How (Who.When.)

Step 1 Secure funding for structure raising or relocation and cow pad projects. Federal funds may require a local match, which would need to be secured before work can begin. (Tillamook County and cities, NRCS, SWCD. Ongoing.)

Step 2 Determine the best approach for flood damage mitigation (vertical or horizontal avoidance, or relocation). (FEMA. By 2000.)

Step 3 Write individual contracts and agreements between homeowners, contractors, and Office of Emergency Management (OEM) to mitigate future flood damage through avoidance or relocation. (Tillamook County and cities. By 1999, ongoing.)

Step 4 Write individual contracts and agreements between operators, contractors, and FEMA to construct cow pads at least 3 feet above the 100-year flood elevation. (Tillamook County. Ongoing).

Where As indicated by the COE Feasibility Study.

Lead Agency Tillamook County Department of Community Development.

Other Partners Cities in Tillamook Bay Watershed, businesses and homeowners, FEMA, SWCD, TCWRC, EDCTC, COE, NW Oregon RC&D, Oregon OEM, Tillamook County Flood Control Group.

Anticipated Cost Under the FHMP program, the average cost to raise one house is approximately $25,000, of which the homeowner is responsible for 25% or $6,250 (source: Tillamook County DCD).

Cost per cow pad is site-specific. Tillamook County DCD currently has $360,000 available for cow pads.

Monitoring Monitor CCMP objectives:

- Raise at least 60 houses at least 3 feet above the 100-year flood elevation by year 2001, and other houses as resources permit.
- Construct 10 livestock and equipment pads in flood-prone areas by 2001 to reduce pollution from petrochemicals and animal wastes during major floods.

Regulatory Issues County Development Permit.
State Removal/Fill law, ORS 196.800B196.990.
COE 404 Permit.
Location of cow pads and equipment pads may be affected by floodway building restrictions.

Related Actions

FLD-06	Effectively Clear Mapped Lowland Floodways or Floodplains of Hazardous Materials
HAB-02	Assess and Map Riparian and Wetland Habitat
HAB-04	Prioritize Floodplain/Lowland Protection and Enhancement Sites
HAB-08	Protect and Enhance Freshwater Wetland Habitat
HAB-11	Encourage Protection and Enhancement on Private Lands
HAB-23	Update the Estuary Plan
HAB-24	Reconnect Sloughs and Rivers to Improve Water Flow
HAB-30	Support the Oregon Plan for Salmon and Watersheds
WAQ-01	Define, Implement, and Enforce Pollution Prevention and Control Measures on Agricultural Lands
WAQ-08	Ensure Adequate Urban Runoff Treatment and Retention
CIT-02	Implement Associate of Arts Oregon Transfer Degree in Environmental Studies
CIT-06	Establish a Land Trust or Conservation Organization

FLD-04 Update Existing Floodplain Map

What

Update the County's map of the 100- and 500-year floodplain, accounting for changes in land elevation, Watershed development, land use, river channels, and woody debris jams.

Why

Floodplain maps are used to guide development and to determine insurance rates and availability for buildings and property. FEMA studies defined the 100-year floodplain in 1975 without benefit of better precipitation and climate data generated in the 1990s[3]. Since then, changes to the Watershed and floodplains themselves have likely affected hydrology and flood elevations. Moreover, earlier FEMA techniques for floodplain mapping did not account for real-world flood problems in Tillamook, such as log, debris, or sediment plugs. New floodplain maps can help solve these problems.

How (Who.When.)

Step 1 Use the watershed hydrodynamic model, direct experience, and/or other analytical tools to revise estimates of 100-year and 500-year flood events. (COE. 2000.).

Step 2 Review and update the floodplain map. Submit revised floodplain map to FEMA for approval. (FEMA, Tillamook County. 2001.)

Step 3 Make revised floodplain maps available on GIS and use them in watershed assessments. (TCWRC. By 2001.)

Step 4 Use revised maps to regulate development within floodplain. (Tillamook County and municipalities. By 2001.)

Where

Floodplains Watershed-wide.

Lead Agency

FEMA.

Other Partners

Tillamook County Community Development Department. FEMA is responsible for quality control and final approval of the updated map.

Tillamook Coastal Watershed Resource Center for GIS services.

Anticipated Cost

County staff costs: 1.0 FTE = $50,000.

Monitoring

Implementation, based on CCMP objective:

- Implement a GIS-based, unsteady state hydrodynamic model by year 2000.

[3] Parameter-elevation Regressions on Independent Slopes Model (PRISM) studies, available at www.ocs.orst.edu.

Regulatory Issues The maps may affect NFIP zones and programs, and impact the content and implementation of County land use regulations.

Related Actions

FLD-01	Develop a GIS-Based, Unsteady State Hydrodynamic Model
FLD-02	Implement Watershed Drainage Modification Projects
FLD-06	Effectively Clear Mapped Lowland Floodways or Floodplains of Hazardous Materials
HAB-04	Prioritize Floodplain/Lowland Protection and Enhancement Sites
HAB-16	Effectively Enforce Laws and Regulations
HAB-23	Update the Estuary Plan
CIT-06	Establish a Land Trust or Conservation Organization
OPSW:	DEQ-6S

FLD-05 Regulate New Construction and Development in the Floodplain

What

Regulate development within the 100-year floodplain to minimize vulnerability to flood damage for new and existing structures. Avoid locating new, essential facilities (*e.g.* hospitals, fire stations, radio stations) within areas that flood. Relocate or retrofit existing facilities to assure their use during emergency conditions. Restrict development within the designated floodway to assure the unimpeded passage of flood waters.

Floodways define areas near active channels where development is highly restricted. New development in the floodway must not raise the flood height, and must not increase hazardous flood currents. The remainder of the mapped floodplain is called the flood fringe.

Why

It is cheaper and easier to avoid floods than to try to control them. Floodwaters can become heavily polluted when they interact with developed areas. Undeveloped floodplains provide hydrologic and habitat benefits.

How (Who.When.)

Step 1 Update and map regulatory floodways and floodplains for each of Tillamook Bay's significant rivers and sloughs. (FEMA, Tillamook County. By 2001.)

Step 2 Review and update ordinances restricting building permits within the floodplain for all jurisdictions in the County.

Step 3 Develop ordinances to implement Oregon Revised Statutes (ORS) 455.447 regarding siting of Essential Facilities, Hazardous Facilities, Major Structures, and Special Occupancies in Tsunami Inundation Zones. (Tillamook County. By 2002.)

Step 4 Provide technical assistance and cost-sharing, where possible, for structural or non-structural flood damage mitigation projects. (FEMA and Performance Partnership. Ongoing.)

Where

Floodplains of each of Tillamook Bay's significant rivers and sloughs.

Who

Tillamook County and cities.

Other Partners

FEMA, COE, Department of Land Conservation and Development (DLCD), Performance Partnership, and Project Impact.

Anticipated Cost

Staff costs: 0.25FTE = $12,750.

Study costs: included in FLD-02.

Costs for mitigation projects site-specific, expected to be high.

Monitoring

Implementation, based on CCMP objective:

- Implement a GIS-based, unsteady state hydrodynamic model by year 2000.
- Control runoff from all construction and development in urban areas by 2003.

Regulatory Issues

Land use code changes.

Updated floodplain maps.

Oregon Revised Statutes (ORS) 455.447 regarding siting of Essential Facilities, Hazardous Facilities, Major Structures, and Special Occupancies in Tsunami Inundation Zones.

Related Actions

OPSW: ODOT-20

FLD-06 Effectively Clear Mapped Lowland Floodways or Floodplains of Hazardous Materials

What Remove or secure hazardous materials located in floodways or floodplains.

Why Decrease the adverse impacts of flooding due to hazardous or toxic chemical spills.

How (Who.When.)

Step 1 Generate accurate maps of the 100-year floodway and floodplain. (FEMA, Tillamook County. By 2002.)

Step 2 Develop a plan to relocate or secure hazardous and dangerous chemical storage containers (using location information from DEQ and State Fire Marshal) so that they are not susceptible to spilling during a flood. (FHMP coordinator. 2001.)

Where Floodplains of each of Tillamook Bay's significant rivers and sloughs.

Lead Agency FHMP coordinator.

Other Partners Performance Partnership Stewardship Council, Tillamook County Emergency Services, Oregon DEQ, State Fire Marshal, Tillamook County Flood Control Group, watershed councils.

Anticipated Cost Site-specific costs to move or secure hazardous materials (expected to be moderate).

Monitoring Track CCMP objectives:

- Secure and/or remove known hazardous chemicals from areas where they pose a real threat to water quality during flood events by 2005.
- Construct 10 livestock and equipment pads in flood-prone areas by 2001 to reduce pollution from petrochemicals and animal wastes during major floods.

Regulatory Issues Building permits needed for retrofitting or elevating.

Related Actions

FLD-01	Develop a Hydrodynamic Model
FLD-04	Update Existing Floodplain Map
HAB-08	Protect and Enhance Freshwater Wetland Habitat
HAB-11	Encourage Protection and Enhancement on Private Lands
HAB-15	Revise Local Ordinances to Increase Protection of Riparian Areas, Wetlands, and Instream Habitat
HAB-16	Effectively Enforce Laws and Regulations
HAB-23	Update the Estuary Plan
HAB-30	Support the Oregon Plan for Salmon and Watersheds
WAQ-01	Define, Implement, and Enforce Pollution Prevention and Control Measures on Agricultural Lands
WAQ-05	Provide Farm Management Training Programs
WAQ-08	Ensure Adequate Urban Runoff Treatment and Retention
OPSW:	DEQ-9S

CHAPTER

8 IMPLEMENTATION & FINANCE

From Planning to Implementation

Tillamook County will implement the CCMP through the Tillamook County Performance Partnership (TCPP). This new county department will coordinate a consortium of federal, state, county, city, special district, non-profit, business, and citizen members to implement the CCMP. The TCPP will provide a results-driven, outcome-based approach to meeting the stated goals and objectives of the CCMP. To strengthen citizen support for CCMP implementation, the strategy includes new institutions and mechanisms for participation, education, and community-based decision-making. See Chapter 9, Citizen Involvement. This chapter provides an overview of the Tillamook Performance Partnership and lays out a financial strategy to fund CCMP implementation.

Tillamook County Performance Partnership

In early 1998 the Financial Strategy Advisory Committee (FSAC) began working with community stakeholders, county officials, and state and federal agency representatives to develop a Performance Partnership to succeed the *existing structure* of the TBNEP. The FSAC developed the concept and the Policy Committee accepted organization by-laws in October of 1998. See TCPP By-laws in Appendix L.

The primary objectives of the TCPP will be to:

- implement the TBNEP Comprehensive Conservation and Management Plan,
- prioritize environmental problems and projects county-wide,
- secure funding and coordinate existing programs to improve watershed health,
- assure implementation of projects,
- monitor, evaluate, and account for projects, and
- share information, transferring as much as possible to Geographical Information System (GIS) and WEB-available formats.

In broader terms, the TCPP focuses on reinvention of government to streamline services and better coordinate resources related to environmental restoration. To improve the chances for successful CCMP implementation, the TCPP will:

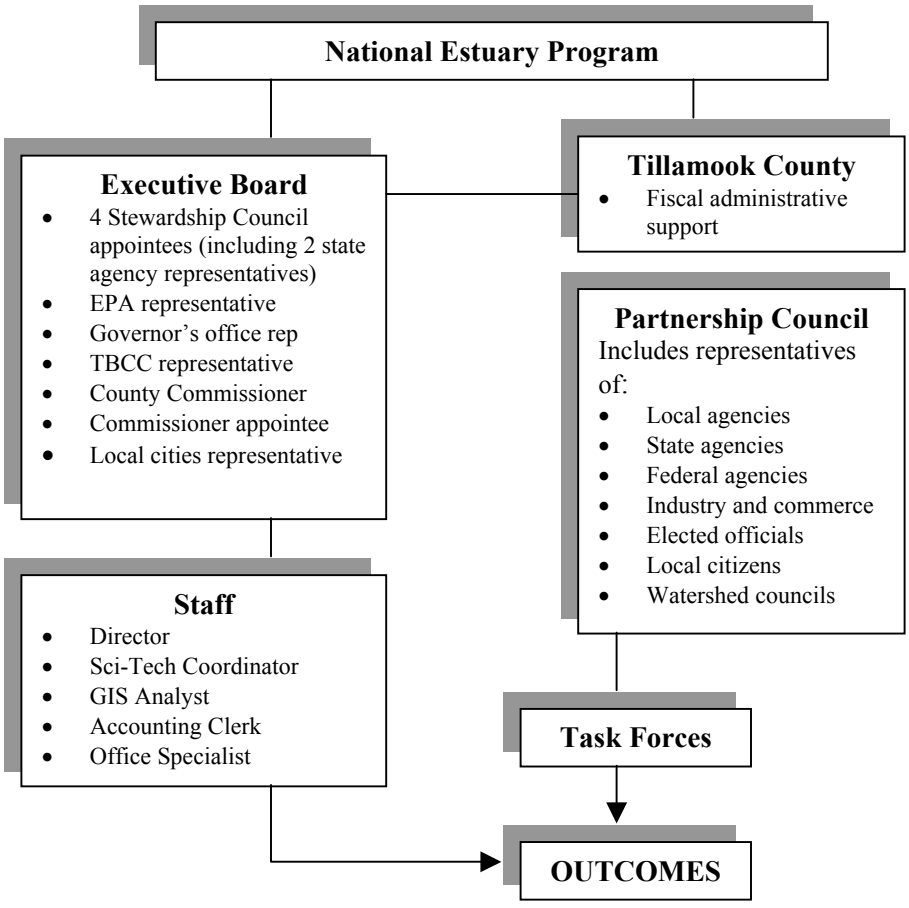
- Increase the efficiency of funding for ecosystem restoration and monitoring projects (reduce consumption of funds to multi-agency overhead) and

- Use existing funds more effectively through local decision making and prioritized project implementation (direct funding to highest priority projects).

Organizational Structure

The Performance Partnership succeeds the TBNEP Management Conference and includes four levels of organization:

- Executive Board
- Partnership Council
- Director and Staff
- Task Forces



The Executive Board. The Executive Board succeeds the TBNEP Policy Advisory Committee. It includes four positions elected by the

Stewardship Council, including two state agency representatives. Other positions include a county commissioner, county commission appointee, and representatives of the EPA, Governor's Natural Resource Office, local cities, and Tillamook Bay Community College. The functions of the Executive Board are to:

- establish the overall direction and policies for the TCPP,
- select necessary TCPP staff and consultants and provide direction and review, and
- review, approve, and ensure implementation of recommended projects and work plans after weighing costs, benefits, and public opinion.

The Partnership Council. The Partnership Council is a non-exclusive group composed of natural resource managers representing local, state, and federal agencies; local elected officials; and industrial, commercial, and citizen representatives. This council provides the locally led basis for CCMP implementation. The Stewardship Council is responsible for developing workplans associated with specific CCMP actions, and recommending those workplans to the Executive Board for approval. The Stewardship Council will:

- develop consensus for coordinated solutions and projects for ecosystem restoration,
- design and recommend restoration projects to the Executive Board,
- approve and monitor project budgets with a view toward leveraging new funds and consolidating funding streams,
- form task forces for project implementation/administration,
- coordinate multi-agency information transfer and reporting of outcomes,
- annually elect two representatives to serve on the Executive Board, and
- provide oversight and support for task force activities.

Task forces. The Stewardship Council will appoint task forces to carry out specific programmatic functions. Like the subcommittees used in the TBNEP Management Conference, task forces may be appointed to focus on specific issues or projects. They can also organize technical expertise in areas such as monitoring or scientific review. Task forces will:

- provide project level focus to elicit funding commitments from identified sources,
- ensure Partnership coordination on multi-agency projects,
- monitor and evaluate to ensure that outcomes are achieved,
- monitor project budgets and expenditures, providing status reports, and
- develop public education components for their projects.

Staff. To oversee implementation and coordinate projects, Tillamook

County will employ a Performance Partnership staff. Initially these will include a director, a scientific/technical coordinator, a geographic information analyst, an accounting clerk, and an office specialist. To facilitate public interaction, the TCPP will provide cash match for a Watershed Council Coordinator to help implement CCMP-related action plans and involve citizens in community-based decisions. The Executive Board will hire the Director, who will then oversee hiring of the core staff described above. The Director, in cooperation with the Stewardship Council, will submit an annual work plan to the Executive Board for approval. See TCPP Bylaws in Appendix L.

Implementation and Accountability

In June 1999, the Tillamook County Performance Partnership Implementation Agreement was approved and signed by members of the Stewardship Council and the Executive Council. This agreement calls for a cooperative effort by members of the TCPP to carry out CCMP implementa-tion. See Appendix K, Implementation Agreement for more information.

The CCMP defines specific goals and objectives to achieve by 2010. The TCPP will coordinate efforts to enhance habitat, reduce sedimentation, improve water quality and mitigate flooding. Chapter 10, Monitoring and Research Needs, describes quantitative methods to track progress in meeting each objective. Accountability for these results will rest with the TCPP and local entities that will lead implementation efforts.

High Priority Goals and Actions

Based on Citizen and Management Committee ranking (See pages 1-14 and 1-15, and Appendices B and C), as well as responses to the TBNEP public opinion survey (Autumn 1995) and the Tillamook Futures Council survey (1998), TBNEP identified six high priority goals and related actions, including:

Goal: Implement Pollution Control Measures

WAQ-01: Define, Implement, and Enforce Pollution Prevention and Control Measures on Agricultural Lands

WAQ-02: Implement Voluntary Farm Management Plans

WAQ-03: Implement Revised CAFO Inspection Procedure

WAQ-04: Use Farm-Specific Agronomic Rates for Nutrient Management

WAQ-05: Provide Farm/Livestock Management Training Programs

WAQ-09: Ensure Properly Functioning On-Site Sewage Disposal Systems

WAQ-10: Implement Temperature Management Strategies

Goal: Improve Roads

SED-01: Implement Road Erosion and Risk Reduction Projects
SED-04: Ensure Sufficient Resources to Enforce Forest Practices Act

Goal: Enhance Riparian Areas

HAB-05: Protect and Enhance Upland Riparian Areas
HAB-06: Protect and Enhance Lowland Riparian Areas
HAB-09: Control Livestock Access to Streams
HAB-10: Stabilize Streambanks Using Alternatives to Riprap
HAB-11: Encourage Protection and Enhancement on Private Lands
HAB-13: Increase Incentive Program Payments

Goal: Enhance Instream Conditions

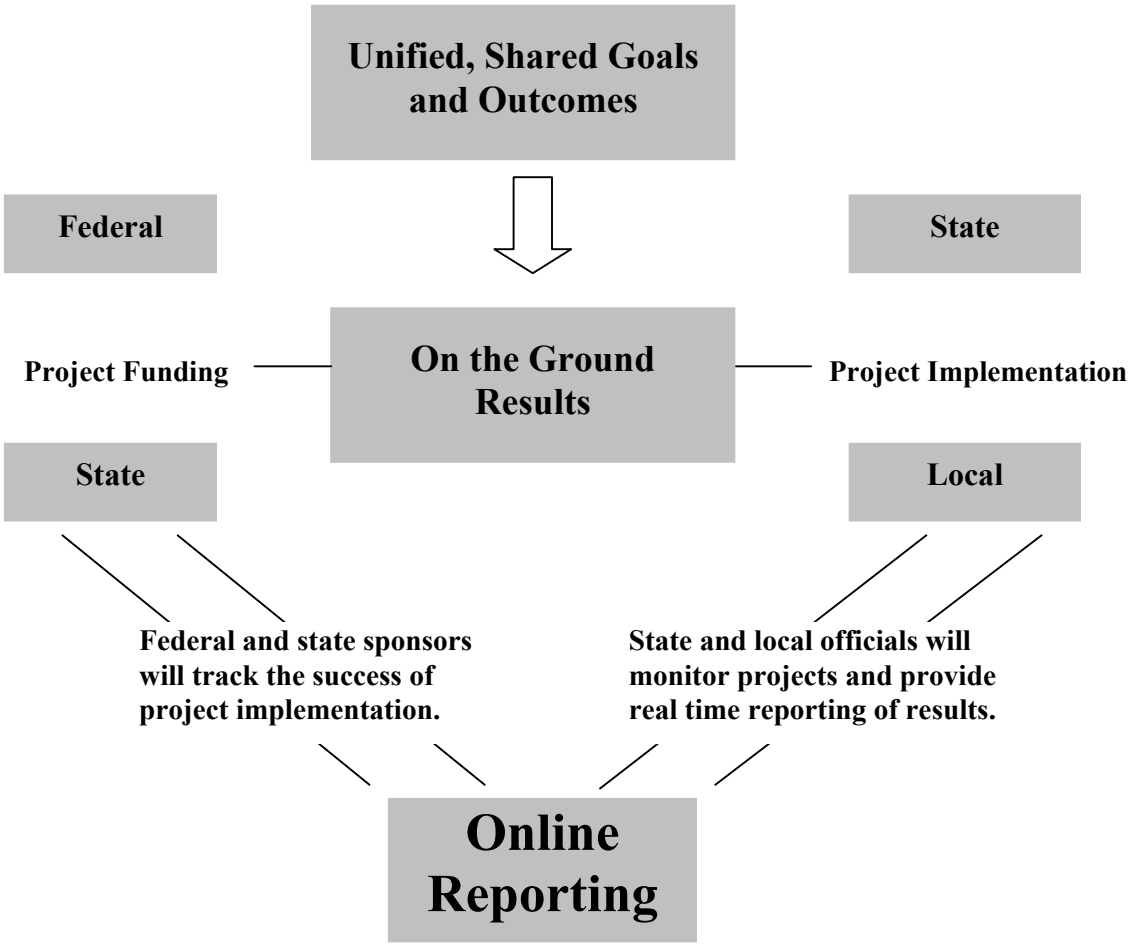
HAB-07: Protect and Enhance Instream Habitat
HAB-09: Control Livestock Access to Streams
HAB-14: Ensure Minimum Streamflows
HAB-15: Revise Local Ordinances to Increase Protection of Riparian Areas, Wetlands, and Instream Habitat
WAQ-10: Implement Temperature Management Strategies
WAQ-11: Implement Suspended Sediments Management Strategies
SED-02: Implement Practices That Will Improve Sediment Storage and Routing

Goal: Enhance Estuarine and Tidal Habitat

HAB-11: Encourage Protection and Enhancement on Private Lands
HAB-13: Increase Incentive Program Payments
HAB-15: Revise Local Ordinances to Increase Protection of Riparian Areas, Wetlands, and Instream Habitat
HAB-17: Characterize Estuarine and Tidal Habitats
HAB-18: Prioritize Tidal Sites for Protection and Enhancement
HAB-20: Protect and Enhance Eelgrass Habitat

Goal: Improve Floodplain Condition

FLD-01: Develop a GIS-Based, Unsteady State Hydrodynamic Model
FLD-02: Implement Watershed Drainage Modification Projects
FLD-04: Update Existing Floodplain Map
FLD-05: Regulate New Construction and Development in the Floodplain
HAB-19: Protect and Enhance Tidal Marsh
HAB-21: Remove or Modify Ineffective Tide Gates and Culverts



Online GIS reporting: Through a centralized database managed by staff, the TCPP will provide online tracking of monitoring objectives, research projects, and ecosystem restoration projects in Tillamook County. The GIS-based relational database will meet or exceed standards described by the National Spatial Data Institute (NSDI) for all agencies in the Watershed. In addition, the online reporting system will account for on-the-ground implementation status through photos or status reports and it will include financial information relevant to program management requirements. TCPP staff will oversee data management activities and will maintain databases at the Tillamook Coastal Watershed Resource Center and at program headquarters.

