Tillamook Bay
WATERSHED COUNCIL

2015-2025

Strategic Action Plan

Tillamook Bay Watershed Council Action Plan
May 22, 2015

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Introduction and History

This document expresses the goals and strategies of the Tillamook Bay Watershed Council (TBWC) from 2015 through 2025. Bierly & Associates and Watershed Initiatives, LLC were contracted to develop this document with the help of the Council's Board, staff, and committees. Organizational and ecological priorities were refined during two facilitated meetings of the Council's Expanded Restoration Committee in March and April of 2015. The resulting action plan was reviewed and adopted by the TBWC Board during its regular meeting on April 28th, 2015.

This Action Plan includes a description of the topical areas covered in each chapter, the tracking and analysis methodology that has been used, a statement of the status of that chapter's topic, and where appropriate, "actions for improvement" that the Council has identified and agreed to incorporate as a method for adaptive management within the basin.

Geographic Scope

The TBWC's geographic scope includes all the of approximately 582 square miles of the Tillamook Basin, including the five tributaries that feed into Tillamook Bay (Wilson River, Trask River, Tillamook River, the Kilchis River and the Miami River), as well as the estuary and tidal lands of the bay (Figure 1).

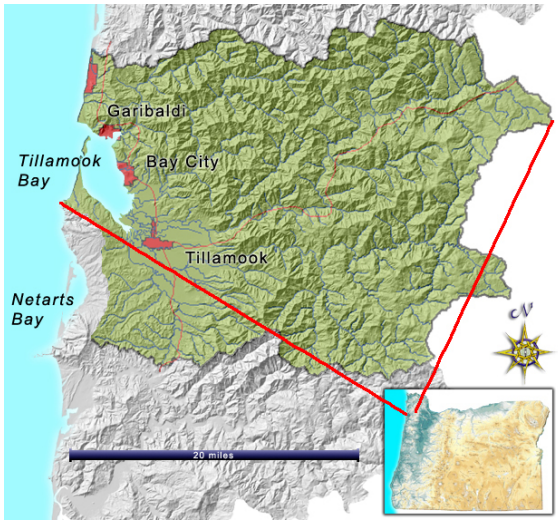


Figure 1: Tillamook Bay Catchment

The Tillamook Bay Setting

Tillamook Bay is a drowned river mouth estuary that lies at the terminus of five distinct tributary drainages. The name, "Tillamook", means "land of many waters." The Miami, Trask, Wilson, Tillamook and Kilchis Rivers all drain the Coast Range to Tillamook Bay. The catchment is nearly square with the Miami and Kilchis Rivers flowing into the Bay from the north and northeast. The Wilson and Trask Rivers have the largest catchments and drain from the northeast and east. The Tillamook River flows into the Bay from the southeast.

Large-scale forest fires have affected the Coast Mountain portion of the catchment in 1933, 1939, 1945 and 1951. The lowlands of the catchment have been protected from tidal and river flooding to some extent and converted to dairy pasture to support agriculture. The dairy industry flourished and formed the Tillamook

County Creamery Association (TCCA). Tillamook Bay and the rivers that enter the bay are some of the most productive salmon streams along the Oregon coast. Tillamook Bay produces shellfish in its broad, shallow intertidal flats. Tillamook Bay also supports commercial oyster production. The Bay has a popular recreational fishery that is important to the community, the state and the greater fishing world.

Tillamook Bay Watershed Council

The TBWC was formed in 1998 and in 2006 became a 501(c)(3) corporation. Its mission and vision statements follow.

Vision

The TBWC's vision is for a healthy watershed that supports natural, functioning ecosystems while also providing for a thriving economic base that supports viable communities.

Mission

The Council's mission is to build collaborative, voluntary partnership with communities and landowners, to protect, maintain and improve the health of the Tillamook Bay Watershed through on-the-ground restoration projects, educational outreach programs, and other community-engagement activities.

Goals & Objectives

The Council's goals include:

1. Develop long-range and annual work plans that support the mission and vision of the Council
2. Assess conditions throughout the watershed and identify opportunities to protect or improve those conditions
3. Promote ongoing monitoring of the health of the Tillamook Bay Watershed
4. Provide ongoing project and program management and evaluation for all Council projects
5. Coordinate with and support other organizations in conservation efforts throughout the Tillamook Bay Watershed
6. Encourage coordinated efforts to increase education programs
7. Encourage collaboration and cooperation with other partners in the basin
8. Improve communication among affected private individuals, interested citizens, business/industry, and representatives of local, state, and federal agencies
9. Provide a framework for resolving community problems and conflicts related to the Council's mission, when all parties to the problem or conflict agree to refer the matter to the Council
10. Actively seek the involvement of youth in Council membership and activities
11. Maintain financial transparency and follow Generally Accepted Accounting Principles in all financial matters
12. Increase council capacity to improve management of projects and mission

Council Capacity and Organization

Participation and Accountability

Description
The Board of Directors consists of between seven (7) and twenty (20) members. The Board is legally responsible for all matters of the Council unless it delegates such responsibility to an officer or officers, the Executive Committee or other authorized personnel. Board responsibilities include making judgments that support the Council's purpose and mission; ensuring that the Council complies with all federal, state and local laws and regulations; ensuring the Council acts in an ethical manner in all dealings; providing oversight of finances and fiscal policies; ensuring adequate resources for the Council to fulfill its purpose and mission; hiring and oversight of the Coordinator/Executive Director; reviewing and approving plans consistent with the Oregon Plan and other conservation plans; reviewing and approving grant proposals; creating committees to address personnel, governance or special projects; and adhering to the Council's By-laws.