Project sponsors will be able to log on to the TCPP internet site at any time and track the current 'on the ground' progress and financial status of restoration projects. Under the monitoring program, the TCPP will integrate project results into GIS to show spatial data about work planned, under way, or completed.

Monitoring CCMP actions: Programmatic accountability. By reporting on current project status, the TCPP will show how efficiently each organization meets its implementation goals and objectives. The table below is an example of how progress on some high priority actions will be reported.

Table 8-1: Examples of Programmatic Accountability

Restoration Project	Units/Date	Investment
Miles of fence installed	miles/year	fed, state, local $$
Wetlands restored	acres/year	$$
Roads upgraded	miles/year	$$
Fish habitat enhanced	projects/year	$$

Monitoring CCMP objectives: Environmental accountability. In addition to updating the status of specific projects, TCPP will monitor environmental progress in meeting stated goals and objectives. The table below lists some CCMP objectives, monitoring parameters, and methods of the CCMP monitoring plan. See Chapter 10, Monitoring, for a more detailed description of the TCPP Monitoring Plan.

Table 8-2: Examples of Environmental Accountability

CCMP Objective	Monitoring Parameters	Method
Achieve at least a 25% reduction in bacteria loads to rivers	Fecal coliform bacteria concentrations, E. coli bacteria concentrations	Field sampling Colilert System Membrane filtration
Enhance 200 miles of forested riparian habitat to healthy riparian condition by 2010	Riparian buffer width and extent; % conifer; % hardwood, shading, vegetative cover, bank stability	Aerial surveys Field assessments
No net decline in eelgrass beds	Eelgrass % cover, shoot density, sediment composition, other aquatic vegetation	Field sampling Aerial multispectral sensor (MSS) imaging

Each monitoring *parameter* addresses a specific CCMP *Objective*. For example, fecal coliform bacteria monitoring provides a measure of the amount of bacteria in the waters of the Watershed, and directly addresses the CCMP objective of achieving at least a 25% reduction in bacteria loads to rivers. The bacteria monitoring program adheres to DEQ guidelines, and utilizes previously-established sampling stations to maximize usefulness of the data collected. The DEQ requests sampling fives times per month at each station following the strict protocols of an approved Quality Assurance Project Plan (QAPP).

Figure 8-2: The TCPP web-based reporting system will resemble the San Francisco Estuary Project's.

Financing the CCMP

Federal, State, and Local Partnerships

The National Estuary Program, as part of Clean Water Act Section 320, funds program development and research, but requires individual NEPs to develop funding mechanisms to help implement CCMP action plans. While some of the proposed actions are already funded and being implemented, many others require a funding strategy that matches local and state resources with federal funds. Many federal funding programs require local or state match, not only to help offset the high cost of restoration and enhancement projects, but to demonstrate local commitment to program implementation. Sufficient local and state matching funds have not yet been identified for implementation. As a result, CCMP implementation will require a more aggressive effort to identify non-federal matching fund sources.

To address these needs, the FSAC recommends local, state, federal, and private partnerships to generate adequate funds for CCMP implementation. The FSAC identified a number of funding programs to provide financial resources to implement the CCMP. This section provides brief descriptions of selected key programs. Additional funding sources can be found in Table 8-1, which lists selected federal and state funding sources, as well as local entities and private organizations to match federal funds. More detailed descriptions of the funding programs can be obtained from individual state agencies, non-profit groups, cities, and counties, or found in the Catalog of Federal Domestic Assistance (CFDA).

Table 8-2, at the end of this chapter, lists potential funding sources for each action, the total estimated implementation cost, and other pertinent information. Table 8-2 identifies a category of "earmarked funds," meaning the dollar amount that agencies or entities have earmarked for Year One CCMP implementation. These funds are not necessarily secured.

Following is a summary of selected federal programs, followed by brief overviews of state, local, and private funding sources.

Federal Programs

The United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) (formerly Soil Conservation Service) was created in 1935 to help farmers and ranchers care for the land. The Soil Conservation Act of 1935 charged the agency to deliver conservation assistance to farmers, ranchers and other private landowners. This assistance is provided through local Soil and Water Conservation Districts by agreements with the USDA and individual states. The NRCS is committed to helping private landowners and managers implement accepted conservation practices to improve land stewardship. The NRCS and the Farm Service Agency administer Farm Bill Programs for the North Coast Basin through the USDA Service Center in Tillamook.

The 1985 re-authorization of the Farm Bill linked eligibility for federal farm program benefits to land stewardship, especially soil conservation and wetland protection. The NRCS is responsible for delineating wetlands on agricultural lands and producing certified wetland delineation maps for Farm Bill program participants upon request.

The 1996 Farm Bill launched a number of new and innovative conservation programs. These voluntary, incentive-driven tools should prove useful in fostering understanding and action regarding conservation problems at the local level. The NRCS in the North Coast Basin will implement Farm Bill programs and the National Cooperative Soil Survey.

Under existing programs, the USDA locally awards about $200,000 per year to eligible agricultural producers. Each participant must complete and agree to implement a conservation plan to qualify initially, before USDA awards project money based on the North Coast Basin local work group ranking criteria. The agency initiated four projects in 1998. Several Farm Bill programs apply directly to CCMP actions and are therefore presented in more detail.

The USFWS funds projects that protect and restore fisheries and wildlife resources. Such projects could include wetlands and saltmarsh improvements, as well as research that benefits fish stocks. Two programs are listed in detail.

The U.S. Army Corps of Engineers provides funds and expertise in addressing navigation, flood control, and restoration needs in watersheds. One program is detailed on page 8-15, and several others are listed in Table 8-1.

FEMA, EPA, and the Federal Department of Transportation have programs designed to assist with implementation of projects similar to the CCMP actions. These programs are also listed in Table 8-1.

Environmental Quality Incentives Program (EQIP)

CFDA number 10.912

Description: This program offers technical, financial, and planning assistance to address soil, water, and related natural resource concerns on agricultural lands. Contracts provide incentive payments and cost sharing for practices such as manure management and riparian area fencing.

Eligibility: Individual or family farmers who face serious threats to soil, water, and related natural resources, or who need assistance with complying with federal or state environmental laws.

Types of assistance: Direct payments.

Available funds: Fiscal Year 1999: $174,000,000 total. $10,000 per person per year, and $50,000 total over length of project. Up to 75% cost share.

Contact: Tillamook NRCS office. (503) 842-2848.

Wetland Reserve Program (WRP)

CFDA number 10.072

Description: Eligible landowners may offer farmed wetlands, prior converted wetlands, wetlands farmed under natural condition and certain other lands to be placed under a permanent or 30-year easement or restoration agreement.

Eligibility: An individual landowner, partnership, association, corporation, estate, trust, other business or other legal entities and, whenever applicable, a state, political subdivision thereof, or any agency thereof owning private croplands.

Types of assistance: Direct payment for specified use.

Available funds: Fiscal Year 1999: $127,741,000 total.

Contact: Tillamook NRCS office. (503) 842-2848.

Wildlife Habitat Incentive Program (WHIP)

CFDA number 10.914

Description: This program helps landowners develop habitat for upland wildlife, wetland wildlife, threatened or endangered species, fish, and other types of wildlife.

Eligibility: A landowner, landlord, operator, or tenant of eligible lands.

Types of assistance: Direct payments for specified use.

Available funds: $15,000,000 total. Limited to $10,000 per contract. Up to 75% cost share.

Contact: Tillamook NRCS office. (503) 842-2848.

Conservation Reserve Program (CRP)

CFDA number 10.069

Description: This program reduces soil erosion and sedimentation, improves water quality, and creates better habitat for wildlife. It encourages farmers and ranchers to convert marginally productive, environmentally sensitive land to vegetative cover such as native grasses, wildlife plantings, trees, filter strips, or riparian buffers. Farmers receive an annual rental payment for the term of the 10–15 year contract.

Eligibility: Individuals, partnerships, associations, estates, business enterprises, states, or political jurisdictions.

Types of assistance: Direct payments for specified use.

Available funds: $1,694,142,000 total. Range is from $50 to $50,000.

Contact: Tillamook FSA Office, (503) 842-2848.

Notes: To qualify owners must identify marginal pastureland that is suitable for use as a riparian buffer to be planted to trees. Acreage must also be determined by NRCS to be eligible and sustainable for riparian buffers, salt tolerant vegetation, or shallow water areas for wildlife. Rental rates, based on soil type, have been established for the North Coast Basin. The maximum rate is calculated in advance of enrollment. An additional incentive of up to 20% of the soil rental rate is offered for riparian buffers.

Conservation Reserve Enhancement Program (CREP)

Description: This program supplements rent rates for recipients of CRP funds. Generally, CRP funds are significantly lower than fair market value, thereby limiting the willingness of farmers to enter the program. CREP creates more realistic financial compensation to farmers.

Eligibility: A landowner, landlord, operator, or tenant of eligible lands.

Types of assistance: Direct payments for specified use.

Available funds: Not known.

Contact: Tillamook FSA office, (503) 842-2848.

Cooperative Forestry Assistance

CFDA number 10.664

Description: This program provides grant funds to improve non-federal forest management practices, and improve fish and wildlife habitat. Projects can include innovations in timber harvest, dispersal of seedlings, reforestation, assisting small woodlot owners with forest practices, conservation of forest land, and improving fish and wildlife habitat.

Eligibility: State forestry agency, nonprofits, or municipalities.

Types of assistance: Project grants, formula grants, and use of property, facilities, and equipment.

Available funds: $104,793,000. Average amount of financial assistance: $1,000,000. Requires 20% state cost share.

Contact U.S. Forest Service, (202) 205-1657.

Watershed Protection and Flood Prevention

CFDA number 10.904

Description: This program provides technical and financial assistance in carrying out works of improvement to protect, develop, and utilize the land and water resources in small watersheds.

Eligibility: Any state agency, county, municipality, SWCD, or nonprofit.

Types of assistance: Project grants, advisory services and counseling.

Available funds: $99,000,000. Average amount of financial assistance: $650,000. 50% to 100% cost share.

Contact: Tillamook NRCS office, (503) 842-2848.

Water and Waste Disposal Systems for Rural Communities

CFDA number 10.760

Description: This program provides funds to provide basic human amenities, alleviate health hazards, and promote the orderly growth of the rural areas of the nation by meeting the need for new and improved rural water and waste disposal facilities.

Eligibility: Any state agency, county, municipality, nonprofit organization, or local association.

Types of assistance: Project grants, direct loans, and guaranteed/insured loans.

Available funds: $763,977,000 in direct loans, $75,000,000 in guaranteed loans, $500,000,000 in grants. Average amount of financial assistance: $700,000. 75% cost share.

Contact: Water and Environmental Programs Rural Utilities Service, (202) 690-2670.

Economic Development: Grants for Public Works and Infrastructure Development

CFDA number 11.300

Description: This program provides funds to promote long-term economic development and assist in the construction of public works and development facilities needed to initiate and support the creation or retention of permanent jobs in the private sector in areas experiencing substantial economic distress.

Eligibility: Any state agency, county, municipality, or nonprofit organization.

Types of assistance: Direct grants; 50%-80% match required.

Available funds: $160,200,000.

Contact: Public Works Division, Economic Development Administration, Room H7326 Herbert Hoover Bldg. DOC, Washington , DC 20230. (202) 482-5265.

Habitat Conservation

CFDA number 11.463

Description: This program provides financial support to carry out research or projects that benefit fisheries, including habitat improvements or protection, restoration of depleted stocks, and wetland protection and restoration.

Eligibility: Any individual, for-profit or nonprofit group, state agency, county, or municipality.

Types of assistance: Project grants.

Available funds: $5,000,000. Average amount of financial assistance is highly variable.

Contact: NOAA regional office, (206) 526-6187.

Protection, Clearing, and Straightening of Channels

CFDA number 12.109

Description: This program provides funds to restore channels for purposes of navigation and flood control. Projects can include clearing logjams and restoring channels.

Eligibility: States and political subdivisions with the authority to implement such projects.

Types of assistance: Provision of specialized services.

Available funds: Not known.

Contact: U.S. Army Corps of Engineers, (202) 272-8835 or (703) 545-6700.

National Coastal Wetlands Conservation Grants

CFDA number 15.614

Description: This program provides grant funds to carry out coastal wetlands conservation projects such as restoring impacted wetlands and acquiring new wetlands for protection.

Eligibility: Coastal States.

Types of assistance: Project grants.

Available funds: $8,500,000 total. Individual grants range from $90,000 to $1,000,000. 50% to 100% cost share.

Contact: U.S. Fish and Wildlife Service Portland Office, (503) 231-6128.

Sport Fish Restoration (Dingell-Johnson Program)

CFDA number 15.605

Description: This program supports projects designed to restore and manage sport fish populations for the preservation and improvement of sport fishing. Types of funded projects include habitat improvement, fishery research, and fish surveys and inventories.

Eligibility: State fish and wildlife agencies.

Types of assistance: Formula grants.

Available funds: $257,447,000. Average amount of financial assistance: $4,800,000.

Contact: U.S. Fish and Wildlife Service, (703) 358-2156.

Project Impact

CFDA number 83.551

Description: This is a new program designed to encourage the implementation of sustained, pre-disaster mitigation programs by states and communities. Examples of projects are elevation of structures and facilities, evacuating flood plain of development, relocating structures out of the floodplain.

Eligibility: Any community, state, or jurisdictions with Project Impact communities.

Types of assistance: Project grants.

Available funds: $300,000 per Project Impact community.

Contact: FEMA Region 10, (425) 487-4784.

State Programs and Agencies

Oregon Watershed Enhancement Board manages a grant program for watershed assessments and action plans that lead to watershed restoration projects. OWEB funds on-the-ground projects and assists with staffing to coordinate watershed councils. Funding is available on a statewide compet-itive basis. Applications are accepted continually and awards are

announced at regularly scheduled OWEB Board meetings three times each year.

State agencies including ODF, ODFW, ODA, DEQ, DSL, and ODOT are responsible for implementation of enhancement and restoration projects and monitoring of ambient conditions. Table 8-1 lists state agencies and the CCMP actions that pertain to each agency.

Riparian Tax Incentive Program

Description: This program provides a tax exemption for landowners who improve or maintain qualifying riparian lands. Landowners and ODFW must agree to a management plan, which details protection measures.

Eligibility: Private landowners of riparian areas.

Types of assistance: Tax exemptions.

Available funds: To be announced.

Contact: Oregon Department of Fish and Wildlife, (503) 872-5252, ext. 5587.

State Income Tax Credit

Description: This program provides state income tax credits for landowners who make instream improvements. Riparian area enhancement measures that benefit instream habitat are eligible.

Eligibility: Private landowners.

Types of assistance: Tax credits equaling 25% of out of pocket expenses.

Available funds: To be announced.

Contact: Oregon Department of Fish and Wildlife, (503) 872-5252.

Note: This program has not yet been legislatively continued for the '99B'01 biennium.

Restoration and Enhancement Fund

Description: This program funds fish habitat enhancement projects on public or private lands.

Eligibility: Local entities, non-profits, or private landowners.

Types of assistance: Grants.

Available funds: $4,067,394 ('99B'00 biennium).

Contact: Oregon Department of Fish and Wildlife, (503) 872-5252.

Salmon and Trout Enhancement Program (STEP)

Description: This program encourages citizen involvement in egg incubation and rearing, habitat improvement, and biological surveys. It provides a tremendous educational opportunity, as well as technical and limited financial assistance.

Eligibility: Citizens, schools, or other entities.

Types of assistance: Technical assistance and grants.

Available funds:

Contact: Oregon Department of Fish and Wildlife (503) 872-5252, ext. 5429.

Northwest Region Habitat Program

Description: Wetland enhancement for private landowners; technical and financial support through cost sharing; liaison between landowners and agencies for regulatory processes, and landowner outreach.

Eligibility: Private landowners.

Types of assistance: Direct grants.

Available funds: $250,000 per biennium.

Contact: Oregon Department of Fish and Wildlife (541)-757-4186, ext. 248.

Conservation Implementation and Planning Grants

Description: Grants to SWCDs for on-the-ground projects. Grant proposals may include some planning, but the focus is on implementation.

Eligibility: Private landowners in conjunction with SWCDs.

Types of assistance: Grants.

Available funds:

Contact: Tillamook County Soil and Water Conservation District, (503) 842-2848.

SB 1010 Planning Process

Description: Funds for the development of BMPs for basin-wide and individual farm plans as required by SB 1010. Overall basin plans must comply with OPSW.

Eligibility: Private landowners in conjunction with SWCDs.

Types of assistance: Technical assistance.

Available funds:

Contact: Tillamook County Soil and Water Conservation District, (503) 842-2848.

Section 319 Funds for Non-Point Source Pollution

Control Projects

Description: Funds provided to reduce pollutants, improve land practices, reduce erosion, increase capacity of soil to hold water, and to rehabilitate and protect riparian areas. DEQ manages the program at the state level, using federal CWA funds.

Eligibility: Any private citizen, organization, or local or state jurisdiction.

Types of assistance: Matching grants (requires 40% local match).

Available funds: $2,700,000 available FY 2000.

Contact: Oregon Department of Environmental Quality, (503) 229-5696.

Clean Water State Revolving Loan Fund

Description: Low interest loan program provides funds for point source and non-point source water quality improvement projects.

Eligibility: States and their subdivisions, municipalities, special districts and corporations or other legal entities.

Types of assistance: Low interest loans.

Available funds: Not known.

Contact: Oregon Department of Environmental Quality, (503) 229-5219.

Stewardship Incentive Program

Description: Low interest loan program provides funds for point source water quality improvements.

Eligibility: Private forest landowners.

Types of assistance: Direct loans.

Available funds: $130,000 (1999).

Contact: Oregon Department of Forestry.

Boating Facility Grants

Description: Provides funds to assist with development of improvement of boating-related facilities, including restrooms, and means to improve runoff and erosion from parking areas or boat ramps.

Eligibility: State, city, and county agencies, and park and recreation depts.

Types of assistance: Direct grants.

Available funds:

Contact: Oregon State Marine Board, (503) 378-8587.

Oregon Watershed Enhancement Board

Description: Provides funds for watershed monitoring, assessment, habitat

improvement, and watershed council support.

Eligibility: Any citizen, non-profit, state or local agency, or other entity.

Types of assistance: Grants (requires 25% match).

Available funds: $15,000,000 (‘97B’99 biennium).

Contact: Oregon Watershed Enhancement Board, (503) 378-3589.

Wetland Mitigation Banking Revolving Fund

Description: Provides funds for wetland (including tidal) restoration and enhancement projects.

Eligibility: Any private citizen, organization, or local or state jurisdiction.

Types of assistance: Direct grants.

Available funds: $132,000 (‘95B‘97 biennium).

Contact: Oregon Division of State Lands, (503) 378-3805.

Water Development Loan Program

Description: Provides assistance to develop water resources through water supply projects for small communities, fish protection and watershed improvements, and irrigation and drainage projects.

Eligibility: Public entities.

Types of assistance: Low interest loans.

Available funds: Up to $20,000,000 (‘99B‘00 biennium).

Contact: Oregon Water Resources Department, (503) 378-8455.

Water and Wastewater Fund

Description: Provides funds for road improvements or wastewater and stormwater system upgrades.

Eligibility: Cities and port authorities.

Types of assistance: Direct grants.

Available funds:

Contact: Oregon Economic Development Department, 1-800-233-3306.

Regional Strategies Program

Description: Lottery-funded program that supports key industry development in the areas of ecosystems industries, small forestry products industries, or targeted, off-season tourism marketing.

Eligibility: Public, private, and non-profit entities.

Types of assistance: Direct grants.

Available funds:

Contact: Northwest Oregon Economic Alliance, (503) 842-2236.

Local Entities

The Tillamook County Soil and Water Conservation District (SWCD) currently has $475,000 through an EPA grant for waste management system modifications or upgrades related to the Methane Energy and Agriculture Development (MEAD) project. Once funds have been loaned to MEAD participants and begin to be paid back, this low interest loan opportunity will be available to landowners for other water quality related projects (WAQ-02).

Economic Development Council of Tillamook County houses an Ecosystems Industries Revolving Loan Fund of over $300,000. The main purpose of the fund is assist start up-businesses in ecosystem restoration or to help existing businesses retool for such work (SED-01, 02, HAB- 05–10).

Tillamook County and the cities of Tillamook, Bay City, and Garibaldi are responsible for implementation of some CCMP actions, such as adopting local ordinances, expanding sewer systems (WAQ-07), and regulating new construction (FLD-05). Tillamook County and individual cities will be responsible for providing some matching funds, and Table 8-1 suggests several ideas for generating those funds.

Private and Non-profit Organizations

Private organizations such as the Oregon Forest Industries Council (OFIC) and the Pacific Coast Shellfish Growers Association (PCSGA) can provide private industry resources for CCMP actions including updating shellfish closure criteria (WAQ-13) and controlling burrowing shrimp (HAB-25).

Non-profit organizations such as The Nature Conservancy (TNC), the Meyer Memorial Trust, and Trout Unlimited are committed to the protection, restoration, and enhancement of natural resources. While each organization focuses on different resources, many CCMP actions represent appropriate use of funds. For example, TNC is well known for purchasing ecologically important land in order to protect it from development, residential, or incompatible agricultural uses. Protecting tidal marsh (HAB-19) is an excellent opportunity to match non-federal (TNC) funds with a federal funding program. Table 8-1 lists additional private and non-profit organizations that should be solicited for CCMP implementation funds.