Metrics
The Council conducts a biennial self-evaluation process. The purpose of the evaluation is to identify how well the council reflects the Tillamook Bay community and to seek additional representation to assure the balance and representativeness required by state statutes that govern watershed councils.

State statute ORS 541.910 provides guidance for selecting representation and interests:

"*Local watershed councils formed under subsection (1) of this section shall consist of a majority of local residents, including local officials. A watershed council may be a new or existing organization as long as the council represents a balance of interested and affected persons within the watershed and assures a high level of citizen involvement in the development and implementation of a watershed action program. A local watershed council may include representatives of local government, representatives of nongovernment organizations and private citizens, including but not limited to:*

(a) Representatives of local and regional boards, commissions, districts and agencies;

(b) Representatives of federally recognized Indian tribes;

(c) Public interest group representatives;

(d) Private landowners;

(e) Industry representatives;

(f) Members of academic, scientific and professional communities; and

(g) Representatives of state and federal agencies.

Status
The Council has experienced attrition of Board members over the past two years, as well as a decrease in public outreach and involvement. With the hiring of a new Coordinator in 2014 and subsequent outreach, the Board is growing its membership. A plan is in place for more public outreach through its "Speakers Series," and an active engagement of diverse constituencies by the Coordinator to increase public awareness about the Council, and to recruit more landowner and citizen involvement in the Council and its Board.

Actions for Improvement

- The Council will review prospective membership against the statutory guidance (above) when recruiting new members.
- The Council will actively recruit new members, with emphasis on representatives of the shellfish industry, sport and commercial fishing industries, and the dairy industry.

Decision-Making

Description
The Council uses a consensus model for decision-making, with a two-thirds "super-majority" fallback vote when consensus cannot be reached. The following steps describe the Council's decision-making process:

1. The Chair opens discussion. Motions shall be made and seconded by a voting member in order to carry forward.
2. A Board member ("director") shall call for a vote.
3. If consensus in not reached (one or more "no" votes), the Chair shall set a time limit for further discussion.
4. The Council shall listen to the concerns of the "no" voting directors. The Council will then listen to those that support an alternative. The goal of this discussion is to seek a solution that can be supported for the entire Board. Each person shall have one minute to speak.
5. At the end f the discussion, the Chair shall call for a re-vote.
6. A two-thirds majority of the voting members will carry the motion.
    a. Voting definitions: "Yes" = support, advocate for the proposal
    b. "Abstain" = neutral: not thrilled by could live with it; not informed enough on the matter.
    c. "No" = no; can't count on me; need more discussion; may need more information
7. If the motion does not carry after the second vote, the item will be tabled. A directory may bring the issue forward at a future meeting for another vote.
8. A director who is present at a meeting when corporate action is taken is deemed to have assented to the action unless the directory's objection or abstention to the vote is entered into the minutes of the meeting, or the

directory delivers written notice of such objection or abstention to the Secretary immediately after adjournment of the meeting.

Meeting Management

Description
The Council strives to meet at least nine (9) times per year, and regularly scheduled meetings are set at times and places determined by the Council, with all regular meetings open to the public.

Meeting conduct is in accordance with the "Simplified Rules of Order" and administered under the direction of the Chair. The Chair may recognize public input at any point during a Council meeting. In addition, a public comment period is provided at each regular meeting.

Special meetings may be called by the Chair or by 20% of the directors on the Board. Special meetings may be closed to the public for discussion of confidential matters.

The Board may act without a meeting provided that the action is in writing and consented to by all directors and filed with the Corporation as a Board resolution. Council Officers may authorize an emergency vote by the Board via electronic media. The decision will stand as a Board decision if the decision is in writing and all Board members sign their consent to such decision(s).

The Chair may permit any or all directors to participate in a meeting through the use of telephonic communication where all directors participating may simultaneously hear each other during the meeting.

Metrics
- Review of attendance records of Board members annually and evaluate what steps necessary to improve attendance

Status
The Council Board has been meeting at least nine times a year since its inception in 1998. A Public Comment time is reserved on each Council Board meeting agenda.

Actions for the Council
- Conduct a review of the number of meetings failing to achieve a quorum over the last year and identify ways to improve attendance.
- Assess the capacity needs of the Council to effectively manage existing projects, and assess the ability to manage new projects.

Staff Management

Description
The Board of directors has authority to hire a Council Coordinator or Executive Director as the administrative head of the Corporation. The Board is responsible for overseeing the Coordinator/Executive Director. The Coordinator/ED is responsible for the day-to-day management and duties necessary to conduct the Council's business, operations and affairs. The Board may delegate to the Coordinator/ED executive powers necessary to facilitate handling and management of the Council's authority and interests, including hiring of additional staff, developing Request for Proposals for soliciting contractors to assist in Council activities, and other tasks.