Table 8-3: Potential sources of federal, state, local and private funds for CCMP implementation (*CFDA = Catalog of Federal Domestic Assistance number)

Federal Programs			
Funding Source	***Program***	***CFDA****	***Actions***
Farm Service Agency, USDA	*Conservation Reserve Program ("CRP")*	*10.069*	*HAB-06, 08, 09, 13, 21, SED-01*
Farm Service Agency, USDA	*Conservation Reserve Enhancement Program ("CREP")*		*HAB-06, 08, 09, 13, 21, SED-01*
Forest Service, USDA	*Cooperative Forestry Assistance*	*10.664*	*SED-01, 02, 05*
Rural Utilities Service, USDA	*Water and Waste Disposal Systems for Rural Communities*	*10.760*	*WAQ-07, 09*
Rural Utilities Service, USDA	*Solid Waste Management Grants*	*10.762*	*WAQ-07, 09*
Rural Utilities Service, USDA	*Water and Waste Disposal Loans and Grants*	*10.770*	*WAQ-07, 09*
Natural Resources Conservation Service USDA	*Watershed Protection and Flood Prevention ("Small Watershed Program")*	*10.904*	*HAB-05, 06, 07, 09, 10, 11, 24, 26, FLD-02*
Natural Resources Conservation Service USDA	*Environmental Quality Incentives Program ("EQIP")*	*10.912*	*HAB-05, 06, 07, 09, 13, 19, 20*
Natural Resources Conservation Service USDA	*Wetland Reserve Program (WRP)*	*10.072*	*HAB 08, 11, 19 WAQ 10, 11, SED 02*
Natural Resources Conservation Service USDA	*Wildlife Habitat Incentive Program ("WHIP")*	*10.914*	*HAB-05, 06, 07, 11, 22*
Economic Development Administration, U.S. Department of Commerce	*Economic Development: Grants for Public works and Infrastructure Development*	*11.300*	*WAQ-06, 07*
NOAA, U.S. Department of Commerce	*Coastal Zone Management Administration Awards*	*11.419*	*HAB-15, 16*
NOAA, U.S. Department of Commerce	*Habitat Conservation*	*11.463*	*HAB-03, 04, 05, 06, 07, 11, 22*
Corps of Engineers, U.S. Dept. of Defense	*Emergency Operations Flood Response and Post Flood Response*	*12.103*	*FLD-02*
Funding Source	***Program***	***CFDA***	***Actions***

Corps of Engineers, U.S. Dept. of Defense	*Flood Plain Management Services ("FPMS")*	*12.104*	*FLD-01, HAB-24*
Corps of Engineers, U.S. Dept. of Defense	*Flood Control Projects ("Small Flood Control Projects")*	*12.106*	*FLD-01, 02, HAB-24*
Corps of Engineers, U.S. Dept. of Defense	*Protection, Clearing and Straightening Channels ("Emergency Dredging Projects")*	*12.109*	*HAB –24*
U.S. Fish and Wildlife Service, U.S. Dept. of Interior	*Sport Fish Restoration ("D-J Program")*	*15.605*	*HAB-05, 06, 07*
U.S. Fish and Wildlife Service, U.S. Dept. of Interior	*Coastal Wetlands Planning, Protection and Restoration Act ("National Coastal Wetlands Conservation Grants")*	*15.614*	*HAB-08, 18, 19, 20, 21*
Office of Water, EPA	*Wetlands Protection--Development Grants*	*66.461*	*HAB-08*
Federal Emergency Management Agency	*Project Impact*	*83.551*	*FLD 03, 04*
Environmental Protection Agency	*Clean Water Act Section 319 Non-Point Source Funds*		*HAB-06, 09, WAQ-06, 08, 09*
Mitigation Directorate, FEMA	*Flood Mitigation Assistance ("FMA")*	*83.536*	*FLD 02, 03*
Response and Recovery Directorate, FEMA	*Individual and Family Grants ("IFG")*	*83.543*	*FLD-03*
Department of Transportation	*Transportation and Community and System Preservation Pilot (Transportation Equity Act for the 21st Century (TEA-21)*		*FLD-02*

State Programs

Funding Source	***Program***	***Actions***
Oregon Department of Fish and Wildlife (ODFW)	*Riparian Tax Incentive Program* *State Income Tax Credit* *Restoration and Enhancement Fund* *Salmon and Trout Enhancement Program* *Northwest Region Habitat Program*	*HAB-01, 02, 03, 04, 05, 06, 07, 09, 17, 18, 20, 22, 23, 26, 29, 30*
Funding Source	***Program***	***Actions***
Division of State Lands (DSL)	*Wetland mitigation banking revolving fund*	*HAB-02, 19, 23*

Northwest Oregon Economic Alliance	*Regional Strategies Program*	*WAQ-06, 07, 08, 09, FLD-03*
Oregon Department of Transportation (ODOT)		*FLD-02*
Oregon Department of Environmental Quality (DEQ)	*Clean Water State Revolving Loan fund* *Section 319 Non-Point Source Pollution Funds*	*WAQ-07, 10, 11*
Oregon Department of Forestry (ODF)	*Stewardship Incentive Program*	*HAB-11, SED-01, 02, 03, 05*
Oregon Department of Agriculture (ODA)	*Conservation Implementation and Planning Grants* *SWCD Administration Grants*	*WAQ-01, 02, 03, 13*
Oregon Economic Development Department	*Water and Wastewater Fund*	*WAQ-07, 08, 09*
Oregon Marine Board	*Boating Facility Grants*	*WAQ-09*
Oregon State Police (OSP)		*HAB-27*
Oregon Water Resources Department	*Water Development Loan Program*	*HAB-14*
Oregon (Governor's) Watershed Enhancement Board (OWEB)	*Watershed Support Grants* *Monitoring Grants* *Habitat Improvement Grants*	*HAB-01, 05, 06, 07, 09, 10, 19, 20, 21, 22*
Local Entities		
Funding Source	***Program***	***Actions***
Tillamook County	*Boating user fee* *Recreational user fee* *State revolving loan fund* *County hotel tax* *Bond measure* *County tax assessment* *Vanity license plates* *License fees*	*HAB-15, 16, 17, 23,* *FLD-01, 03, 04*
Cities of Bay City, Tillamook, Garibaldi	*City hotel tax* *Bond measure* *City tax assessment*	*SED-06, WAQ-08*

Funding Source	Program	Actions
Soil and Water Conservation District	SB 1010 Planning Process Conservation implementation and planning grants	HAB-06, 10, 12, CIT-07
Oregon Forest Industries Council (OFIC)	Forestry practices research	SED-02, 05, FLD-03
Private and Non-profit Groups		
Pacific Coast Shellfish Growers Association (PCSGA)		HAB-25, WAQ-13
The Nature Conservancy (TNC)	Land conservation and protection	HAB-08, 19, 20, CIT-06
The Bullitt Foundation	Environmental protection and restoration	HAB-08, 11, 12, 20
National Fish and Wildlife Foundation	Wetland conservation, fisheries and wildlife habitat conservation, education	HAB 05-11, 19-22, 29
Environmental Defense Fund (EDF)		HAB-08, 11, 12, 21
Meyer Memorial Trust		HAB-08, 11, 12, 21
Trout Unlimited	Fisheries habitat, restoration, and protection	HAB-08, 11, 12, 21
Audubon Society	Avian protection and appreciation	HAB-08, 11, 12, 21

CHAPTER

9 CITIZEN INVOLVEMENT

A History of Stewardship

The people of Tillamook County have a tradition of rising to meet challenges and working together to achieve common goals. In her 1992 nomination letter, Governor Barbara Roberts recognized the area's

> "long history of individuals, groups, affected industries and government working together to identify problems, develop plans, and implement solutions. Repeatedly, the Tillamook community has responded effectively to long-range resource management needs, including such efforts as the reforestation of the Tillamook Burn after a series of devastating forest fires, completion of the Rural Clean Water Program to address dairy waste management, and implementation of the Methane Energy and Agricultural Development (MEAD) project to further control bacterial contamination and allow for economic development."

Later, in the 1997 TBNEP Video, *Citizen Stewardship,* Governor John Kitzhaber described Tillamook citizenship as a "success story of citizen stewards taking control over their environmental destiny."

To meet the goals and objectives of the CCMP, the Tillamook County Performance Partnership (TCPP) will continue to foster citizen stewardship through public outreach and education. TCPP will develop stronger links among existing programs and develop new institutions to serve the evolving needs of watershed councils and community-based decision making. The program will continue to provide staff, expertise and resources to the Tillamook Coastal Watershed Resource Center (TCWRC) and the local watershed councils. It will produce an annual State of the Bay report and continue to publish maps, brochures, signs, educational programs and other material to involve the public in project goals and objectives.

Moreover, TCPP will cooperate with local educators to focus public awareness on resource management issues and choices, and build citizen stewardship by developing better understanding of watershed processes. The program will coordinate related programs in agriculture, forestry, and shellfish industries. TCPP also will work to strengthen K-12 school programs and improve opportunities for adult education. This chapter outlines the Performance Partnership vision for citizen involvement,

describes past programs and citizen input, and presents an action plan to catalyze education and community development projects.

Citizens in Implementation

Citizens will be involved in implementation of the CCMP through several programs and institutions:

- watershed councils,
- Tillamook Coastal Watershed Resource Center,
- volunteer organizations, and
- education programs

Watershed Councils

Four watershed councils serve Tillamook County: Tillamook Bay, Netarts Bay, Nestucca-Neskowin, and Lower Nehalem. Each of these councils provides informational programs on watershed issues and coordinates enhancement activities such as riparian fencing and planting with local industry, state agencies, and private landowners that have a stake in the Watershed. The councils also will involve private landowners in supporting bond measures for stormwater or sewer system improvements. Watershed council members represent industry, business, the County, state agencies, and the general public. Moreover, watershed councils will have representatives on the Performance Partnership Stewardship Council. TCPP will provide cash match for the watershed council coordinator, employed through the Tillamook County Soil and Water Conservation District, to work with each of these councils and perform public outreach functions.

Tillamook Coastal Watershed Resource Center

Tillamook Bay Community College (TBCC), the TBNEP, Tillamook County Soil and Water Conservation District (SWCD), and the Economic Development Council (EDC) of Tillamook County pooled resources to create the center, which is housed at the TBCC Bay City Campus. The Center provides GIS services, products and training; watershed assessment training through TBCC; and technical assistance for watershed councils. It provides a public access facility for GIS, computers, databases, maps, Internet, and information about watershed health, processes and restoration. The TCWRC houses the Tillamook County Watershed Council Coordinator and conducts watershed assessments. It is currently making the transition from the TBNEP-supported pilot phase to an independent, self-supporting public institution.

Volunteer Organizations

Volunteer organizations have played a critical role in helping TBNEP gather data about Tillamook Bay and the Watershed. The following programs have been the most active over the last four years:

Citizens water quality monitoring. Over the last four years TBNEP, other non-profits, and state agencies have trained numerous volunteers in water quality monitoring. Under state GWEB grants, TBNEP supported a part-time volunteer coordinator and worked with local schools, conservation groups, the local correctional facility, and individual citizens. In addition to water quality monitoring, local citizens have also been active in other monitoring activities such as fish counts, surveys of benthic macro-invertebrates, and primary productivity in the Bay. TBNEP supported various citizen monitoring and demonstration projects under APDP funds. See Appendix J. The Performance Partnership will continue citizen monitoring efforts with state funding related to salmon restoration.

Stream stewardship groups. TBNEP grants supported local stewardship groups, including Pals of Patterson Creek, South Prairie School Creek Committee, and the Doughty Creek Group. These groups write and receive grants, conduct citizen training and education, monitor insect populations and salmon migration, implement enhancement projects such as clearing non-native species and planting trees, and work closely with local agency personnel, neighbors, service groups, and families. Much of the TBNEP's success in reaching the public results from coordination with these groups, tapping citizens' desire to implement projects.

Three Graces Intertidal Program. TBNEP partnered with Camp Magruder and other educational organizations in a volunteer monitoring program known as the Three Graces Intertidal Program. This program focused on the extent and impacts of human uses of the Three Graces intertidal area of Tillamook Bay. The program integrated Portland State University field studies and identification guides with local volunteers.

Tillamook County Creamery Association (TCCA). The Tillamook County Creamery Association is informing and helping its member farmers with stream fencing, riparian plantings, and culvert and tide gate improvements. TCCA participated with TBNEP in water quality monitoring of the Wilson River. Many individual farmers participate in projects to enhance habitat, reduce sedimentation and improve water quality through SWCD and NRCS programs.

Community groups. Other groups such as the Tillamook County Anglers, Tillamook County Flood Control Group, and Project Impact share similar goals and objectives with the CCMP and will provide public outreach, willing workers and cooperation.

Accomplishments in Public Outreach

During the first four years, TBNEP devoted much public outreach toward community education about environmental resource, science, and management issues. The first step was the development of the Citizen Action Committee (CAC) and a strategy for public involvement. Led by concerned citizens and the TBNEP, CAC designed and managed an extensive outreach and education program. With speakers programs, public events and forums, signs, videos, and printed material, the TBNEP used diverse media to educate the citizens about the issues and involve them in the solutions.

Speaker's series. The TBNEP speaker's series provided educational public science lectures targeted to the local community. Lectures included such diverse topics as:

- high school students explaining how to use macroinvertebrates in restoration assessment and
- local biologist leading a discussion about the role of hatcheries in salmon restoration.

Public presentations. Public outreach included hundreds of presentations by TBNEP staff and management conference members to local service clubs and organizations. TBNEP representatives also spoke often at local, regional, and national science, management, and education conferences.

Tillamook Bay Paddle. In 1995 and 1996, TBNEP sponsored the Tillamook Bay Paddle to increase awareness and understanding of the Tillamook Bay environment. Roughly 80 people participated in the events. Paddlers took photographs of human uses of Tillamook Bay and the surrounding landscape as well as the effects of the 1996 flood. Displays were created with these photographs.

Fairs and exhibits. The TBNEP maintained booths at the Tillamook County Fair and Portland Sportsmen's and Boater's Show, which each receive more than 50,000 visitors annually. Displays at these events focused on watershed and resource education and increasing participation in the TBNEP process. The TBNEP also maintains an exhibit at the TCCA Cheese Factory (about 900,000 visitors annually), outlining TBNEP's mission, priority problems, and management.

Issue forums. Between 1994 and 1995, TBNEP conducted four Issue Forums on Biochemical and Water Quality, Sedimentation and Erosion, Fish and Wildlife, and Human Resource Use. Scientists, local resource specialists, and local citizens made presentations and answered questions

at the forums, which drew 60B100 participants each. These forums provided public discussion and input on TBNEP priority problems.

State of the Bay. In 1997, the TBNEP State of the Bay Conference presented 24 speakers who highlighted the ongoing science and policy work occurring in the watershed and region. Held in conjunction with the annual meeting of the Pacific Estuarine Research Society (PERS), the State of the Bay Conference attracted well over 100 people.

Signs and displays. The TBNEP used many portable and fixed displays for a variety of venues throughout the local community and region. For example, TBNEP created an exhibit titled "Habitat Lost" that displayed for six months at the County Pioneer Museum in Tillamook. Displays have also been put up in all of the branches of the county library, bank lobbies, schools, athletic and public service events (*e.g.,* Multiple Sclerosis walk), Earth Day celebrations, art shows, dairy parades, and so on.

Five different designs of interpretive signs can be found throughout the region identifying TBNEP and the priority problems. The five designs include:

- Estuary: Where the River Meets the Sea,
- Watershed: A Place to Call Home,
- The Anadromous Five (the five native salmonids),
- Fish Bearing Stream and Fish Habitat; and
- Habitat in Estuaries

TBNEP web site. http://osu.orst.edu/dept/tbaynep/nephome.html provides a constant profile of the project. It contains demonstration project summaries, Request for Proposal (RFPs), publications, meeting updates, and other elements of the project.

Video: *Citizen Stewardship in Tillamook County*. In 1997, TBNEP produced Citizen Stewardship in Tillamook County. Distributed regionally, the 30-minute video highlights the stewardship efforts of Tillamook County's citizens. Introduced by Governor Kitzhaber, the video reached tens of thousands of people through cable stations in Tillamook, Salem, Eugene and Portland Metro area.

Video: *Estuaries of Oregon*. The TBNEP partnered with ODFW to produce "The Estuaries of Oregon" video. The 25-minute video discusses the importance of Oregon's 22 major and 17 minor estuaries.

Newsletters. TBNEP produced a quarterly newsletter describing its latest program developments, scientific findings, and upcoming events.

Public Participation in the CCMP

In addition to constant educational outreach activities, the TBNEP has always encouraged public participation in the planning process. During several periods TBNEP actively solicited public participation. During late 1995 and early 1996, prior to the publication of the Preliminary Comprehensive Conservation and Management Plan (PCCMP), a 10-member Lowland Committee met to discuss management of lowland agricultural areas. During the first half of 1997, a more ambitious public outreach process solicited input on all three of TBNEP's original priority problems. Later the TBNEP Management Committee adopted flooding as a fourth priority problem.

The Lowland Committee and the PCCMP

A group of ten individuals met on several occasions during late 1995 and early 1996 to work out policies and actions for the PCCMP. Dale Buck, present chairman of the Management Committee, invited the committee members to participate. The committee members included one landowner and one dairy operator from each of Tillamook Bay's five major tributary rivers. These meetings resulted in the set of actions designated Land Use Actions (LUA) in the PCCMP. In all, the PCCMP contained 162 actions.

TBNEP published the PCCMP in July 1996, summarizing the early efforts of the TBNEP Management Conference to address the three priority problems of the TBNEP. The document served as a basis for discussion during 1996 and 1997, and many ideas and actions found in the PCCMP are found in the Final CCMP.

Pubic Outreach in 1997 and the Draft CCMP

The TBNEP held a series of 14 public meetings between January and July, 1997, to solicit public input and involvement in the planning process leading to the Draft CCMP, which was published in September 1998. From a list of more than 300 proposed actions, the public input process yielded a list of 24 broadly supported high priority actions for the Management Committee to consider for inclusion in the CCMP. These priority actions are listed on Page 1-14.

Sector Meetings

The public meetings took place in three phases. The first phase, termed "sector meetings," brought together individuals from similar backgrounds or interests to recommend ideas to represent their interests. Eight sector meetings gathered representatives from forestry, the estuary, sport fishing, local government, environmental advocacy, education, local businesses, and riparian landowners. Participants suggested actions for the CCMP, which would address one or more of TBNEP's priority problems. These meetings produced a list of 147 possible actions, which were listed fully in the September 1998 Draft CCMP.

Table 9-1: Sector Meetings

Title	Date	Attendees	Actions Suggested
Commerce/Business	Feb. 6, 1997	7	11
Education	March 18, 1997	19	22
Environmental	Feb. 11, 1997	20	37
Estuary	Jan. 16, 1997	11	12
Forestry	Jan. 9, 1997	8	15
Government	Feb. 15, 1997	19	21
Rec. Fishing	Feb. 15, 1997	15	17
Riparian Owners	May 21, 1997	10	12

Geographic Meetings

Following the sector meetings, five "geographic meetings" brought different points of view and sectors together to discuss specific geographic areas. The geographic meetings focused on: Lowlands (April 29, 1997); Education (June 4, 1997); Uplands (June 5, 1997); Estuary (June 10, 1997); and Urban (June 24, 1997). The best-attended meeting was the Lowlands, with 35 participants.

Staff combined the 147 actions from the sector meetings with the 162 actions of the PCCMP to create a list of 309 possible actions. Participants in the geographic meetings were asked to prioritize all actions into their top recommendations. Through consensus building dialogues and discussions, each small group chose a list of roughly 10 actions it could support, and five actions it would oppose. Often, the same action would be endorsed by one group and rejected by another at the same meeting. The geographic meetings culminated with 89 actions receiving consensus support (also listed in the September 1998 Draft CCMP) and approximately 40 receiving opposition.

A Final Roundup

A final roundup meeting took place July 12, 1997, following the geographic and sector meetings. More than 30 people attended this meeting.

Like the earlier geographic meetings, the final round-up meeting asked groups of participants to endorse or reject specific actions. The initial list of actions to be discussed was taken from the actions supported during the geographic meetings. Participants were asked to rate actions based upon what they would like to see done during the first year of TBNEP's implementation phase. In this way, the final roundup meeting yielded a short list of 24 Citizens' High Priority Actions (see Page 1-14).

Management Committee Response to Citizen Recommendations

Members of the management committee met in the fall of 1997 to address citizen recommendations. The committee compared citizen input with current programs to identify gaps and/or recommend solutions. TBNEP staff provided scientific summaries and the best available technical information to support management decisions. The September 1998 draft CCMP presented the management committee's initial recommended actions after nearly a year of discussion and deliberation.

In October, 1998, a "listening post" meeting was held to generate public comment on the draft CCMP. The TBNEP sent a mailing to its entire mailing list of 1,000 interested persons and placed large advertisements in the local newspaper for two consecutive weeks. While attendance was lower than expected, the listening post still generated further public input into the CCMP development process.

The CCMP changed significantly as staff, agency representatives, management committee, and subcommittees hammered out specifics over the next few months. Moreover, a list of High Priority Goals and Actions (see Page 1-16) was developed, incorporating the Citizens' High Priority Actions, the results of a Management Committee Prioritization Exercise (see Page 1-15 and Appendices B and C), and visioning, questionnaire, and survey data. The TBNEP, which was by that time transitioning into the Tillamook County Performance Partnership, made another broad push for public comment, with a 1,000-card mailing, posting of the latest draft on the Internet, a prominently-placed newspaper article, and a radio news item and public service announcement. Additional citizen and agency comments are accounted for in Appendix P.

Education Fosters Citizen Involvement

Education is key to helping citizens become an informed, effective force in solving the Watershed's problems. The TBNEP worked closely with Tillamook County's many educational institutions and groups. They will become more involved through the programs described below and the Action Plan listed at the end of this chapter.

The organizational structure of education in Tillamook County is a loose affiliation of several entities, including:

- three school districts (Nestucca Valley, Tillamook, and Neah-Kah-Nie);
- Tillamook County Education Consortium;
- Tillamook Bay Community College;
- Tillamook Bay National Estuary Project;
- private schools;
- Oregon State University Extension Service;
- four watershed councils;
- Tillamook County Performance Partnership; and
- other local, state, and federal entities.

The educational community is making an effort to expand natural resource education curricula. These efforts will provide students with a greater connection to their surroundings as well as an alternative educational structure for students who respond better to hands-on, outdoor experiences than to the traditional classroom setting.

K12 Education

Passed in 1991, the Oregon Education Act for the 21st Century requires schools to overhaul their curricula and requires students to demonstrate knowledge, skills, and problem solving abilities. The act encourages individual school districts to adopt two indicators of academic ability: the Certificate of Initial Mastery (CIM), and the Certificate of Advanced Mastery (CAM) for specific areas. The CIM is a broad examination of a student's ability in areas such as English, math, and writing. To achieve a CIM, a student must score at or above state benchmarks. The test is intended to be an indicator of whether students have acquired the knowledge and skills necessary to succeed in the real world. As of yet, very few school districts require CIM for graduation. The CAM is a more specific test of advanced knowledge in a given subject area. Tillamook County Schools have chosen local specialty CAMs in natural resources, health, and business and management.

In pursuit of both academic and real world achievement, Tillamook County schools encourage the use of outdoor classrooms. Some schools developed outdoor laboratories along wetlands and creeks and use these places to teach natural sciences and serve as inspiration for other classwork. In addition, schools encourage internships, community service, and school-to-work programs for better links with government and industry.

To meet educational goals, schools will need planning assistance, agency knowledge, and increased local capacity to supervise their projects. The CCMP also calls on public schools to expand their outdoor learning programs and to upgrade professional development for teachers. As a result, students will better integrate their entire educational experience with the rich natural setting available in Tillamook County.

Educating the Educators

The National Faculty recently provided grant money to train local teachers in watershed issues and natural sciences. The grant allows university-level scholars to hold workshops and classes for an integrated teacher audience. The idea is to establish a pool of teachers who are well-versed in the field of natural science and are, therefore, able to better connect students to the environment in which they live. The TBNEP participated in the National Faculty Workshops Series, which trained ten local educators in natural resource education.

The TBNEP also conducted a Teacher's Institute, a weeklong lecture and discussion series for 30 local and regional educators. The Institute emphasized team teaching in "place based" experiential science education.

Tillamook County School Districts

The three school districts of Tillamook County have made an effort to increase alternative, outdoor, and community education. The districts have developed links to local businesses, colleges, and universities; incorporated the Oregon Educational Act for the 21st Century; and even established a natural resource school in Tillamook Junior High. Following are examples of programs and partnerships initiated by the school districts to expand and improve education.

Rural Education Corps/Oregon Youth Conservation Corps. In addition to changing traditional education methods to include more out-of-class activities and links to outside entities, the districts offer educational alternatives such as the Oregon Youth Conservation Corps (OYCC). The OYCC targets students who benefit more from non-traditional education. The curriculum focuses on community service and outdoor experience, but includes classroom subjects such as mathematics, history, reading, and writing. The districts invite students who feel that they would learn more from such a program to apply for a semester at a time. Although relatively

new, the program has met with great success and expanded in the 1998-99 school year.

Outdoor School. Nearly all sixth grade students in Tillamook County participate in Outdoor School, where they learn environmental science and are exposed to the area's natural resources. High school students volunteer as counselors, providing the grade school children with guidance, and the high school students with the opportunity to develop responsibility and leadership skills.

Portland State University (PSU). The PSU Center for Science Education provides training for schoolteachers to better assess students with regard to CIM/CAM as well as to provide quality natural resource education. Local teachers are encouraged to earn advanced degrees through PSU.

Natural resource school. The Tillamook School District recently designated Tillamook Junior High School as a natural resource school. The junior high schools curriculum will emphasize natural resource education.

Private Schools

To varying degrees, Tillamook County's private schools provide natural resource education. Most sixth graders participate in outdoor schools, and a general trend indicates increased use of creeks, forests, and other natural settings as classrooms.

Tillamook County Education Consortium

The three Tillamook County school districts and Tillamook Bay Community College (TBCC) comprise the Tillamook County Education Consortium, a cooperative effort to coordinate education, resources, and programs in the county. The Consortium was recently awarded an Annenberg Grant, with the goal of connecting K-12 education with the community. This follows a concerted effort by each member of the consortium to increase awareness and education with regard to the natural environment in Tillamook County. Members of the consortium recognized that the rich and varied natural environment of this area provides an exceptional opportunity to learn experientially about our natural resources, the way humans interact with our environment, and basic science such as chemistry and biology.

Adult and Community Education

The CCMP includes Tillamook Bay Community College's new Oregon Transfer Degree in Environmental Studies (CIT-02). recommends an Oregon State University (OSU) Extension Service Watershed Master series (CIT-01), watershed council seminars (part of CIT-07), and improved institutional links to increase agency and citizens' knowledge of natural resources. In addition, new resources such as the TCWRC, a land trust organization, and watershed councils are available to community members who wish to increase their knowledge base and pursue a more active role in resource stewardship.

Tillamook Bay Community College

Accredited through Portland Community College (PCC), TBCC offers a variety of technical and social science courses. TBCC now offers an Environmental Studies Program in response to industry and government's need for more environmentally aware employees. The college recently hosted a watershed assessment course as a cooperative effort with the Tillamook Bay National Estuary Project (TBNEP), and plans to offer the course again.

Oregon State University (OSU) Extension Service

The OSU Extension Service conducts educational programs that help Oregonians solve problems and develop skills related to youth, family, farm, community, forest, energy, and marine resources. County-based Extension faculty and staff are supported by OSU campus-based teaching, research, and Extension faculty.

Goals of the CCMP currently are supported by local Extension activities pertaining to forest management, youth development, general agriculture, family living, dairy farm management, and marine resource use. Many of the actions contained in the CCMP could be the focus of new Extension activities locally.

Tillamook Coastal Watershed Resource Center

The center, which is housed at the TBCC Bay City Campus (see Page 9-2) provides GIS services, products and training; watershed assessment training through TBCC; and technical assistance for watershed councils. It provides public access to GIS, computers, databases, maps, Internet, and information about watershed health, processes and restoration.

Citizen Involvement Action Plan

Problem

Environmental awareness within the community and sound environmental decision-making by stakeholders depend on focused education programs and progressive community development. Currently, too few educational resources regarding the Tillamook Bay Estuary exist for citizens, watershed council members, resource users, and others involved in or affected by community decisions. Adult education must be strengthened to meet the needs of diverse stakeholder groups. In addition, K–12 programs must connect learning experiences to the environment and the community.

Goal **Improve Community Education**

Few educational and training resources exist to serve the diverse stakeholder groups involved in community decision-making. Improving adult education regarding Tillamook Bay and Watershed will strengthen citizen stewardship and ensure community support for implementing the Comprehensive Conservation Management Plan (CCMP).

Goal **Strengthen K–12 Science and Outdoor Programs**

Oregon's Educational Act for the 21st Century calls on students, parents, educators, and business people to promote higher academic standards in the schools and to hold schools and students accountable for better results. To meet these standards in Tillamook County, K–12 programs will strengthen natural science and outdoor education.

Goal **Promote Community Development**

To build local capacity, foster citizen leadership, and improve community decision-making, Tillamook County requires new and renewed institutions. These institutions must provide better training, greater expertise, and stronger enforcement of local ordinances. State-of-the-art information technologies will support local infrastructure and nourish community development. By strengthening organizational linkages and regional partnerships, the community will leverage additional resources and streamline project implementation.

Citizen Involvement Action Plan

CIT - 01 Implement an Oregon State University Extension Watershed Masters Series

CIT - 02 Implement an Associate of Arts Oregon Transfer Degree in Environmental Studies

CIT - 03 Improve Professional Development for K–12 Teachers

CIT - 04 Strengthen Organizational and Institutional Linkages

CIT - 05 Expand Authentic Learning Experience Opportunities

CIT - 06 Establish a Land Trust or Conservation Organization

CIT - 07 Sustain the Tillamook Bay Watershed Council

CIT - 08 Sustain the Tillamook Coastal Watershed Resource Center

CIT - 01 Implement an Oregon State University Extension Watershed Masters Series

What

The OSU Extension Service has developed a watershed stewardship education program that could be used for a Watershed Masters series for community stakeholders and watershed council members. The series is divided into several modules, each focusing on a specific area of watershed science such as riparian areas, fish habitat, and water quality. After completing the required number of modules, participants would then be required to complete a volunteer "stewardship action" and report on the action to the coordinating entity. Support this program through OSU Extension, TBCC, and TCWRC. Invite OSU Extension educators or other experts to present the series in cooperation with local institutions.

Why

The success of the Governor's Oregon Plan and the TBNEP CCMP relies on volunteer stewardship efforts of an educated populace. Throughout Oregon, few educational programs are available for watershed council members involved in watershed assessments and environmental restoration. Historically, OSU Extension has taken the lead in developing and implementing adult science and technical education programs to fill community educational needs, and a Watershed Masters series would provide the opportunity for community members to gain knowledge and experience in the field of watershed stewardship. There is an immediate and future need for a Watershed Masters program.

How (Who.*When.)**

Step 1 Tillamook Bay Watershed Council Coordinator and TBCC determine interest and curriculum. (TBWC & TBCC. 1999.)

Step 2 Develop cooperative arrangement between OSU Extension Service and local coordinating entities. (TBCC, TBWC, & OSU Extension Service. 1999.)

Step 3 Advertise Masters Series to members of the community, watershed council members, local service organizations, students, and teachers. (TBCC, TBWC, & OSU Extension Service. 2000.).

Step 4 Schedule classroom and field days, and invite experts to teach modules. (TBWC. 2000.)

Step 5 Present classes. (TBCC, TBWC, & OSU Extension Service. Three modules by 2001.)

Step 6 Follow up with course evaluations. Ascertain that all participants complete volunteer stewardship action within one year of course completion. (TBWC. Ongoing.)

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* Coordinating entity.
** By end of named year.

Lead Agencies OSU Extension Service, TBCC, TCWRC.

Other Partners Soil and Water Conservation District, watershed councils, TBNEP, PSU Center for Science Education, TCPP.

Anticipated Costs In-kind contributions of staff time for instructors; $250 per series for materials; 0.25FTE TCPP staff for one year = $12,500.

Regulatory Issues None.

Related Actions

CIT-02	Implement an Associate of Arts Oregon Transfer Degree in Environmental Studies
CIT-03	Improve Professional Development for K–12 Teachers
CIT-04	Strengthen Organizational and Institutional Linkages
CIT-05	Expand Authentic Learning Experience Opportunities
CIT-07	Support a Tillamook Bay Watershed Council
CIT-08	Sustain the Tillamook Coastal Watershed Resource Center
OPSW	DSL-23
	ODA-3
	ODFW-VA1
	ODOT-12
	OPRD-3

CIT - 02 Implement an Associate of Arts Oregon Transfer Degree in Environmental Studies

What

Tillamook Bay Community College is developing an Associate of Arts Oregon Transfer Degree in Environmental Studies. This program will provide students with core courses and an associate degree, which is transferable to environmental science or environmental policy bachelor's degree programs at Portland State University and Oregon Institute of Technology. Each student will complete work in core environmental studies courses and in a series of foundation courses in mathematics and the natural and social sciences.

Why

There is now no local higher education program in environmental studies in Tillamook County. This program will provide opportunities for high school and college students to pursue this field.

How (Who.When)

Step 1 Include first year level Environmental Studies courses in the Pathways Program (concurrent high school/college enrollment) classes (TBCC. 1999.)

Step 2 Implement second year level classes in conjunction with Performance Partnership staff (TBCC. 1999.)

Lead Agency

Tillamook Bay Community College.

Other Partners

Natural resource agencies and entities, TCWRC, TCPP.

Anticipated Costs

$5,712 over two years for instructor costs.

Monitoring

Students completing associate degrees by spring 2001.

Regulatory Issues

None.

Related Actions

CIT-03	Improve Professional Development for K–12 Teachers
CIT-04	Strengthen Organizational and Institutional Linkages
CIT-05	Expand Authentic Learning Experience Opportunities
CIT-08	Sustain the Tillamook Coastal Watershed Resource Center
OPSW	ODOT-12 OPRD-3

CIT - 03 Improve Professional Development for K–12 Teachers

What

Provide greater professional development opportunities to public and private school educators in science, natural history, and resource management. Cultivate a team of educators to provide county leadership in science education. This team would serve as mentors and resource providers for other county educators.

Why

Natural sciences and environmental studies need additional attention and further development in county schools. Certificate of Initial Mastery/ Certificate of Advanced Mastery will be implemented in the County by 2005, requiring increased teacher training for implementation.

How (Who.When.)

Step 1 Fund natural resource curriculum development and summer science institutes for at least five years. (TCEC. 2001.)

Step 2 Encourage educators to complete their Master of Science in Education Degree (MSEd), Master of Science in Teaching (MAT), or Master of Science in Teaching Science (MSTS). (TCEC. Ongoing.)

Step 3 Design, develop, promote, and implement teacher-to-teacher mentoring program in Tillamook County. (TCEC. 2001.)

Step 4 Fund incentive pay for teacher mentors. (TCEC. 2001.)

Lead Agency

Tillamook County Education Consortium.

Other Partners

PSU, GWEB, natural resource agencies (state and federal), OSU Extension Service, TBCC/TCWRC, watershed councils, public and private educators, TCPP.

Anticipated Costs

$50,000 for one FTE educator, incentive pay for mentors ($1200/mentor/year).

Monitoring

Increasing trend in the number of educators completing advanced degrees, and/or training in CIM/CAM certification by 2001.

Regulatory Issues

None.

Related Actions

CIT-01 Implement an Oregon State University Extension Watershed Masters Series

CIT-02 Implement an Associate of Arts Oregon Transfer Degree in Environmental Studies

CIT-05 Expand Authentic Learning Experience Opportunities

CIT - 04 Strengthen Organizational and Institutional Linkages

What

Develop and sustain better organizational links between local schools, TBCC, state universities, government agencies, and other entities.

Why

No single district or consortium of districts has the resources to develop the very best in natural resource education. Rural educators can access more resources by building partnerships with larger universities, stakeholder industries, and private educational groups such as the Oregon Museum of Science and Industry (OMSI).

How (Who.When.)

Step 1 Write a mission statement to clarify goals and objectives. Promote concept throughout school system and community. (TCEC. 2001.)

Step 2 Identify partners, resources, and benefits. (TCPP. 2001.)

Step 3 Identify staff lead and funds needed for program. (TCPP. 2001.)

Step 4 Establish, develop and sustain organizational links between partners. Promote partnership at community level (through school boards, Parent Teacher Associations, educational boards, etc.). (TCEC and TCPP. Ongoing.)

Step 5 Determine administrative costs, funding sources, yearly benchmarks. (TCEC. 2001.)

Lead Agency

Tillamook County Education Consortium.

Other Partners

GWEB, PSU, OSU, public and private educators, timber landowners and industries, GIS high tech firms, and resource agencies, TBCC/TCWRC, TCPP.

Anticipated Costs

No significant new costs.

Monitoring

All county schools should have a natural resource partner such as ODF, TCCA, BLM, etc. by 2000.

Regulatory Issues

None.

Related Actions

CIT-03 Improve Professional Development for K–12 Teachers

CIT-07 Support a Tillamook Bay Watershed Council

CIT - 05 Expand Authentic Learning Experience Opportunities

What

Integrate coursework with authentic learning experiences, which include outdoor and community-linked educational experiences. Develop community learning labs in areas such as health care, agriculture, and the environment. Enhance community education programs for K-12 students. Review mission of Certificate of Initial Mastery/Certificate of Advanced Mastery (CIM/CAM) goals.

Why

Tillamook County offers tremendous resources for community-linked education, and local schools are beginning to incorporate authentic learning experiences into their curriculum. Experiential learning enriches the classroom experience and strengthens the lessons learned.

How (Who.When.)

Step 1 Articulate goals and mission. Promote concept throughout school system, community and private business. (TCEC. 2000.)

Step 2 Identify partners, resources and benefits. (TCEC. 2000.)

Step 3 Identify staff lead and funds needed for program. (TCEC. 2000.)

Step 4 Establish, develop, and sustain a model program. (TCEC. 2001.)

Step 5 Develop outreach and education to other schools regarding local model. Develop buy-in from administrators and educators. (TCEC. 2000.)

Step 6 Support existing and developing programs through technical and administrative support. (TCEC. Ongoing.)

Lead Agency

Tillamook County Education Consortium.

Other Partners

GWEB, resource agencies, public and private educators, administrators, TBCC/TCWRC, watershed councils of Tillamook County, TCPP, BLM, ODF, USFS.

Anticipated Costs

$50,000 for 1.0 FTE education specialist or community education liaison.

Monitoring

All county students have community-linked educational experiences by 2002.

Regulatory Issues

None.

Related Actions

CIT-03 Improve Professional Development for K–12 Teachers

CIT-04 Strengthen Organizational and Institutional Linkages

OPSW ODOT-12

CIT - 06 Establish a Land Trust or Conservation Organization

What

Establish an organization or process to purchase or accept donations of private land or easements in areas of high quality habitat. Obtain donated or purchased lands or easements to meet habitat restoration targets and manage lands to benefit habitat. Work with the Central Coast Land Conservancy, The Nature Conservancy, Oregon Natural Heritage Program, or other habitat conservation organizations to manage these lands.

Why

Land trusts and conservation organizations have been used successfully in many areas to provide alternative mechanisms to acquire and conserve lands or rights. In the case of the Tillamook Bay Watershed, these organizations might acquire, conserve, and manage lands that have high values for fish and wildlife habitat and/or flood hazard mitigation, or conserve lands where traditional production practices contributed excessively to sedimentation or water quality problems. Land trusts and other conservation organizations also allow landowners to donate lands or easements to a tax-exempt non-profit organization. Donations can be structured in a variety of ways to maximize tax benefits for the landowner.

How (Who.When.)

Step 1 Establish a process for accepting donated land or easements and for purchasing either easements or title to habitat lands. Consider current organizations and/or the feasibility of establishing a new organization for Tillamook Bay. (TCPP. 2001.)

Step 2 Develop guidelines for different types of land acquisitions and specify which organizations are best suited for each type of conservation project, easement, and/or purchase. (TCPP. 2001.)

Step 3 Enter into a management contract with the conservation organization for the land involved in that project. (TCPP. 2001.)

Step 4 Acquire easements or ownership through purchase or donation. (TCPP. Ongoing.)

Step 5 Secure funds for management of the lands. (TCPP. 2001.)

Step 6 Turn over lands and management funds to the conservation organization for management. (TCPP. 2005.)

Step 7 Periodically review the performance of the conservation organization in carrying out its management duties. (TCPP. Ongoing.)

Lead Agency

Tillamook Bay Performance Partnership.

Other Partners Central Coast Land Trust, North Coast Land Conservancy (Clatsop County), The Wetlands Conservancy, The Nature Conservancy, The Trust for Public Land, Oregon Natural Heritage Program, Oregon Water Trust, USFWS, watershed councils, ODFW.

Anticipated Costs 0.25FTE TCPP staff time for facilitating the process.
Cost of land purchases and real estate transfers: site-specific.

Monitoring Increase in donated or purchased land in land trust by 2005.

Related Actions

HAB-19	Protect and Enhance Tidal Marsh
OPSW	ODFW-IVA6

CIT-07 Sustain the Tillamook Bay Watershed Council

What

Sustain a Tillamook Bay Watershed Council, and other Tillamook County watershed councils. Obtain ongoing funding for a Tillamook Bay Watershed Council Coordinator. Obtain funds for restoration and enhancement activities County-wide. Encourage brief seminars on relevant topics at each watershed council meeting.

Why

Watershed councils coordinate restoration and enhancement projects and are able to engage in a wide range of activities to promote watershed health and community education. Implementation of the CCMP to address priority problems will require a strong and focused organization to support continued coordination and cooperation among the various entities involved and to advocate those measures which must be accomplished by other agencies or groups. Brief seminars at each watershed council meeting will increase understanding of important topics.

How (Who.When.)

Step 1 Watershed council coordinator takes the lead in facilitating council activities. Use the SWCD and TCWRC as the base for the coordinator/educator position. (SWCD. 2000.)

Step 2 Secure long-term funding for the council coordinator position. (SWCD. 2000.)

Step3 Prepare council for the Performance Partnership and the responsibilities in the process. (SWCD. 2000.)

Lead Agency

SWCD.

Other Partners

TBCC, TCWRC, OSU Extension Service, natural resource agencies, TBNEP, GWEB, TCPP.

Anticipated Costs

$50,000 1 FTE (Council Coordinator position).

Monitoring

Watershed councils involved in at least five restoration/enhancement projects per year.

Regular topical seminars presented at watershed council meetings.

Related Actions

OPSW
DEQ-3S
DOGAMI-2
DSL-23, 24
ODA-3
ODFW-VA1
ODOT-4, 12
OPRD-1

CIT - 08 Sustain the Tillamook Coastal Watershed Resource Center

What

Establish the TCWRC as an independent non-profit organization under Section 501(c)3. Build a local library of geographic information available to the public and update GIS layers and databases housed in TCWRC. Provide public education and training in GIS technologies. Secure ongoing funding for TCWRC management and technical staff.

Why

The TCWRC provides GIS technology and databases for citizens, agencies and others involved in natural resource decision making. It provides a shared meeting space for Tillamook County watershed councils and facilitates public access to all relevant geographic data. A sustainable TCWRC will require good management, technical staff, and adequate resources for computer technology and maps. Funding will be provided through a combination of contract work and grant funds.

How (Who.When.)

Step 1 Establish a non-profit foundation and board of directors. Develop mission and visioning statement. Identify and secure long-term funding sources for the Center, including significant income from contract work. (TCPP. 2000.)

Step 2 Create partnerships with resource agencies, private businesses, colleges, and schools. (TCWRC. 2001.)

Step 3 Define staff job descriptions, hire full TCWRC staff. (TCPP. 2000.)

Step 4 Establish formal training programs for watershed assessment, resource education, and GIS. (TCWRC. 2001.)

Step 5 Update marketing strategy periodically to respond to new opportunities. (EDC. Ongoing.)

Step 6 Become a self-sustaining institution that serves local and regional needs. (TCWRC. Ongoing.)

Lead Agency

TCPP.

Other Partners

TBCC, Economic Development Council of Tillamook County (EDC), SWCD, Tillamook County watershed councils, TBNEP, OWEB, SWCD, Tillamook County, federal, state and local agency and utility partners,.

Anticipated Costs

Yearly costs: $207,000

Salaries, computer upgrades, utilities, office supplies, etc. 3 FTE: $150,000 (administrative coordinator/educator, council coordinator/educator, GIS coordinator/educator).

2+ FTE interns: $31, 000. Resource Assistance for Rural Environments [RARE] or other student.

Office and miscellaneous costs: $26,000 (includes rent, supplies, utilities, computer upgrades).

Monitoring

Increase in citizen use of the TCWRC by 2000.

Regulatory Issues

None.

Related Actions

CIT-01	Implement an Oregon State University Extension Watershed Masters Series
CIT-03	Improve Professional Development for K–12 Teachers
CIT-04	Strengthen Organizational and Institutional Linkages
OPSW	ODF-59S
	ODFW-IB1S

CHAPTER

10 MONITORING AND RESEARCH NEEDS

Tracking CCMP Objectives

The Clean Water Act (CWA) section 320(b)(6) specifies that each Management Conference shall "...monitor the effectiveness of actions taken pursuant to the plan," with the following two primary goals:

1. measure the effectiveness of the management actions and programs implemented under the Comprehensive Conservation and Management Plan (CCMP); and
2. provide essential information that can be used to redirect and refocus the CCMP during implementation.

In the technical sense, monitoring often entails collecting a series of observations over time. This repetition of measurements over time for the purpose of detecting change distinguishes monitoring from inventory and assessment. For example, maximum daily temperatures could be measured over a summer to assess if high temperatures might limit fish populations under existing conditions; this is an assessment. However, if water temperatures are measured over several years to determine the effect of upstream management activities on water temperature, this is monitoring.

The Tillamook Bay Monitoring Plan (TBMP) is described herein. It is structured so as to answer both implementation and effectiveness types of questions:

1. Are the goals and objectives of the Plan being met?
2. Is the health of the ecosystem changing?

The first type of question is programmatic in nature and addresses Plan implementation issues. The second type of question is environmental in nature, and focuses on changes in ambient conditions, ecological functions, and biological populations and communities. To effectively evaluate the success of the Plan, it will be necessary to track both the extent to which the actions laid out in the Plan are being implemented and the environmental effects, or lack thereof, of those implemented actions.

Implementation Monitoring

Programmatic implementation monitoring will help to keep managers informed regarding the implementation status of various programs and the degree to which programs are or are not achieving their intended outcomes. With this information, managers can modify the Plan or actions as needed to achieve the desired outcomes outlined in the Plan. Where appropriate, resources could be redirected to ensure that desired outcomes are achieved.

Implementation, or programmatic, monitoring is designed to answer such questions as: "Is the CCMP being implemented at the level of commitment specified in the CCMP goals, targets, and measures of success?" "Are the actions in the Plan having the desired effects?" "Does the Plan need to be changed?" We will monitor the effectiveness of implementation based on achieving the goals, targets, or measures of success defined in the CCMP. Many actions in the CCMP lend themselves to this type of administrative monitoring. Implementation monitoring establishes accountability on the part of the designated lead organizations for specific actions outlined in the CCMP. It can also be used to verify whether an educational outreach program has reached its target audience.

The Tillamook County Performance Partnership will develop an on-line, Web-based accountability system that will house all monitoring data at the Tillamook Coastal Watershed Resource Center (TCWRC). This system will track projects and costs so that citizens and resource agencies have access to information regarding implementation activities through the Internet.1 In addition, all data will be available in hard copy form for those without access the World Wide Web. When appropriate, monitoring results will be entered into a monitoring database, then into a Geographical Information System (GIS) to display spatial data. The GIS system has been established by the TBNEP and will be maintained by the TCWRC. The Performance Partnership will establish the monitoring database, which will also be maintained at the TCWRC. The intent is that all data will be Web-accessible (*e.g.* data collected by or for the Program) or Web-linked (*e.g.* DEQ Storet database).

1 Example: A Key Habitat objective is to Aenhance 500 miles of riparian habitat in the 0B500' elevation band to healthy condition by 2010.≅ Information contained on the Internet might include: data on how many miles of streambank had been fenced and planted to date; the cost of the project to date; source(s) of funding; and a GIS layer showing the location of fenced/planted areas. For more information, see Chapter 8: Implementation and Finance.

Effectiveness Monitoring

Effectiveness monitoring answers broader ecological questions: "Is the ecological integrity of the Bay and Watershed changing?" " Is water quality improving or getting worse, and by how much?" Effectiveness monitoring lends itself more toward an assessment of success in attaining CCMP goals and objectives than to the implementation of specific actions. This type of monitoring requires a statistically sound analysis of environmental data of known quality and confidence. For each CCMP Objective, associated monitoring parameters provide a measurement of success. For example, to monitor the CCMP Objective "Achieve at least a 25% reduction in bacteria loads to rivers" we will measure fecal coliform and *E. coli* bacteria concentrations at numerous sites in the Watershed. See Pages 8-8 and 10-5 for more details.

The environmental monitoring component of the TBMP is designed to provide data that can be directly compared to the quantifiable objectives in each Action Plan. It builds upon recently conducted characterization studies and existing monitoring efforts. It seeks to promote cooperation among agencies and stakeholders by incorporating and coordinating efforts into an integrated monitoring plan, increasing the scope and resolution of existing efforts, improving the timeliness of data analyses, and making the results available to a diverse group of agencies and stakeholders in a timely manner.

The TBMP will incorporate existing and planned monitoring efforts, or elements from those programs, identify critical information gaps, and attempt to standardize and coordinate future monitoring efforts. This will minimize duplication of effort among agencies, reduce the cost of monitoring, and provide integrated results to the scientific, regulatory, and stakeholder communities in an efficient and timely manner.

Standardized sampling, analytical methods, and quality assurance/quality control (QA/QC) protocols will be adopted to ensure that monitoring information collected by the various partners in this effort are of high quality and are directly comparable. Where new QA/QC plans are needed, the Performance Partnership will act as the central figure in developing and implementing a strong quality assurance program.

Monitoring Workplans

Fifteen monitoring workplans are divided into three categories. Core monitoring workplans are those activities required to determine whether the stated CCMP environmental goals and objectives are being met. Research workplans are those activities developed to provide the additional information required to make good management decisions as identified in specific action plans. Citizen workplans build upon ongoing efforts to support citizen involvement and development of bioindicators.

Core Monitoring Workplans

Bacteria Monitoring
Temperature Monitoring
Total Suspended Solids Monitoring
Riparian Assessment
Stream Channel and Habitat Assessments
Tidal Wetland Assessments
Submerged Aquatic Vegetation Survey
Forest Road Surveys
Fish Monitoring (Rivers)

Research Monitoring Workplans

Fish Use of the Estuary
Benthic Invertebrate Inventory (Bay)
Ecological Interactions Among Eelgrass, Oysters, and Burrowing Shrimp
Nutrient Monitoring

Citizen Monitoring Workplans

Benthic Macroinvertebrate Monitoring (Rivers)
Plankton Monitoring

BACTERIA MONITORING

Program Objective (Core)

Determine long-term trends in bacteria loading and short-term variations in bacteria concentrations in relation to DEQ water quality standards.

Monitoring Question(s)

Is the concentration (flow-weighted average concentration and peak concentration) of fecal coliform bacteria (FCB) in the lower reaches of the Tillamook, Trask, and Wilson Rivers increasing or decreasing (and by how much) during typical storm events during the summer, fall, winter, and spring seasons over time scales of years to decades?

Are the storm loads of FCB increasing or decreasing (and by how much) during typical seasonal storm events in the Tillamook, Trask, and Wilson Rivers over time scales of years to decades?

How often and for what length of time does each of the five rivers violate DEQ's water quality criteria for *Escherichia coli* bacteria? Are there trends in the frequency and/or duration of those water quality standard violations over time scales of years to decades?

CCMP Objectives

Achieve at least a 25% reduction in bacteria loads to rivers (Apparent trends by 2005. Statistically significant trends by 2010).

Achieve at least a 25% reduction every four years in the number of days that the rivers are not in compliance with water quality standards for bacteria.

Program Description

Water quality in rivers to Tillamook Bay has often exceeded, and continues to exceed, DEQ standards for water contact for pathogens (*i.e.,* fecal coliform bacteria or *E. coli*). Fecal bacteria inputs into the Bay above FDA standards have forced periodic closure of oyster and other shellfish harvesting.

In Tillamook Bay the shellfish industry is regulated by federal standards which specify the use of fecal coliform bacteria (FCB), whereas DEQ currently uses the measurement of *E. coli* for water contact in both the rivers and the Bay. Fecal coliform was the standard until 1996. FCB has been the most long-standing and widely-used indicator of fecal contamination. FCB has been selected to represent fecal contamination because of its widespread use *and* its linkage to regulation of the shellfish industry in the Bay.

The DEQ, ODA, and others have monitored bacteria in Tillamook Bay and its Watershed for many years. For a historical perspective of these

efforts, please refer to Table 4-4 in the TBNEP *Environmental Characterization Report*.

These programs will support Oregon Plan workplans DEQ2S, DEQ8S, DEQ20S, DLCD1, DSL2, DSL20, ODA1, and ODA2.

TBNEP Source and Transport Studies

1996–1997	River Water Quality Scoping Study
1997–ongoing	Storm Sampling in the Tillamook Bay Watershed
1997–ongoing	Routine Sampling in the Wilson River
1997–1998	Source Identification of Fecal Coliform Delivered to Tillamook Bay
1997–1998	Organism Movement for Various Manure Handing Practices
1996–1998	Constructed Wetlands

DEQ Ambient Water Quality Monitoring

DEQ continues to implement a long-standing periodic monitoring program in support of water quality compliance/enforcement and TMDL development. Monitoring is conducted approximately quarterly, with synoptic programs added as needed.

ODA/DEQ National Shellfish Sanitation Program

ODA and DEQ conduct monthly monitoring at 20 sites in the Bay to ensure compliance with the National Shellfish Sanitation Program, administered in Oregon by ODA. Additional water and shellfish meat samples are collected to fulfill the requirements of annual and triennial FDA reviews. Pathogen monitoring in the Bay will be continued by ODA/DEQ under the auspices and requirements of this program.

TBNEP Storm Sampling

The storm sampling design was developed based on results of the initial scoping study (Sullivan *et al.* 1998), the first year of storm sampling, and earlier efforts. FCB in the Tillamook Basin are highly episodic in nature and the short term variability makes it difficult to quantify long term trends. For that reason, the monitoring program uses a storm-based approach to assess trends in the fluxes of bacteria from the Watershed to the Bay. Sullivan *et al.* provides baseline data for achieving the following Water Quality objective: Achieve at least a 25% reduction every four years in the number of days that the rivers are not in compliance with water quality standards for bacteria.

Citizen Water Quality Compliance Monitoring
In addition to agency monitoring, the program will use a citizen monitoring effort which includes periodic (5 samples/month) measurements of *E. coli* to evaluate the extent to which Tillamook area rivers violate DEQ's water quality standards.

Date Initiated
1996 TBNEP Storm Sampling.
1997 TBNEP Citizen Compliance Monitoring.

Coordinating Agency
TBNEP/TCPP.

Funding Agency
TBNEP/TCPP.

Monitoring Parameters
Fecal coliform bacteria (rivers X membrane filtration: Bay X A-1 tube)
E. coli (Colilert)
Flow
Precipitation
Salinity/Conductivity
Temperature

Stations
Storm Monitoring: Primary sites on the Tillamook, Trask and Wilson Rivers (see Figure 10-1).

Compliance Monitoring: At least at the downstream primary sites for all 5 rivers for *E. coli*.

Frequency
Storm Monitoring: Eight storms per year in the rivers.
FCB will be measured during selected moderate to large storm events (*e.g.,* > 2 in [5 cm] of precipitation in 4 days) each year. These will include two fall (Sept. 16BNov. 30), two winter (Dec. 1BFeb. 15), two spring (Feb. 16BJune 20), and two summer (June 21BSept. 15) storms. The summer storms will be of necessity smaller. During each storm, six to eight samples will be collected at each site and analyzed for bacteria.

Compliance Monitoring: Five samples per month for *E. coli* in the rivers.

Sample Collection
Storm Monitoring: Quantify changes that occur in bacterial concentrations and loads in rivers. Concentration reflects the number of bacteria (or bacterial colony forming units (CFU) per volume of river water. Load reflects the number of bacteria flowing down the rivers per unit time. It is best to attempt to do that using several approaches, anticipating a high degree of temporal variability. These will include analyzing for trends in bacterial fluxes associated with specific storm types, and deter-mining flow-weighted storm average concentrations and total storm loads.

Measure FCB at the primary downstream sites on the Tillamook, Trask,

and Wilson Rivers. During each storm, six to eight samples (plus QA samples) will be collected at each site and analyzed for bacteria. Within each season and combination of seasons, storms will be classified in an 8-cell matrix. An effort shall be made to constrain the number of storms actually sampled to only a few of these types. Data will be analyzed for trends in bacterial fluxes associated with specific storm types, flow-weighted storm average concentrations, and total storm loads. Results of bacterial concentrations and flow-weighted loads will be compared from year to year by evaluating results obtained for each storm type for which a sufficient number of storms are successfully monitored (∃10). A strawman storm classification system has been proposed. Within each season and combination of seasons, individual cells in an 8-cell matrix will be used as the basis for classifying storm events. This matrix will be based on two possible values for each of three parameter choices:

- rainfall intensity X high or low;
- total storm size X large or moderate; and
- length of precipitation-free (< 1" [25 mm]) period prior to storm X long or short.

Compliance Monitoring: Collect *E. coli* samples at (at least) the downstream primary monitoring sites five times per 30 days. Analyze using the Colilert™ system. Determine the extent to which the DEQ freshwater bacteria standard is exceeded (30 day log mean of 126 *E. coli* per 100 ml based on a minimum of five samples with no single sample exceeding 406 organisms per 100 ml).

Data Management

TBNEP collected data: Relational Database (Microsoft Access/SAS).
DEQ/ODA data: Linked to Storet.

Related Monitoring Programs

Total Suspended Solids Monitoring
ODA Tillamook Bay Shellfish Sanitation Program

Anticipated Cost

$45,000 Storm Monitoring/year
$8,000 Compliance Monitoring/year
$25,000 Bay Monitoring/year
$25,000 River Gauges/year

Figure 10-1.

Figure 10-2.

TEMPERATURE MONITORING

Program Objective (Core)

To determine the daily maximum temperatures of the rivers during summer months.
To quantify changes in the number of days per year that daily maximum temperatures in the rivers exceed water quality criteria.
To determine the spatial extent of water temperature exceedences during summer months in the rivers.

Monitoring Question(s)

What is the frequency and duration of temperature excursions above threshold values (expressed as daily maxima) in the rivers and what is the spatial extent of such excursions?

Are there trends (increasing or decreasing) in the frequency, duration or extent of temperature excursions above threshold values in the rivers over time scales of years to decades?

CCMP Objective

Achieve instream temperatures that meet salmonid habitat requirements by 2010. (The average of the daily maximum water temperature over a moving 7-day period shall not exceed 17.8EC [64.8EF]).

Program Description

Temperatures in several rivers in the Tillamook Basin have been measured above 64.8^{o}F, temperature conditions in the range of stressful to lethal for salmonid fish. The monitoring program will measure temperature to more precisely quantify the frequency, duration, and extent of temperature excursions above threshold values in each of the rivers. To develop a temperature TMDL, DEQ conducted baseline monitoring at 40 sites in the Miami, Trask, Tillamook, and Wilson Rivers in 1997. Based on those data, DEQ deployed continuous temperature monitors at 60 locations in the Tillamook Bay Watershed from MayBSeptember, 1998.

In 1994, ODF initiated a monitoring program (ODF14) to record stream temperatures and physical characteristics of a variety of streams under various silvicultural activities allowed under the water protection rules. The objective of the program is to determine the effectiveness of the forest practice rules in maintaining stream temperature at the site and watershed scales.

Temperature monitoring by DEQ and ODF will continue, with support from the Tillamook Bay Watershed Council and the Performance Partnership to assess the current status of water temperature conditions in the Basin. These activities will support OPSW workplans DEQ1S, DEQ2S, DEQ7S, DEQ8S, DEQ19S, ODFWIB3, ODF14S, ODA1, DLCD1, and ONHP2.

Date Initiated	1997.
Coordinating Agency	DEQ.
Funding Agency	DEQ.
Monitoring Parameters	Temperature Flow Shade
Frequency	20 continuous monitors during periods of low flow (June through September). 10 continuous monitors during salmonid spawning (May, October).
Sample Collection	Follow established DEQ protocols for OPSW. Continuous temperature recorders with suitable range for water: resolution of ∀0.2EC and accuracy of ∀0.3EC. Data collected every 30 minutes. Pre and post deployment checks conducted in the laboratory against traceable NIST thermometer within ∀0.2EC. Logger must check within ∀0.5EC at two temperatures (one temperature in the 5B15EC range and one in 15B25EC range). Audit field checks recommended once per month. Accuracy ∀0.5EC and resolution of ∀0.2EC. Loggers must be within ∀1.5EC on the field check.
Data Management	Use DEQ template for data entry. Linked to DEQ: LASAR, STORET.
Related Monitoring Programs	Bacteria Monitoring Stream Channel and Habitat Assessments Fish Monitoring (Rivers) Riparian Assessments
Anticipated Cost	$25,000/year

Table 10-1. Stations for Proposed DEQ 1999 Temperature Monitoring Program

STORET#	SITE NAME	JUNE TO SEPTEMBER	SPAWNING (MAY) (OCTOBER)
	MIAMI RIVER BASIN		
412120	Miami River @ Moss Creek Rd.	X	X
412180	Miami River @ Stuart Creek Rd.	X	
	KILCHIS RIVER BASIN		
412188	Kilchis River @ Curl Rd.	X	
405613	NF Kilchis River @ RM 1.2 Bridge	X	X
405989	SF Kilchis River @ Mouth	X	
	WILSON RIVER BASIN		
405758	Wilson River downstream of Cedar Creek	X	X
405763	Wilson River @ Hwy. 6 (Lee's Camp)	X	
405760	North Fork Wilson River upstream of West Fork of North Fork	X	X
405759	West Fork of North Fork Wilson River @ Mouth	X	
405992	South Fork Wilson @ Mouth	X	X
405988	Devils Lake Fork Wilson @ Mouth	X	
405768	Cedar Creek @ Mouth	X	X
	TRASK RIVER BASIN		
405770	Trask River @ Trask Fish Hatchery	X	
412190	North Fork Trask River @ Mouth	X	
405778	Trask River downstream of Bark Shanty Creek		X
405776	Trask River downstream of Clear Creek		X
405774	South Fork Trask River upstream of East Fork of South Fork	X	
405986	East Fork of South Fork Trask River @ Mouth	X	X
405777	Middle Fork of NF Trask River @ Mouth	X	
405775	North Fork of North Fork Trask River @ Mouth	X	
	TILLAMOOK RIVER BASIN		
412120	Tillamook River @ Bewley Creek Rd.	X	X
412151	Tillamook River @ Yellow Fir Rd.	X	

TOTAL SUSPENDED SOLIDS MONITORING

Program Objective (Core)

To quantify changes in the storm loading of total suspended solids (TSS) to the Bay from the Trask, Wilson, and Kilchis Rivers.
To quantify changes in the storm loading of TSS in selected subwatersheds that are the focus of intensive erosion control actions.

Monitoring Question(s)

Are storm loads of TSS to Tillamook Bay from the Trask, Wilson, and Kilchis Rivers increasing or decreasing (and by how much) over time scales of years to decades?

Are the storm loads of TSS increasing or decreasing (and by how much) in subwatersheds that become the focus of intensive erosion control activities?

CCMP Objectives

Achieve instream suspended sediment concentrations that meet salmonid habitat requirements by 2010.

Achieve at least a 25% reduction in sediment loads to rivers. (Apparent trends by 2005. Statistically significant trends by 2010.)

Program Description

Environmental monitoring for erosion and sedimentation trends will consist of storm-based monitoring of total suspended solids (TSS) near the mouths of the three rivers that contribute the largest sediment loads to the bay: Wilson, Trask, and Kilchis Rivers. Storm loading of TSS will also be monitored in selected subwatersheds that become the focus of intensive erosion control activities, such as culvert repair or replacement, road decommissioning, landslide stabilization, etc.

The highest concentrations and loads of TSS are found in the Wilson and Trask X and to a lesser extent, the Kilchis X Rivers. TSS monitoring only in these three rivers, and only at the primary (downriver) monitoring site on each is recommended at this time. This will measure changes over time in the cumulative flux of TSS from both the forested and a large portion of the agricultural lands in each of these watersheds.

ODF uses its Forest Road Surveys to identify potential sources of sediment to streams. ODA will monitor compliance with SB 1010 to determine the extent that agricultural practices contribute to sedimentation. As erosion control efforts are implemented within the basin, it will be advantageous to monitor for the effectiveness of these actions. Because the watersheds are large (especially the Wilson and Trask River watersheds) and contain a multitude of erosional source areas (*i.e.,* mass wasting, road cuts, etc.), it is likely that the results of erosion control efforts implemented in part of the Watershed will not be readily evident at the downriver monitoring sites. An effort will be made to concentrate erosion control efforts (*i.e.,* culvert repair, slope stabilization, road decommissioning) to the extent practical within a limited number of subwatersheds, and these X and perhaps also

	one or more reference (control) subwatersheds X will be monitored for TSS during four to six large storm events each year. The effects of these erosion control efforts are expected to be evident in the subwatershed monitoring results, but not necessarily at the full watershed scale. Monitoring will support OPSW workplans ODFWIB2S, ODFWIB3S, ODF1S, ODF2S, ODF3S, ODF4S, ODF5S, ODF13S, ODA1, DEQ1S, DEQ2S, DEQ4S, DEQ5S, DEQ8S, DEQ19S, DEQ34S, ODOT2, DSL5, DSL6, DLCD1, and ONHP2.
Date Initiated	1996.
Coordinating Agency	TBNEP/TCPP.
Funding Agency	TBNEP/TCPP.
Monitoring Parameters	Total Suspended Solids Flow Precipitation
Stations	Primary sampling sites (lower rivers, see Figure 10-1) on the Trask, Wilson, and Kilchis Rivers. Downstream of selected enhancement activities.
Frequency	At least 6 storms per year.
Sample Collection	Measure TSS at the primary downstream sites on the Wilson, Trask, and Kilchis Rivers during each of six large storms (*i.e.,* when the Wilson River flows exceed 6,000 cfs). During each storm, six to eight samples (plus QA samples) should be collected at each site and analyzed for TSS. Data will be analyzed to estimate the total annual TSS load per river, using observed discharge and a quantification of the relationship between measured TSS and river discharge.
Data Management	TBNEP collected data: Relational database (Microsoft Access/SAS). DEQ collected data: Linked to Storet.
Related Monitoring Programs	Forest Road Surveys Stream Channel and Habitat Assessments Bacteria Monitoring
Anticipated Cost	Storm Monitoring: Included in cost for Storm Monitoring Subwatershed Monitoring: $40,000/year

RIPARIAN ASSESSMENT

Program Objective (Core)

Track the abundance and distribution of riparian areas in the Tillamook Bay Watershed.

Monitoring Question(s)

Is the length of continuous riparian habitat changing along rivers and streams in the agricultural lowlands and forested uplands over time scales of years to decades?

CCMP Objectives

Enhance 200 miles of forested riparian habitat to healthy riparian condition by 2010.

Enhance 500 miles of riparian habitat in the 0B500' elevation band to healthy condition by 2010.

Program Description

Monitoring will be required to achieve the CCMP goal to Aassess, protect and restore riparian habitat.≅ The CCMP recognizes that protecting and restoring continuous riparian habitat along rivers and streams throughout the Watershed will improve water quality, sediment loading, and salmonid habitat. The extent to which riparian habitat borders water courses in the forested uplands and urban, rural, and agricultural areas will be periodically monitored, at least once every five years.

Monitoring to determine the extent of riparian area will use either remote imagery or aerial photography, in conjunction with the proposed tidal wetland surveys. The riparian zone surveys will not have to provide exhaustive coverage of all water courses in the Watershed. A statistically-based random sampling of stream reaches defined on the basis of grid squares will provide the required information.

Riparian condition (HRC) will be determined using field assessment as outlined in HAB-06. Trained staff NRCS, ODA, ODF, ODFW, or County staff will assess whether or not each area meets these management objectives: (1) create shade to meet instream water temperatures; (2) produce woody debris; (3) filter out excess sediments, organic material, pesticides, and other pollutants in surface runoff; and (4) stabilize streambank.

Assessments will support the following OPSW workplans: ODFWIBS2, ODFWIB3, ODFWIVA1, ODFWIVB2, ODF4S, ODF5S, ODF8S, ODF11S, ODF24S, ODA1, DEQ1S, DEQ2S, DEQ34S, OPRD2, DLCD2, DLCD3, DLCD4, and ONHP2.

Date Initiated

2000.

Coordinating Agency

TBNEP/TCPP.

Funding Agency ODA/ODF.

Monitoring Parameters

Aerial Surveys:	**Field HRC:**
Riparian buffer width and extent	Stream shading
Percent conifer	Vegetative cover
Percent hardwood	Width
	Structure and species composition
	Floodplain connectivity
	Bank stability

Stations The survey covers the extent of Tillamook Bay Watershed.

Frequency Aerial surveys at least every five years.

Sample Collection Environmental monitoring of riparian habitats will be conducted every five years, beginning in 2000. Satellite Landsat Thematic Mapper (TM) multispectral imagery, or an alternative remote sensing approach, will be used to classify land cover and provide the required information.

The riparian surveys will not have to provide exhaustive coverage of all water courses in the Watershed. A statistically-based random sampling of riparian areas defined on the basis of grid squares will provide the required information.

This approach will allow standardized mapping classification of several key habitat types simultaneously, over a relatively large area and over a short period of time. The classified land cover information will be readily compatible with the geographic information system (GIS) system at the TCWRC. Habitat maps will be constructed every five years and habitat gains and losses will be tabulated.

Ground-truthing will be used to refine the land classifications and environmental measurements, coinciding with the imaging collected as part of the survey, and incidentally by other agencies, organizations, and individuals.

Guidelines set for imaging specify that they can be taken during periods of low or no wind and clouds, and with sufficient identifiable land area to assure accurate plotting of riparian areas.

Data Management GIS ArcInfo/ArcView according to TCWRC specifications.

Related Monitoring Programs
Coordinate with Tidal Wetlands Assessments
Coordinate with Submerged Aquatic Vegetation Survey
Stream Channel and Habitat Assessments

Anticipated Cost $75,000 every 5 years

STREAM CHANNEL AND HABITAT ASSESSMENTS

Program Objective (Core)

Provide quantitative information on habitat condition for streams in the Tillamook Bay Watershed.

Monitoring Question(s)

Are there changes in key indicators of instream habitat quality (*i.e.,* pool/riffle ratio, presence of large wood, sediment particle size distribution) over time scales of years to decades in critical stream segments prioritized for protection or restoration?

CCMP Objectives

Enhance 100 miles of upland instream habitat by 2010.
Enhance 200 miles of forested riparian habitat to healthy riparian condition by 2010.
Enhance 500 miles of riparian habitat in the 0B500' elevation band to healthy condition by 2010.

Program Description

The spawning and rearing habitat of anadromous salmonids in the Tillamook Basin extends from the mouth of the Estuary to the headwaters of its five major tributary rivers. The TBNEP funded ODFW to conduct Stream Channel and Habitat Assessments (OPSW Monitoring Task 4): More than 300 miles of stream were surveyed between 1995 and 1998. Quantitative stream habitat information is needed to evaluate habitat quality, estimate juvenile seeding levels, develop and calibrate habitat based escapement models, and to expand the applicability of abundance and habitat relationships to all coastal regions. The associated riparian components assess current riparian condition and the future contribution of riparian trees to large woody debris, and identify areas that may be important for the maintenance of beaver populations and areas that may benefit from hardwood conversions. On agricultural lands, riparian surveys identify the contribution of shrubs and trees to stream shade and may be useful in determining the effectiveness of efforts to improve riparian condition conducted under SB 1010.

Using a stratified random sampling design, ODFW will continue habitat inventories at approximately 20 sites in the Tillamook Bay Watershed per year. These data will also support watershed assessments and help identify and prioritize critical segments of streams for habitat protection and restoration efforts. Results of these surveys will be entered into the TBMP database and analyzed numerically and spatially.

The assessments support OPSW workplans: ODFWIB2S, ODFWIB3, ODFWIB4, ODFWIVA6, ODFWIVA8, ODF4S, ODF5S, ODF11S, ODF14S, ODF16S, ODF24S, ODF34S, ODF59S, ODA1, DSL2, DLCD2, DLCD3, DEQ2S, DEQ5S, DEQ8S, DEQ12S, DEQ19S, ONHP2, ODOT2, and OPRD2.

Date Initiated 1990.

Coordinating Agency ODFW.

Funding Agency ODFW.

Continued stream assessments are part of the USFS and BLM PACFISH monitoring programs. ODFW continues to support permanent Aquatic Inventory Staff but funding for new field work is contingent on R&E Board allocations and contract support from ODF, BLM, USFWS, industrial forest landowners groups, and other sources.

Monitoring Parameters

Basin name
Stream name
Stream order, drainage area, and drainage density
Elevation at the confluence with the receiving channel and at the end of the survey
ODFW-EPA regions and sub-regions, geology, and soils of the basin
Stream flow
General community structure and size composition of riparian vegetation
Description of fish species and stocks present, management concerns, and linkage to other databases or research projects
Flow regulation
General description of land use and ownership in the basin

Contacts	Gravel available
Pool area	Shade
Pool frequency	LWD pieces
Residual pool depth	LWD volume
Riffle width/depth ration	LWD key pieces
Silt/sand/organic matter	LWD recruitment potential

Stations Stratified random sampling, 20/year, budget permitting.

Frequency Annual.

Sample Collection Methods for Stream Habitat Surveys: Aquatic Inventory Project. Natural Production Program: Oregon Department of Fish and Wildlife.

Data Management GIS ArcInfo/ArcView according to TCWRC specifications.

Related Monitoring Programs

Riparian Assessments	Forest Road Surveys
Temperature Monitoring	Fish Monitoring (Rivers)
Tidal Wetland Assessments	

Anticipated Cost $50,000/year

TIDAL WETLAND ASSESSMENTS

Program Objective (Core)

Track the abundance and distribution of tidal wetlands in Tillamook Bay.

Monitoring Question(s)

Are there changes in area of tidal wetlands that are accessible to fish and other aquatic biota?

Is the spatial extent of tidal wetland habitat changing over the scales of years to decades?

Are visual indicators of tidal wetland habitat quality (*i.e.,* vegetation composition, percent open water) changing over time scales of years to decades?

CCMP Objectives

Enhance 750 acres of tidal wetland by 2010.
Enhance 100 acres of freshwater wetland by 2010.
Upgrade 50% of all tide gates by 2010.

Program Description

The near-bay hydrology has been seriously modified since the last century by diking, ditching, tidegate installation, and other human modifications to the landscape. The concomitant loss of a large percentage of the original tidal wetlands that surrounded the Bay is recognized as an important ecological threat to salmonids and other aquatic species. CCMP actions will focus on the protection and enhancement of existing tidal wetlands and also the restoration of former tidal wetland areas.

Tidal wetland monitoring will focus on aerial extent and distribution, measures of open water and vegetation coverage, and improved access to fish and other aquatic biota. This monitoring will be conducted via remote sensed imagery every five years.

Ground-truthing will occur as part of other ongoing monitoring programs. As Tillamook County and cities develop and enforce riparian ordinances, they (along with DSL) will survey wetlands on residential areas within their jurisdiction. ODA/NRCS will identify wetlands as they develop farm plans under SB 1010. ODFW identifies wetlands as part of the stream channel and habitat assessment program.

The assessments will support OPSW workplans: ODOT 15, ODOT 19, ODFW1B2S, ODA1, DSL13, DSL16, DSL17, DSL18, DSL19, DLCD3, DLCD4, DEQ10S, and ONHP2.

Date Initiated (1) 1999, (2) 1999, (3) 1997.

Coordinating Agencies ODA, Tillamook County, DSL.

Funding Agencies ODA, Tillamook County, DSL.

Monitoring Parameters
Aerial extent of tidal wetlands
Open water
Vegetation coverage
Number of tide gates replaced
Amount of available aquatic habitat for salmonids

Stations The survey covers the tidal portion of Tillamook Bay Watershed.

Frequency Aerial surveys at least every five years.

Sample Collection Environmental monitoring of key habitats will be conducted every five years, beginning in 2000. Satellite Landsat Thematic Mapper (TM) multispectral imagery, or an alternative remote sensing approach, will be used to classify land cover. Ground-truthing will be used to refine the land classifications and environmental measurements.

The tidal wetlands surveys will not provide exhaustive coverage of all water courses in the Watershed. A statistically-based random sampling of tidal areas defined on the basis of grid squares will provide the required information. This approach will allow standardized mapping classification of several key habitat types simultaneously, over a relatively large area and over a short period of time. The classified land cover information will be readily compatible with the geographic information system (GIS) system at the TCWRC. Habitat maps will be constructed every five years and habitat gains and losses will be tabulated.

Guidelines set for imaging specify that images may be taken only at low tide, during periods of low turbidity and low or no wind and clouds, and with sufficient identifiable land area to assure accurate plotting of habitat. Ground-truthing data to coincide with the imaging is collected as part of the survey, and incidentally by other agencies, organizations, and individuals.

Data Management GIS ArcInfo/ArcView according to TCWRC specifications.

Related Monitoring Programs
Coordinate with Tillamook Bay Riparian Assessments
Coordinate with Submerged Aquatic Vegetation Surveys
Stream Channel and Habitat Assessments
Fish Use of the Estuary

Anticipated Cost Contained in Riparian Monitoring

SUBMERGED AQUATIC VEGETATION SURVEY

Program Objective (Core)

Track the abundance and distribution of eelgrass beds in Tillamook Bay.

Monitoring Question(s)

Is the spatial extent of eelgrass beds in the estuary changing over time scales of years to decades?

Are there changes in eelgrass density or other visual indicators of changes in eelgrass health over time scales of years to decades?

CCMP Objective

No net decline in eelgrass beds (baseline = 363 hectares).

Program Description

Eelgrass (*Zostera* spp.) meadows contribute to estuarine water quality and provide habitat for many aquatic species, including salmonids. Eelgrass has also been identified as Essential Fish Habitat in Amendment 14 to the Pacific Coast Salmon Plan and is consistent with Goal 6 of the OPSW.

In 1995, the TBNEP used a prototype airborne imaging system to collect multispectral data for Tillamook Bay at a 1-meter spatial resolution to:

(1) accurately map eelgrass beds throughout Tillamook Bay in order to establish an initial baseline of eelgrass bed density and distribution and

(2) identify a means of monitoring the Bay environment in terms of cover and substrate that is both accurate and cost effective.

Vegetation was assigned to one of six classes, and substrate was assigned to one of four classes. During this survey, eelgrass beds were found to cover nearly 11% of the area (approximately 363 hectares) of Tillamook Bay with the majority of the dense beds in the northern half of the Bay. (Strittholt and Frost 1996). Field surveys as part of the eelgrass monitoring project and as part of the ODFW benthic surveys verified the accuracy of this assessment.

Continued surveys will support OPSW workplans: ODFW1B2S, ODFWIVB2, ODF28S, DSL17, ONHP2, and DLCD3.

Date Initiated

1995.

Coordinating Agency

TBNEP/TCPP.

Funding Agency

TBNEP/TCPP.

Monitoring Parameters

Terrestrial plants	Sand/gravel
Green algae	Mud/sand
Dense mixed algae	Organic debris
Dense eelgrass	Developed
Sparse eelgrass	Water
Sparse mixed algae on dark substrates	
Sparse mixed algae on light substrates	

Stations

The survey covers the extent of Tillamook Bay.

Frequency

Aerial surveys at least every five years.

Sample Collection

Multispectral sensor imaging (AirCam^{TM}) mounted on light aircraft. Data collection requires over four hours during extreme low tide, during which high resolution (~1 meter) images are captured. Three spectral bands mimic bands 1 (blue), 3(red), and 4 (infrared) of Landsat TM. More than 300 separate frames are collected and georeferenced. Color photographs should be taken at the same time to provide an additional resource to improve the classification of digital files. For detailed collection methods and post-processing requirements, see Strittholt, J. R. and P. A. Frost. 1996. Determining Abundance and Distribution of Eelgrass (*Zostera* spp.) in Tillamook Bay Estuary, Oregon Using Multispectral Airborne Imagery.

Guidelines set for imaging specify that images may be taken only at low tide, during maximum delineation of submerged aquatic vegetation (SAV), during periods of low turbidity and low or no wind and clouds, and with sufficient identifiable land area to assure accurate plotting of beds.

Ground-truthing for eelgrass extent and distribution to correlate with imaging will occur through the Eelgrass, Oyster, and Burrowing Shrimp Study and incidentally by other agencies, organizations, and individuals (*e.g.*, during fish or benthic studies, or other research).

Data Management

ArcInfo/ArcView according to TCWRC specifications.

Related Monitoring Programs

Coordinate with Ecological Interactions Among Eelgrass, Oysters, and Burrowing Shrimp
Coordinate with Riparian Assessment
Coordinate with Tidal Wetlands Assessment
Benthic Invertebrate Inventory (Bay)
Fish Use of the Estuary

Anticipated Cost

$40,000/survey

FOREST ROAD SURVEYS

Program Objective (Core)	To determine forest road condition and risks to aquatic habitat.
Monitoring Question	Is there a measurable reduction in erosion and sedimentation from forest roads?
CCMP Objectives	Upgrade 1,400 miles of forest roads on state and private lands by 2010. Decommission 50 miles of forest management road by 2010.
Program Description	In studies of forest lands in western Oregon and Washington, foresters identified fire, and soil exposure and compaction as the principal factors responsible for surface erosion. Roads cause the greatest soil exposure and compaction. ODF, in cooperation with the TBNEP, established road survey protocols and has inventoried many of the roads in the Tillamook Forest. This inventory will guide ODF sediment monitoring on a watershed level and prioritize road upgrade projects. Road surveys focus on drainage structures, looking for culvert failure and/or other evidence of sediment delivery to stream channels. This effort supports OSPW workplans: ODF1S, ODF2S, ODF4S, ODF5S, ODF13S, ODF15S, ODF16S, ODF33S, ODF34S, ODF35S, ODFWIB2S, ODFWIB3, ODFWIB4, and WRDS21.
Date Initiated	1996.
Coordinating Agency	ODF.
Funding Agency	ODF.
Monitoring Parameters	General road characteristics Symptoms of road erosion Conditions of culverts and bridges Risks of sidecast landslides Potential for sediment delivery to streams
Stations	Tillamook State Forest.
Frequency	Annually.

Sample Collection Surveys will be conducted according to ODF or OFIC protocols. See Mills K. 1997. Forest Roads, Drainage, and Sediment Delivery in the Kilchis River Watershed. Appendix 1: Oregon's Forest Road Construction and Maintenance Rules.

Data Management GIS ArcInfo/ArcView according to TCWRC specifications. Linked to ODF.

Related Monitoring Programs
Total Suspended Solids Monitoring
Stream Channel and Habitat Assessments
Fish Monitoring (Rivers)

Anticipated Cost $75,000/year

FISH MONITORING (RIVERS)

Program Objective (Core)

(1) Temporal estimates of the number of fish (salmonid and non-salmonid) migrating past the monitoring site(s);
(2) Estimates of between-year variability in the number of juvenile salmonids produced;
(3) Estimate of monitoring efficiency; and
(4) Data that would support development of an index to evaluate the effects of management actions on juvenile salmonid production in the Basin.

Monitoring Question(s)

Is the number of outmigrants of salmonid species in the Wilson and Kilchis Rivers changing over the time scales of years to decades?

CCMP Objective

Achieve ODFW wild fish production and escapement goals[2] by 2010.

Program Description

Fish monitoring in freshwater habitat will support the monitoring objectives of the OPSW. *In this context* the primary questions for the monitoring program are as follows:

Is the Oregon Plan contributing to a positive change in the productive capacity and resilience of Oregon=s aquatic ecosystems as indicated by salmon and the cultural values and ecological processes dependent upon salmon?

Is the Oregon Plan promoting recovery of naturally reproducing populations of salmon in sufficient abundance and across a sufficient geographic and

[2] ODFW estimated production and escapement goals for coho and chum salmon, described in the table and text below, in its Oregon Coastal Salmon Restoration Initiative plan. There are no production estimates for other salmonid species.

Table 10-2. Estimate of coho salmon production potential and spawner needs for Tillamook Watershed.

Spawner Escapement Goal	Marine Survival Rate of Brood	Production Potential			
		Spawning Habitat Quality Utilization			Total Return (Recruitment)
		High	Moderate	Poor	
17,100	10%	8,100	8,500	16,400	33,000
5,700	5%	4,000	4,300		8,300
2,000	3%	2,400			2,400

Note: Tillamook Bay, primarily the Kilchis and Miami rivers, hosts Oregon's largest population of **chum** salmon. The largest number of chum harvested the Bay was 264,570 in 1928 (Oakley 1962). If the catch represented 40.7% of the total population, similar to estimates derived for the fishery after the late 1940's, then since the 1960s the maximum estimated run has peaked at only 47,000 (or about 7% of the historic peak run into the Bay). Current evidence indicates that the potential maximum run of chum salmon is about 47,000 fish in Tillamook Bay with existing environmental conditions. Recruitment (return) of chum salmon by brood year (ages 3 through 5 combined in successive years of returns) has ranged between 2,608 (1957 brood year) and 34,729 (1970 brood year) where estimates of the age composition of the run were available.

temporal range, proximity (spatial organization), and diversity of habitats to ensure that salmon species can persist in a variable environment?

Some of the most useful kinds of information for assessing the status and trends of anadromous salmonid populations include the number of adults returning to spawn (escapement), the number of fish harvested, and smolt production. ODFW has periodically estimated escapement in the Tillamook Watershed using "peak counts" since the 1950s. Steelhead and cutthroat trout populations have been estimated using resting pool counts since the mid 1960s. Additional information has been gathered through creel curveys and commercial harvest records. ODFW will continue this type of monitoring under OPSW workplan ODFWIA1: Establish new escapement goals.

As part of the Oregon Plan, the ODFW and other resource agencies initiated an extensive juvenile and adult salmonid sampling program along the coast. The TBNEP, in cooperation with ODF and ODFW, supported OPSW Monitoring Task 9: ACore Area≅ and AIndex Area≅ Monitoring of Habitat and Populations. The program counted outmigrating smolts by installing traps at two index sites (the Little South Fork Kilchis River and Little North Fork Wilson River). The results of the first year of monitoring showed that Chinook fry and fingerling density in the LNF Wilson was the highest of the fourteen coastal streams monitored by ODFW, and that this density was also relatively high in the LSF Kilchis. The Tillamook Bay Watershed has the last healthy chum salmon populations in Oregon. The densities of steelhead smolts and cutthroat par were also among the highest of the ODFW monitored coastal streams. However, coho salmon smolt density was relatively low in the LNF Wilson and only one other ODFW monitored stream had smolt densities as low as the LSF Kilchis.

This monitoring program directly supports OPSW workplans: ODFWIA, ODFWIB, and ODFWIIB while providing essential information to guide virtually every other OPSW workplan developed to date.

Date Initiated 1997.

Coordinating Agency ODFW.

Funding Agency ODF/TBNEP/ODFW.

Monitoring Parameters
Fish species, size, age
Fish development (smoltification) class
Weather conditions
Cone rotations
River levels

Stations LNF Wilson.
LSF Kilchis.

Frequency Annually: first week of March through end of migration period (mid-summer).

Sample Collection Rotary juvenile screw traps will be operated 24 hours per day, seven days per week and monitored at least once per day (additional monitoring may be required during high flow periods). Captured fish will be removed from the trap, anesthetized (MS-222), and measured to the nearest millimeter for fork length. Each fish will be identified to the species level and assigned to an appropriate size group. Size classes will be #90 mm, 91B120 mm, 121B160 mm, 161B200 mm, 201B280 mm, and ∃281 mm. Each day up to 30 fish from each species and size group will be marked with a caudal fin notch and released into an area of quiet water, preferably within 50B100 meters upstream from the trap site. All of the fish captured within a size class will be marked when the trap catch is less than 30 fish in a given size group. All marked fish will be released at dusk each evening.

Recaptured fish will be used to estimate trap efficiency by dividing the number of marked fish released by the number of marked fish recaptured in the corresponding time interval. This rate will be multiplied by the total number of fish captured to estimate the total number of fish passing the trap site each week. Weekly estimates will be summed to obtain an estimate of the total number of fish passing the trap site during the trapping season. A bootstrap method will be used to estimate the variance for each weekly population estimate for each size group. The variance from each week will be summed to estimate the variance for the total number of migrants passing the trap site. Records will be kept of all fish and amphibians captured (sculpins, lamprey, dace, salamanders, etc.), but trap efficiencies and population estimates will only be made for salmonids.

Data Management Monitoring data compiled in Microsoft Excel.

Related Monitoring Programs ODFW Spawning and Resting Pool Counts and Creel Surveys
Stream Channel and Habitat Assessments
Fish Use of the Estuary

Anticipated Cost $40,000/year

FISH USE OF THE ESTUARY

Program Objective (Research)

To provide reliable information on fish species composition and relative abundance that can be used as an index to long-term trends in the fish community of Tillamook Bay.

To monitor food habits of selected fish species through time as an index to long-term trends in fish food resources.

To develop a quantitative baseline information on the numbers and species of fish using relatively undisturbed salt marsh habitat in Tillamook Bay.

Monitoring Question(s)

Are there changes in habitat use by salmonids in the Bay over the time scales of years to decades?

CCMP Objective

Research findings to develop estuarine bioindicators and track progress in achieving estuarine restoration objectives.

Program Description

Long-term data sets for fish distribution and abundance are lacking for Tillamook Bay. In summer 1998, the TBNEP sponsored a study to examine fish use of the estuary, the first comprehensive survey since the ODFW surveys in the late 1970s. One objective was to help design a long-term monitoring program based on fish use of the major habitat types in Tillamook Bay. Sampling design emphasizes fish use of salt marsh habitat because salt marsh habitat is most likely to be affected by future habitat restoration programs (*e.g.,* dike breaching) and shoreline development. Efforts will focus on identifying sampling techniques and sampling locations that will provide reliable, quantitative information on fish abundance and distribution. A variety of physical, chemical, and biological measurements are collected in conjunction with the fish sampling to characterize habitat conditions at each sampling site. The fish monitoring program is designed to integrate with monitoring efforts that focus on other biological, physical, and chemical components of the estuarine ecosystem.

Additional special studies might focus on food sources for juvenile salmonids. Gut analyses of juvenile Chinook showed that the fish were eating mostly terrestrial insects. The importance of salt marsh habitat as an important source should be explored in addition to its importance as habitat.

Date Initiated

1998.

Coordinating Agency

TBNEP/TCPP.

Funding Agency TBNEP/TCPP.

Monitoring Parameters

Fish species
Fish size (fork length for fish species with forked tails, standard length for other species)
Water temperature (surface and bottom)
Dissolved oxygen (surface and bottom)
Salinity (surface and bottom)
Turbidity (surface and bottom)
Site location - dGPS
Habitat conditions
Tidal stage

Stations

Six regions of the Bay have been identified for location of sampling sites (Fig 10-4). Three sampling locations within each of the six regions will be sampled by beach seine.

Trawling sites will be Garibaldi Harbor and the lower end of the Bay City Channel.

Fyke net sites will be selected in third or fourth order channels within the lower and upper regions of the salt marsh (outside of cattle grazing areas). A random selection process will be used to identify three sites from the list of potential sites.

Frequency

Beach Seining X bi-weekly from May through mid-July.
Trawling X bi-weekly from May through mid-July.
Fyke Net X bi-weekly from May through mid-July.

Sample Collection

Detailed sampling protocols can be found in "Tillamook Bay Fish Use of the Estuary" prepared by Ellis Ecological Services and TeraStat Consulting Group, 1999.

Beach Seining X 0.63 mm mesh nylon seine measuring 2m x 30 m long with a mid-section seine bag measuring 2m x 2m across the opening.

Trawling X semi balloon trawl with the following dimensions:
4-seam semi balloon trawl with a 6.1 m head rope and 7.6 m foot rope. A Atickler chain@ attached to the foot rope. Body and wings X 3.7 cm stretch mesh 100 meshes deep. Intermediate section X 3.2 cm stretch mesh 66 meshes deep. Cod end, outer bag X 2.9 cm stretch mesh 889 meshes deep. Cod end, inner bag X 1.8 cm stretch mesh 200 meshes deep. Trawl doors X 0.53 m. V-shaped bridle with 18.3 m legs. All trawling done at low tide. Tow with the current for 5 minutes.

	Fyke Net X aluminum frame measures 1.8 m x 1.8 m. Four panel net of 0.95 cm stretch mesh netting, tapering from the mouth to a 10.2 cm diameter opening at the cod end. A PVC sleeve attaches the cod end of the net to an nylon sleeve on a 61 cm x 91 cm live box covered with 0.64 cm woven mesh nylon. A wooden frame supports the fyke net in a vertical position. Fyke net samples are collected by placing the fyke nets in the wooden frames at high slack tide. The nets fish until the channel is drained at low tide.
Data Management	Relational Database (Microsoft Access/SAS). GIS according to TCWRC specifications.
Related Monitoring Programs	Fish Monitoring (Rivers) Tidal Wetlands Assessments Submerged Aquatic Vegetation Surveys
Anticipated Cost	$25,000/year

Figure 10-3. Locations of sampling sites in Tillamook Bay.
Source: Ellis and TeraStat. 1998. Tillamook Bay Fish Use of the Estuary. Prepared by Ellis Ecological Services and TeraStat Consulting Group (draft) for the Tillamook Bay National Estuary Project, Garibaldi, OR.

BENTHIC INVERTEBRATE INVENTORY (BAY)

Program Objective (Research)	To quantify changes in the abundance and distribution of dominant benthic macroinvertebrates in Tillamook Bay.
Monitoring Question(s)	Are the density or extent of dominant benthic macroinvertebrates in Tillamook Bay changing over the time scale of years to decades?
CCMP Objective	Research Need: Collect information to manage the shellfish industry, monitor burrowing shrimp populations, identify non-native species, and develop estuarine bioindicators.
Program Description	The ODFW surveyed Tillamook Bay in the summer of 1996 (Golden *et al.*) to inventory the Bay's benthic invertebrates. The survey emphasis was to estimate clam density and biomass in selected areas and habitats. Data were also gathered on burrowing shrimp, algae, eelgrass, habitat, and benthic infauna from grab samples. This study identified conspicuous absences of important prey species for juvenile salmonids and changes in clam community structure compared with past studies.
Date Initiated	1996.
Coordinating Agency	ODFW.
Funding Agency	ODFW.
Monitoring Parameters	Clam species Clam length Clam recruitment Clam density Clam biomass Benthic identification, count, biomass (calculate richness, diversity, and dominance indices) Substrate type Shrimp spp. Eelgrass density Depth
Stations	Garibaldi Flats and in one subtidal area associated with 1996 clam surveys.

Frequency Every 5 years.

Sample Collection	As described in "Biological Inventory of Benthic Invertebrates in Tillamook Bay" prepared by ODFW, 1998.
Data Management	Relational Database (Microsoft Access/SAS).
Related Monitoring Programs	Submerged Aquatic Vegetation Survey Ecological Interaction Among Eelgrass, Oysters, and Burrowing Shrimp ODFW Shellfish Harvest Management
Anticipated Cost	$50,000/survey

Figure 10-4. Benthic sampling sites map.
Source: Golden, J., D. Gillingham, V. Krutzikowsky, D. Fox, J. Johnson., R. SardiZa, and S. Hammond. 1998. *A Biological Inventory of Benthic Invertebrates in Tilamook Bay.* Oregon Department of Fish and Wildlife. Prepared for the TBNEP, Garibaldi, OR.

Figure 10-5. Multispectral habitat map of Tillamook Bay (modified from Earth Design Consultants (1996) showing the locations of three eelgrass patch-edge study sites and manipulative experiment site.
Source: by Shreffler, D., R. Thom, and A. Borde (Battelle Marine Sciences Laboratory) and K. Griffin (TBNEP). 1999. *Ecological Interactions Among Eelgrass, Oysters, and Burrowing Shrimp in Tillamook Bay, Oregon: Year 1 (1998) Final Report*. Prepared for TBNEP, Garibaldi, OR.

ECOLOGICAL INTERACTIONS AMONG EELGRASS, OYSTERS, AND BURROWING SHRIMP

Program Objective (Research)

Identify and characterize the major forcing factors affecting the temporal and spatial variability in eelgrass distribution in Tillamook Bay. Evaluate whether current oyster ground culture practices have long-term effects on eelgrass distribution in the Bay.

Monitoring Question(s)

What are the major forcing factors that may explain the spatial and temporal variability in the distribution and densities of eelgrass "patches" in the Bay?

What are some of the specific ecological interactions among eelgrass, oysters, and burrowing shrimp that, if better understood, could be used to improve management decisions?

Objective

Collect information to develop cost-effective, long term ecological monitoring and mapping strategies for the Bay and to support the development of estuarine bioindicators.

Program Description

Historically, Tillamook Bay was one of Oregon's top oyster-producing Bays. While some oyster culture methods may negatively impact eelgrass meadows, oyster culture also can provide habitat for aquatic species. Burrowing shrimp will inhabit an established eelgrass bed that has been stressed in some way. In 1998, the TBNEP initiated a project to conduct an eelgrass patch-edge study to evaluate interspecific interactions among eelgrass, oysters, and burrowing shrimp. We started a series of manipulative studies to evaluate whether oyster culture practices have long term effects on eelgrass distribution, and patch edge studies to identify and characterize the major forcing factors that affect eelgrass distribution. These studies will be continued over the course of an oyster harvest cycle.

Date Initiated

1998.

Coordinating Agency

TBNEP/TCPP/USFWS.

Funding Agency

TBNEP/TCPP/USFWS

Monitoring Parameters

- Percent cover
- Eelgrass density
- Burrow density
- Oyster density
- Photo station at Strata C site
- Multispectral surveys
- Dissolved oxygen
- Salinity
- pH
- Aerial photographs
- Temperature

Stations

See Fig. 10-6. Three eelgrass patch-edge sites (Schweizer lease, Crab Harbor, South Channel). Manipulative experiments X Strata A, B, C, and D of Pacific Oyster Lease. Water quality X five stations monitored by Schweizer in 1998. Three eelgrass patch-edge sites monitored by Griffin in 1998.

Frequency

Patch edge: three times per year (spring, summer, fall) for four more years (through 2002).
Manipulative experiments: three times per year (spring, summer, fall) for four more years (through 2002).
Water quality: preferably weekly, but at a minimum bi-weekly (through 2002).
Aerial photographs: once per year.
Multispectral surveys: every five years (next one in 2001, then every five years thereafter).

Sample Collection

For detailed sampling and analysis protocols, see "Ecological Interactions Among Eelgrass, Oysters, and Burrowing Shrimp in Tillamook Bay, Oregon: Year 1 Final Report," prepared by Battelle Marine Sciences Laboratory, 1999.

Patch edge study: Five parallel 30 m transects that extend from approximately 10 m outside of the eelgrass patch to the interior of the patch. Record data at low tide (eelgrass percent cover, eelgrass shoot density, shrimp burrow density, and oyster density). Data recorded within 1 m^2 quadrants placed at 5 m intervals.

Manipulative study: 10 controlled removal and transplant experiments (See Table 4.2 in "Ecological Interactions Among Eelgrass, Oysters, and Burrowing Shrimp in Tillamook Bay, Oregon: Year 1 Final Report").

Aerial photographs with photo-interpretation to map habitat changes (scale 1:200 shot at low tide).

Multispectral surveys with subsequent ground-truthing (see Submerged Aquatic Vegetation Surveys).

Data Management

Relational Database (Microsoft Access/SAS).
GIS according to TCWRC specifications.

Related Monitoring Programs

Submerged Aquatic Vegetation Survey
Fish Use of the Estuary
Benthic Invertebrate Inventory (Bay)

Anticipated Cost

$25,000/year

NUTRIENT MONITORING

Program Objective (Research)

To quantify changes in the total annual loading of nitrogen and phosphorus from the Wilson and Trask River watersheds to Tillamook Bay.

Monitoring Question(s)

Is the total nutrient loading (N, P) to Tillamook Bay from the Trask and Wilson Rivers increasing or decreasing (and by how much) over time scales of years to decades?

CCMP Objective

To meet water quality standards in the rivers and Bay.

Program Description

Based on TBNEP sampling conducted from 1996 to 1998, and DEQ monitoring conducted over the last two decades, the immediate risk of nutrient-caused degradation of the ecological integrity of the rivers and the estuary appears less than the risk of degradation caused by other issues, such as bacteria, sediment and temperature. However, because of the importance of eutrophication as a potential threat to any estuary, including Tillamook Bay, and evidence of site-specific nutrient water quality issues (sloughs, small tributaries, etc.), continued monitoring of nitrogen will continue, but at lower intensity than monitoring of other parameters. The largest loads of N and P occur in the Wilson and Trask Rivers, and these watersheds contain a variety of land uses, including forestry, agricultural, rural residential, and urban.

The program will continue to collect samples for nutrient analysis for the Wilson and Trask Rivers during storm conditions to enable continued evaluation of nutrient loads during high-flow periods. It will continue to collect nutrient data during summer to enable detection of potential future indications regarding N and P limitation. This frequency of sampling will provide general information on most probable ranges of concentration.

Nutrient monitoring will support OPSW workplans DEQ9S, DEQ11S, DEQ17S, DEQ19S, and ODA1.

Date Initiated

1996 TBNEP Monitoring.

Coordinating Agency

TBNEP/TCPP.

Funding Agency

TBNEP/TCPP.

Monitoring Parameters	TP TKN DOP NO_3^{2-} and NO_2^{2-} NH_4^+ and NH_3 Flow Precipitation
Stations	Primary lower sites on Wilson and Trask Rivers.
Frequency	Bi-monthly sampling with the winter-season sampling skewed toward high-discharge periods.
Sample Collection	Van Dorn sample collection at 0.5m depth.
Data Management	Relational database (Microsoft Access/SAS).
Related Monitoring Programs	Bacteria Monitoring OSU Water and Watersheds Monitoring
Anticipated Cost	Included in Storm Monitoring for bacteria

BENTHIC MACROINVERTEBRATE MONITORING (RIVERS)

Program Objective (Citizen)	To quantify changes in the abundance and distribution of dominant benthic macroinvertebrates in the Tillamook Watershed.
Monitoring Question(s)	Are the density, biomass, species richness, or diversity of benthic macro-invertebrates in the rivers changing over the time scale of years to decades?
Objective	Support DEQ water quality monitoring program, increase citizen involvement, and development of freshwater bioindicators.
Program Description	The DEQ recently collected benthic data using the Index of Biotic Conditions protocol in several tributaries in the Watershed and reported poor community structure in many of the streams surveyed. Using the same procedure, Oregon Trout started citizen-based benthic macroinvertebrate monitoring in the Kilchis subbasin in the fall of 1997. OSU began benthic macroinvertebrate monitoring in the Tillamook and Kilchis rivers as part of its Water and Watersheds Project in 1998.
Date Initiated	1997.
Coordinating Agency	DEQ.
Funding Agency	DEQ.
Monitoring Parameters	Species Biomass Density Abundance
Stations	10 locations on the Kilchis River.
Frequency	2/year.
Sample Collection	According to DEQ protocols .
Data Management	Relational Database (Microsoft Access/SAS).

Related Monitoring Programs	Benthic Invertebrate Inventory (Bay) Fish Use of the Estuary Tillamook Bay Shellfish Sanitation Program
Anticipated Cost	$10,000/year

PLANKTON MONITORING

Program Objective (Citizen)	To quantify changes in the abundance, distribution, and community structure of plankton in Tillamook Bay.
Monitoring Question(s)	Are plankton biovolumes changing over time scales of years to decades?
Objective	Support citizen involvement and development of estuarine bioindicators.
Program Description	The TBNEP initiated a plankton monitoring program in September 1997 to develop a multi-year data set of plankton species identification, biovolumes, and relative abundance. The Tillamook Bay plankton monitoring program was based on a similar monitoring program in Willapa Bay, Washington. A local oyster grower began collecting weekly samples at three stations in the Bay, each station representing different water column habitats. This effort will be continued as a tool for local resource managers to track subtle changes in the bay environment. Moreover, the Performance Partnership will collaborate with other regional coastal managers to develop standard monitoring protocols for Pacific Northwest estuaries. Monitoring of relative rates of primary production has been identified as a need in the OPSW.
Date Initiated	1997.
Coordinating Agency	TBNEP/TCPP.
Funding Agency	TBNEP/TCPP.
Monitoring Parameters	Zooplankton biovolume Phytoplankton biovolume Temperature DO Salinity Secchi Depth pH
Stations	Port of Garibaldi dock. Larson Cove. Memaloose Point Dock.
Frequency	Weekly samples March through September.

Sample Collection	Following methods developed by staff from Willapa Bay and detailed in *"A Citizen's Guide to Plankton Monitoring in Tillamook Bay"* prepared by K. Griffin, 1998. Horizontal tows and vertical lifts. Plankton biovolumes are settled and enumerated using Imhoff cones. Samples are fixed with formalin. Plankton are identified to lowest practical taxon using a compound microscope.
Data Management	Relational Database (Microsoft Access/SAS).
Related Monitoring	Fish Use of the Estuary Benthic Invertebrate Inventory (Bay)
Anticipated Cost	$5,000

CHAPTER

11 FEDERAL CONSISTENCY REPORT

Overview

The Clean Water Act (CWA) Section 320 (b)(7) (Purpose 7) requires a review to determine whether federal assistance and development programs are consistent with the objectives described in this CCMP. This chapter provides an overview of federal programs and development projects relevant to resource management in the Tillamook Bay Watershed. It identifies possible inconsistencies and describes the existing Oregon review process in place to coordinate federal programs with state and local mandates. Furthermore, this chapter describes the process that the Performance Partnership will follow to assure that future actions related to the CCMP are consistent with local, state and federal mandates, permits and programs.

In order to achieve the stated goals and objectives within the CCMP effectively, federal, state and local governments must strive for consistency and coordination among diverse programs. Federal programs can present inconsistencies at the local level due to multi-agency involvement in various efforts to fund, license, permit, or undertake resource management projects. Changes in federal policies, authority, and/or jurisdiction can bring about unintentional overlaps, conflicts or redundancies in programs. Without a method in place to identify problems, federal programs administered at national or regional levels may overlook or even work against local initiatives.

In Oregon, the federal Coastal Zone Management Act falls under the authority of the Oregon Department of Land Conservation and Development. The DLCD review process provides opportunity for stakeholders to review pertinent information. This process is described within division 35 (Federal Consistency) of the Oregon Administrative Rules for the Land Conservation and Development Department (OAR 660-35-0040). As an example, the Oregon Division of State Lands, the DLCD and the U.S. Army Corps of Engineers have designed a streamlined process for reviewing permit applications for fill and removal permits. Their joint permit form cannot be submitted until the local county planning department has reviewed and signed it. After this step, the application is jointly reviewed by the Oregon Division of State Lands, the Department of Land Conservation and Development and the COE.

The county, the state and the COE all take steps to notify adjoining landowners, stakeholders, and concerned parties of the application.

To further minimize local inconsistencies and redundancies, federal programs in the Tillamook Bay Watershed will be coordinated to achieve common objectives efficiently and effectively. The TBNEP Management Conference will undertake this responsibility through an innovative consortium called the Tillamook County Performance Partnership. The Performance Partnership will aggressively seek to streamline and coordinate government programs while meeting clearly stated performance indicators related to CCMP implementation.

In summary, this chapter will:

1) Provide an inventory of federal programs, mandates, and development projects that may affect actions proposed in the CCMP,
2) Strive to identify and outline potential conflicts and identify mandates that will need further coordination under the Tillamook County Performance Partnership, and
3) Define strategies for correcting or minimizing inconsistencies and redundancies.

Authority and Requirements of the Clean Water Act

Section 320 of the Clean Water Act is the enabling legislation for the National Estuary Program. An analysis of federal programs for consistency is required by section 320 (b)(7). The section reads as follows: "The purposes of any Management Conference convened with respect to an estuary under this subsection shall be to:

"*…review all federal financial assistance programs and federal development projects in accordance with the requirements of Executive Order 12372, as in effect on September 17, 1983, to determine whether such assistance program or project would be consistent with and further the purposes and objectives of the plan prepared under this section.*

"For purposes of paragraph (7), such programs and projects shall not be limited to the assistance programs and development projects subject to Executive Order 12372, but may include any programs listed in the most recent Catalog of Federal Domestic Assistance which may have an effect on the purposes and objectives of the plan developed under this section."

To meet this Executive Order, the TBNEP on Dec. 1, 1998 initiated a review of federal programs and projects that may be relevant to the CCMP action in the Watershed. This includes current and potential programs and/or mandates relevant to environmental management. The review also identifies federal programs that might conflict with actions identified

within the CCMP and describes a process to resolve federal inconsistencies.

Coordination with Other Programs

The CCMP summarizes and integrates local, state, and federal programs into a comprehensive action plan for the Tillamook Bay Watershed. In this context, the CCMP includes and integrates federal goals, standards, and criteria relevant to the Tillamook Bay Watershed. Federal partners have been involved in the development of the CCMP and as a result, have helped to ensure an action plan that is consistent with their respective missions. In the Tillamook Bay Watershed, important federal reviewers included the USDA/Natural Resources Conservation Service (NRCS), US Army Corps of Engineers (USCOE), US Fish and Wildlife Service (USFWS), the Federal Emergency Management Agency (FEMA), National Marine Fisheries Service (NMFS), and the Environmental Protection Agency (EPA). These agencies will actively participate in implementation.

In many cases, the federal government delegates implementation and/or enforcement to state agencies. In the Tillamook Bay Watershed, state agencies with federal mandates have worked to integrate their programs and mandates into the CCMP. Important state partners include the Department of Land Conservation and Development (DLCD), responsible for the Coastal Zone Management Act; the Oregon Department of Environmental Quality (DEQ), overseeing implementation of relevant provisions of the Clean Water Act (including Total Maximum Daily Loads, NPDES permits, and 319 nonpoint source projects); and the Oregon Department of Agriculture, which manages the Confined Animal Feeding Operation (CAFO) permit/inspection process for livestock operations as well as the licensing and inspection program for commercial shellfish growers. The Tillamook County Performance Partnership includes all relevant state agencies responsible for federal mandates.

This section outlines existing federal review mechanisms and highlights programs that facilitate coordination. Important programs include:

- Coastal Zone Management Act (NOAA Section 307)
- Coastal Zone Act Reauthorization Amendments (NOAA Section 6217)
- Endangered Species Act (NOAA-NMFS Sections 7 & 10)
- Clean Water Act (EPA Section 319)
- Clean Water Act (USCOE Section 401)
- National Environmental Policy Act (EPA Section 309 and Section 1502.16(c))
- Office of Management and Budget (A-106)

Coastal Zone Management Act (CZMA)

The Coastal Zone Management Act was developed to "protect, preserve, develop, and where possible, to restore or enhance the resources of the nation's coastal zone." The Act does not provide any new land use regulations but encourages states to conserve their coastal areas by developing and implementing coastal land and water use programs according to the guidelines established in the Act. As a voluntary program, the CZMA encourages states to participate by providing funding incentives and technical expertise to state planning efforts. The federal consistency provision is an important feature of the CZMA, which requires federal activities to be consistent with enforceable state policies and programs. Oregon has an approved Coastal Zone Management Plan.

CZMA Federal Activities and Development Projects. Sections 307 (c)(1) and (2) of the CZMA require all federal activities and development projects, that affect any water use or natural resource of the coastal zone to be consistent to the maximum extent practicable with approved CZM programs. The phrase "to the maximum extent practicable" is defined to mean fully consistent with the state coastal management plan unless prohibited by laws and regulations that govern a federal agency's activities.

CZMA Federal Licenses and Permits. Section 307 (c)(3) of the CZMA provides that no federal license or permit shall be granted by a federal agency to an applicant for an activity, inside or outside of the coastal zone, affecting any land or water uses or natural resources of the coastal zone until the coastal state concurs (or concurrence is conclusively presumed) that the activity is consistent with the federally-approved state CZM program. The Secretary of Commerce, upon appeal, may override a state's consistency objection, but only if the Secretary finds that the activity is consistent with the goals of the CZMA or necessary in the interest of national security.

Financial Assistance to State and Local Government. Section 307(d) of the CZMA requires that state and local projects be in accordance with their Coastal Zone Plan to receive federal assistance. This is especially important in Oregon, which has developed an enforceable land use planning system. Organized around a series of statewide goals, this planning system defines specific criteria for the management of estuarine resources (Goal 16), coastal shorelands (Goal 17), beaches and dunes (Goal 18), and ocean resources (Goal 19).

Coastal Zone Act Reauthorization Amendments of 1990 (CZARA)
Section 6217 of the CZARA requires state coastal management programs to develop coastal nonpoint pollution control programs and enforceable policies to implement those nonpoint programs. Federal consistency may

be used to implement coastal nonpoint program enforceable policies to support existing state coastal management programs.

Endangered Species Act (ESA)

The Endangered Species Act (ESA) may be the most forceful federal legislation to affect aquatic habitat in the Tillamook Bay Watershed. Based on the "threatened" listing of the coho salmon and other species the legislation has the potential to restrict public and private land uses to protect critical habitat. The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) share responsibility for listing and restoring populations of threatened and endangered species. NMFS oversees all ESA responsibilities for anadromous salmonid (and other marine) listings. Specific duties include:

- Review status of species and determine if listing of the species is warranted under ESA;
- Propose and designate critical habitat for listed species;
- Under Section 7 of ESA, consult on activities or plans which are authorized, funded, or carried out by federal agencies which may affect listed species or their habitat to insure ESA compliance;
- Under Section 10 of ESA, work with land owners to develop Habitat Conservation Plans to minimize take of listed species which may result from activities on State or private lands;
- Enforce laws; and
- Develop and review species recovery plans.

Incidental Take and Habitat Conservation Plans (HCP). Section 9 of the ESA prohibits the take of federally listed species without appropriate authorization. An incidental taking refers to the "killing, harming, or harassment" of a federally listed species due to activities which are not meant to disrupt the species and are otherwise lawful. Section 10 requires a land user to apply for a permit to take federally listed species. In order to be eligible for an incidental take permit, applicants must prepare a Habitat Conservation Plan (HCP).

The ESA, pursuant to Sections 7 and 10, therefore, provides authorization to work in critical habitat areas by issuing "incidental take" permits. These permits include provisions to specify:

- The amount (number) or extent (habitat) of anticipated take, if any;
- Measures considered reasonable and prudent to minimize the risk; and
- Nondiscretionary terms and conditions to implement the reasonable and prudent measures, including the procedures used to handle or dispose of any individuals of the species actually taken.

In order to obtain an incidental take permit an applicant must prepare and gain approval of a Habitat Conservation Plan (HCP). An HCP must specify:

- Measures the applicant will undertake to monitor, minimize, and mitigate such impacts; funding that will be made available to undertake such measures; and procedures to deal with unforeseen circumstances;
- Alternative measures the applicant considered that would not result in take, and the reasons why such alternatives are not being utilized;
- Impacts likely to result from proposed taking of federally listed species;
- Additional measures the Service may require as necessary or appropriate for the purposes of the conservation plan, such as an Implementing Agreement that spells out the roles and responsibilities of all parties.

The Oregon Department of Forestry (ODF) is negotiating an HCP for timber harvest activities in the Tillamook State Forest.

Clean Water Act

The Clean Water Act contains two important sections that require federal consistency reviews. Section 319 coordinates nonpoint source programs and Section 401 certifies federal activities in waters of the state.

Section 319 Nonpoint Management Plan. Section 319 of the Clean Water Act requires states to prepare a nonpoint pollution control plan. A portion of that plan requires a review of federal actions that could contribute to the nonpoint loading of waters within the state. In the Tillamook Bay Watershed, Oregon Department of Environmental Quality (DEQ) is preparing a Total Maximum Daily Load (TMDL) plan for the basin. DEQ staff have actively participated on the TBNEP Management Committee and coordinated their activities with other relevant agencies. The Management Conference expects DEQ to complete a TMDL in 1999. The program will be reviewed by all agencies under the Tillamook County Performance Partnership.

Section 401 Certification. Section 401 of the Clean Water Act requires states to certify that federal activities comply with the state's water quality requirements. It requires that applicants for federal licenses or permits obtain a certificate from the state if a proposed activity may result in any discharge to navigable waters. Actions covered include filling wetlands (Section 404 of the Clean Water Act); activities in navigable waters (Sections 9 and 10, Rivers and Harbors Act of 1899); and point source discharge permits (Section 402 of the Clean Water Act). In Oregon the process is the responsibility of the Department of Environmental Quality.

National Environmental Policy Act

The National Environmental Policy Act (NEPA) contains two review elements of interest. Section 309 charges EPA with reviewing and commenting in writing on federal actions that have potential for significant environmental impacts. Section 1502.16 (c) of NEPA also requires
Environmental Impact Statements (EISs) to include a discussion of possible conflicts between the proposed action and the objectives of federal, regional, state and local (and in the case of a reservation, Indian tribe) land use plans, policies and controls for the area concerned.

Office of Management and Budget (OMB) A-106

The A-106 process requires federal agencies to identify federal facilities that are not in compliance with pollution abatement standards and develop plans to bring the facilities into compliance. The EPA reviews and recommends to OMB any necessary changes.

National Historic Preservation Act (P.L. 89B665)

Under the National Historic Preservation Act, federal agencies must review projects for potential impacts to cultural, archeological, and historical resources. The process requires a review by a State Historic Preservation Officer (SHPO).

Inventory and Review of Federal Programs

This section provides an initial assessment of federal assistance programs and mandates relevant to the TBNEP CCMP. The assessment includes a review of the *Catalog of Federal Domestic Assistance* for funding programs available from, and permits and/or licenses required by the federal government. The review includes all federal programs identified in the *Base Programs Analysis* along with other programs that have the potential to affect natural resource management in the Tillamook Bay Watershed. The review identifies specific programs that may conflict with each other and it highlights federal mandates that will require close coordination.

Criteria for review

Any federal action providing financial assistance or taking direct action relevant to the CCMP is subject to federal consistency review under CWA Section 320. In general, a federal program, action, permit or license will be reviewed for consistency if:

- It is located within the estuary program study area; or
- It may significantly affect the water quality, habitat, sedimentation, and/or flooding within the Tillamook Bay Watershed.

A program or action selected for review will be found to be *consistent* with the CCMP if it will:

- Preserve and enhance water quality within the Watershed and estuary;
- Protect and restore the biological integrity of the Bay and Watershed;
- Decrease sediment and bacteria loading to water bodies;
- Support policies, targets, and/or actions in the CCMP;
- Contribute to the implementation of the CCMP; or
- Result in significant economic/social benefits consistent with CCMP policies, targets, and actions.

Any federal action providing financial assistance or taking direct action relevant to the Comprehensive Conservation and Management Plan (CCMP) which may affect ESA listed species would also be subject to ESA Section 7 consultation.

Federal Assistance Programs

The 1997 Catalog of Federal Domestic Assistance (Catalog) lists 1,328 separate programs provided by the federal government. Fifty-one agencies are responsible for administering these programs. From this group, TBNEP initially identified 134 programs administered by 12 agencies that have the potential to affect the actions included in the

management plan. The remaining 1,194 programs are judged to have no effect on the actions included in the management plan. Most of the 134 assistance programs are likely to have positive, rather than negative, effects.

Relevant Federal Programs

The programs judged to have the potential of affecting the management plan are listed below by agency, catalog number, and title.

Department of Agriculture X 27 programs

10.215 Sustainable Agriculture Research and Education
10.500 Cooperative Extension Service
10.054 Emergency Conservation Service
10.055 Production Flexibility Payments for Contract Commodities
10.069 Conservation Reserve Program
10.664 Cooperative Forestry Assistance
10.670 National Forest—Dependent Rural Communities
10.062 Water Bank Program
10.064 Forestry Incentives Program
10.072 Wetlands Reserve Program
10.901 Resource Conservation and Development
10.902 Soil and Water Conservation
10.904 Watershed Protection and Flood Prevention
10.906 Watershed Surveys and Planning
10.912 Environmental Quality Incentives Program
10.913 Farm Land Protection Program
10.914 Wildlife Habitat Incentives Program
10.769 Rural Development Grants
10.771 Rural Cooperative Development Grants
10.766 Community Facilities Loans
10.760 Water and Waste Disposal Systems for Rural Communities
10.761 Technical Assistance and Training Grants
10.762 Solid Waste Management Grants
10.763 Emergency Community Water Assistance Grants
10.764 Resource Conservation and Development Loans
10.765 Watershed Protection and Flood Prevention Loans
10.770 Water and Waste Disposal Loans and Grants

Department of Commerce X 20 programs

11.400 Geodetic Surveys and Services
11.407 Interjurisdictional Fisheries Act of 1986
11.417 Sea Grant Support
11.419 Coastal Zone Management Administration Awards
11.426 Financial Assistance for Ocean Resources Conservation and Assessment Program

11.427 Fisheries Development and Utilization Research and Development
Grants and Cooperative Agreements Program
11.429 Marine Sanctuary Program
11.434 Cooperative Fishery Statistics
11.436 Columbia River Fisheries Development Program
11.437 Pacific Fisheries Data Program
11.438 Pacific Salmon Treaty Program
11.439 Marine Mammal Data Program
11.441 Regional Fishery Management Councils
11. 443 Short Term Climate Fluctuations
11.454 Unallied Management Projects
11.455 Cooperative Science and Education Program
11.462 Hydrologic Research
11.463 Habitat Conservation
11.472 Unallied Science Program
11.473 Coastal Services Center

Department of Defense X 12 programs (includes USCOE)
12.100 Aquatic Plant Control
12.101 Beach Erosion Control Projects
12.102 Emergency Rehabilitation of Flood Control Works or Federally Authorized Coastal Protection Works
12.103 Emergency Operations Flood Response and Post Flood Response
12.104 Flood Plain Management Services
12.105 Protection of Essential Highways, Highway Bridge Approaches, and Public Works
12.106 Flood Control Projects
12.107 Navigation Projects
12.108 Snagging and Clearing for Flood Control
12.109 Protection, Clearing and Straightening Channels
12.110 Planning Assistance to States
12.111 Emergency Advance Measures for Flood Prevention

Department of Housing and Urban Development X 4 programs
14.218 Community Development Block Grants/Entitlement Grants
14.219 Community Development Block Grants/Small Cities Program
14.228 Community Development Block Grants/State's Program
14.859 Public and Indian Housing X Comprehensive Grant Program

Department of Interior X 15 programs
15.252 Abandoned Mine Land Reclamation (AMLR) Program
15.605 Sport Fish Restoration
15.608 Fish and Wildlife Management Assistance
15.611 Wildlife Restoration
15.614 Coastal Wetlands Planning, Protection and Restoration Act

15.615 Cooperative Endangered Species Conservation Fund
15.616 Clean Vessel Act
15.617 Wildlife Conservation and Appreciation
15.618 Administrative Grants for Federal Aid in Sport Fish and Wildlife Restoration
15.808 Geologic Survey **X** Research and Data Acquisition
15.977 State Partnerships
15.916 Outdoor Recreation **X** Acquisition, Development and Planning
15.918 Disposal of Federal Surplus Real Property for Parks, Recreational, and Historical Monuments
15.919 Urban Park and Recreation Recovery Program
15.921 Rivers, Trails, and Conservation Assistance

Department of Transportation X 20 programs
20.001 Boating Safety
20.005 Boating Safety Financial Assistance
20.006 State Access to the Oil Spill Liability Trust Fund
20.007 Bridge Alteration
20.106 Airport Improvement Program
20.205 Highway Planning and Construction
20.217 Motor Carrier Safety
20.218 Motor Carrier Safety Assistance Program
20.219 National Recreational Trails Funding Program
20.301 Railroad Safety
20.303 Grants-in-Aid for Railroad Safety **X** State Participation
20.312 High Speed Ground Transportation
20.500 Federal Transit Capital Improvement Grants
20.505 Federal Transit Technical Studies Grants
20.507 Federal Transit Capital and Operation Assistance Formula Grants
20.509 Public Transportation for Nonurbanized Areas
20.515 State Planning and Research
20.700 Pipeline Safety
20.703 Interagency Hazardous Materials Public Sector Training and Planning Grants
20.801 Development and Promotion of Ports and Intermodal Transportation

General Services Administration X 2 programs
39.002 Disposal of Federal Surplus Real Property
39.003 Donation of Federal Surplus Personal Property

Environmental Protection Agency X 28 programs
66.651 Sustainable Development Challenge Grants
66.419 Water Pollution Control **X** State and Interstate Program Support

66.432 State Public Water System Supervision
66.433 State Underground Water Source Protection
66.438 Construction Management Assistance
66.454 Water Quality Management Planning
66.456 National Estuary Program
66.458 Capitalization Grants for State Revolving Funds
66.460 Nonpoint Source Implementation Grants
66.461 Wetlands Protection **X** Development Grants
66.463 National Pollutant Discharge Elimination System Related State Program Grants
66.467 Wastewater Operator Training Grant Program (Technical Assistance)
66.468 Capitalization Grants for Drinking Water State Revolving Fund
66.470 Hardship Grants Program for Rural Communities
66.508 Senior Environmental Employment Program
66.606 Surveys, Studies, Investigations and Special Purpose Grants
66.604 Environmental Justice Grants to Small Community Groups
66.700 Consolidated Pesticide Enforcement Cooperative Agreements
66.701 Toxic Substances Compliance Monitoring Cooperative Agreements
66.708 Pollution Prevention Grants Program
66.710 Environmental Justice Community/University Partnership Grants
66.801 Hazardous Waste Management State Program Support
66.804 State Underground Storage Tanks Program
66.805 Leaking Underground Storage Tank Trust Fund Program
66.808 Solid Waste Management Assistance
66.810 CEPP Technical Assistance Grants Program
66.811 Brownfield Pilots Cooperative Agreements
66.951 Environmental Education Grants

Federal Emergency Management Agency (FEMA) X 4 programs
83.011 Hazardous Materials Training Program for Implementation of the Superfund Amendment and Reauthorization Act (SARA) of 1986
83.100 Flood Insurance
83.505 State Disaster Preparedness Grants
83.551 Project Impact

Corporation for National and Community Service X 2 programs
94.006 Americorps
94.007 Planning and Program Development Grants

Possibly Inconsistent Funding Programs

The following 11 could negatively affect actions in the management plan. These programs will require additional attention and/or clarification from the Management Conference and Tillamook County Performance Partnership.

Department of Agriculture
10.765 Watershed Protection and Flood Prevention Loans
Emergency Watershed Protection Program

Department of Defense
12.101 Beach Erosion Control Projects
12.102 Emergency Rehabilitation of Flood Control or Coastal Protection Works
12.103 Emergency Operations Flood Response and Post Flood Response
12.107 Navigation Projects
12.108 Snagging and Clearing for Flood Control
12.109 Protection, Clearing and Straightening Channels
12.111 Emergency Advance Measures for Flood Prevention

Department of Transportation
20.205 Highway Planning and Construction
20.801 Development and Promotion of Ports and Intermodal Transportation

Federal Emergency Management Agency (FEMA)
83.100 Flood Insurance

Potential Conflicts with Federal Agency Mandates

Federal mandates, direct actions, and/or permits present a different set of circumstances than most federal funding programs. While funding programs are often discretionary, mandates require a non-discretionary obligation of an agency. This means that the responsible agency must meet federal rules, standards, and/or procedures.

Federal Laws
Important federal laws outlining agency mandates include the following:
Wild and Scenic River Act (16 U.S.C. 401)
Rivers and Harbors Act of 1899 (33 U.S.C. 401)
Rivers and Harbors Act of 1899 (33 U.S.C. 403)
Rivers and Harbors Act of 1899 (33 U.S.C. 404)
Rivers and Harbors Act of 1899 (33 U.S.C. 407)
Rivers and Harbors Act of 1899 (33 U.S.C. 408)
Marine Protection, Research and Sanctuaries Act of 1972, as amended (16 U.S.C. 1413)
Marine Protection, Research and Sanctuaries Act of 1972,

as amended (16 U.S.C. 1432)
Coastal Zone Management Act of 1972, as amended (16 U.S.C. 1456(c)
Clean Water Act (33 U.S.C. 1341)
Clean Water Act (33 U.S.C. 1342)
Clean Water Act (33 U.S.C. 1344)
Coastal Barrier Resource Act (16 U.S.C. 1301-1305)
Coastal Zone Management Act of 1972 as amended (16 U.S.C. 1451-1464)
Endangered Species Act (16 U.S.C. 1531 et seq.)
Fish and Wildlife Coordination Act (16 U.S.C. 661-666c)
Fish and Wildlife Act of 1956 (U.S.C. 16 U.S.C. 742a, et seq.)
Marine Mammal Protection Act of 1972 (16 U.S.C. 1361 et seq.)
Migratory Marine Game-Fish Act (16 U.S.C. 760a-760g)
Transportation Equity Act
Water Resources Development Act 1999 (pending authorization)

Federal agency coordination

In the Tillamook Bay Watershed, diverse federal agencies implement and/or oversee relevant laws and mandates. Important federal mandates that will require close coordination through the Tillamook County Performance Partnership include:

Federal Agency	Program Mandate
USDA-National Forest Service	Forest Planning and Harvest Decisions
NOAA	Coastal Zone Management Act
NOAA	Coastal Zone Act Reauthorization Amendments
NOAA-NMFS	T&E Species Listing
NOAA-NMFS	T&E Consultations and HCP Development
USA-COE	404 Permits
USA-COE	Dredge Plans
USA- COE	Reservoir Operations
DOI-USF&WS	T&E Species Listing
DOI-USF&WS	T&E Jeopardy Opinions
DOI-USF&WS	Refuge Planning and Management
USDOT-CG	Oil Spill Response
USDOT-CG	MARPOL Regulations
EPA	Establishing Water Quality Criteria
EPA	NPDES Permits
EPA	Dredge and Fill Discharge Regulations
EPA	CERCLA Regulations
EPA	Registration and Licensing of Pesticides
EPA	NEPA

EPA	National Estuary Program Approval

Federal Consistency Review Strategy:

The Tillamook County Performance Partnership

Serving as the Management Conference, the Tillamook County Performance Partnership will coordinate all federal programs through a collaborative process that includes all local, state, and federal stakeholders.

To strengthen this process, Tillamook County formally adopted Resolution A98-15 on April 22, 1998 as a Memorandum of Understanding (MOU) "…to encourage and facilitate cooperation among federal, state, and local entities to implement an outcomes-oriented approach to ecosystem restoration in Tillamook County." The Resolution solidifies the County's commitment to greater government coordination. It serves as a milestone in the State of Oregon's broader initiatives to streamline government services under Vice President Al Gore's National Performance Review (NPR). An Oregon Watershed MOU: Reinvention Lab Agreement signed by the Vice President and Governor Kitzhaber on July 1, 1998, partners the State with 10 federal agencies in their commitment to greater cooperation and innovation.

The State of Oregon has not formally adopted a review process that completely addresses Executive Order 12372. Oregon has, however, developed a process for interagency and public review of permit applications for Department of State Lands Removal/Fill permits and USCOE section 404 permits. This process is commonly referred to as the Joint Permit Application for Fill and Remove permits. The State and the Corps developed a joint permit application form and circulate completed applications to agencies and the public for review. This system provides a model for review that the Performance Partnership may choose to adopt locally.

DLCD, as the State's designated coastal management agency, also has a federal consistency review process with which the Performance Partnership will coordinate. DLCD reviews involve consultation with local governments, state agencies, federal agencies, and other interested parties in determining project consistency with the Oregon Coastal Management Plan (OCMP). Federal permits, licenses, and financial assistance grants cannot be issued if the State objects based on project inconsistency with the OCMP. Direct federal activities inconsistent with the OCMP cannot proceed unless federal law specifically prohibits federal agency compliance. However, DLCD objections are rare, averaging only 2-3% of total projects reviewed for the last several years.

The Tillamook County Performance Partnership will call upon individuals within the Partnership to form task forces for the purpose of reviewing and coordinating all federal activities and to identify possible conflicts, overlaps, and redundancies in program funding and mandates. Performance Partnership Bylaws (see Appendix L) specifically commit the organization to review and coordinate federal programs in Article 1 Section 3(B) and Article V Section 2 (A). The signatories to an Implementation Agreement (most federal, state, and local agencies involved in the Tillamook area; see Appendix K) will be expected to help raise and resolve any potential conflicts between planned activities and the goals of the CCMP. The Scientific-Technical and Management Committees have dissolved under the TBNEP framework, and the members of those committees have been invited to participate in two task forces to deal with implementation issues. These new task forces have been named the Implementation Oversight Task Force and Implementation Task Force, respectively.

These task forces include local, state, and federal representatives who are able to identify and resolve conflicts or inconsistencies in federal financial assistance and development programs as well as with issues surrounding local and federal mandates. They will meet monthly throughout the implementation phase of the estuary project; more often as needed. Conflicts and/or inconsistencies will be resolved every 30 days when possible.

Example of Conflict Resolution. During the winter of 1998, repetitive flooding of the lower Wilson River prompted local citizens to request emergency measures to clear a growing log jam where the river enters the Bay. A task force was convened for the purpose of reviewing the proposed project and working out any potential conflicts that would arise as a result of the work. This task force consisted of individuals from Oregon Department of Fish & Wildlife, Tillamook County Flood Group (citizen group), Tillamook County Department of Emergency Management, USCOE, Tillamook County Soil & Water Conservation District, Oregon Division of State Lands and landowners adjacent to the project area.

This effort resulted in an emergency response project that was acceptable to all federal, state, and local stakeholders.

Conclusion. Efforts such as this by members of the Management Conference (now Tillamook County Performance Partnership) and county and State government will ensure close coordination of all government programs and meet the intent of Executive Order 12372.