Metrics
- Annual review of Coordinator's performance over the previous 12-month work period.
- Feedback to Coordinator on areas of competency and areas needing improvement.

Status
A new Coordinator was hired in October of 2014 after a number of short-term tenures of previous Coordinators. The newly hired Coordinator is actively engaged in community outreach efforts, project management—including the development of new on-the-ground restoration projects, as well as pursuing funding and grant opportunities. While it is too early to discern the efficacy of the new Coordinator's actions, early indications of success include the recent addition of new members to the Board, new programs including the "Speakers' Series," outreach to schools and educational institutions, and an increase in programs designed to attract more interest from the larger community, including presentations by ODFW biologists and others on issues that are important to the local community such as the status of salmon population trends in the Tillamook Basin watershed.

Actions for the Council

- The Executive Committee will review staff performance annually.

Fiscal Management

Description
The Council has a "Fiscal Policies and Procedures" manual that articulates the fiscal management policies for the Council, how purchases and disbursements are made, accounts receivables, billings, payroll procedures, financial statements, budgeting and procurement policies.

Metrics

- Review and reconciliation of the Council's funds and bank statements by its fiscal administrator (TEP Accounting Manager)
- Completion of required tax forms and financial reviews
- Biennial audit by a contracted CPA

Status

The Tillamook Estuaries Partnership (TEP) currently manages payroll support, as well as fiscal management of all grants, for the Council. The Fiscal Policies and Procedures manual has not been updated or reviewed since May of 2007. The Coordinator is scheduling a review of the manual for September of 2015.

Actions for the Council

- Complete the scheduled review and provide the Council an updated manual.

Project Management

Description

Oregon Department of Fish and Wildlife (ODFW) staff has provided significant project management assistance since the departure of Denise Lofman in 2012. With the hiring of a new coordinator, project management is now being organized through the software Basecamp, with each project given an identification number in order to provide tracking and other monitoring oversight by members of the Council's Executive Committee and Restoration Committee.

In addition, the Council has developed a two-year work plan for all projects and uses an Excel spreadsheet that provides a description of the project, key partners involved, limiting factors that affect the targeted resource/spatial area, challenges and opportunities associated with the project, and planned deliverables.

Metrics

- Development of a comprehensive database on Basecamp to allow monitoring and tracking of all restoration projects

Status

The new project management processes that have recently been put in place are designed to improve project management for the Council. However, it is too early to determine how effective these new processes will be in assisting and improving project management at this time. With the real potential loss of state-supported technical assistance, additional capacity will undoubtedly be needed.

Actions for the Council

- Build technical expertise either through contracting or hiring, to allow the Council to take on more complex projects

- As the Council manages more projects, it will need to budget for contracted or partner project managers
- Consider each grant application as an opportunity to provide project management capacity

Citizen Involvement and Support

Description
The Council has been challenged in garnering more citizen involvement and support over the past few years. As noted in previous self-evaluations, the broader community has a limited understanding of the Council's work or mission. Consequently, the Council has developed a plan for increasing citizen awareness of the Council's work, as well as greater citizen involvement. Such plans include developing a more robust online presence, including a website and Facebook page, increasing the number of presentations by staff, agency or educational professionals on topics that are of interest to local landowners and citizens, and a more concerted outreach effort by the coordinator to targeted stakeholders and groups. The Council has plans to attend local events such as the Farmers' Market, County Fair and Garibaldi Days, as well as community volunteer activities such as bay/river clean ups, riparian planting parties, and invasive plant removal efforts. Partnering with local schools, the community college and other educational or recreational partners will enhance the Council's presence in the community and increase public awareness and involvement in Council activities.

Metrics
- The number of students helping with citizen monitoring of projects and habitat.
- Attendance at local events such as the Farmer's Market and Garibaldi Days to increase public awareness of the Council

Status
The council has not had a robust outreach and citizen involvement program due to the high level of staff turnover during the past two years. However, the coordinator is working with partners to develop student monitoring opportunities and other outreach activities in order to increase citizen involvement and awareness of council activities. In addition, the council is working with the City of Tillamook on a restoration project on Holden Creek in downtown Tillamook, which will provide new opportunities to engage with the public.

Actions for Improvement

- Encourage board members to engage citizens and community groups to foster broader community awareness of the council and support greater citizen involvement in council activities.

Collaboration with Partners

Description
Maintaining the many relationships developed through time and building additional relationships are core functions of any watershed council. The TBWC has a long track record of collaborating with public and private partners in the catchment. The Council relies on public agencies for technical assistance, especially ODFW staff. Some of that capacity is threatened by budget cuts at the state level. The Council also has a strong partnership with Tillamook Estuaries Partnership (TEP) on projects and planning and for fiscal management. The Council conducts restoration projects on private industrial forestlands, state forest lands, Tillamook County and City of Tillamook lands, as well as lands belonging to other private and governmental entities.

Metrics
- Implementation of projects that maintain and enhance partnerships and collaboration
- Involvement with all appropriate agencies and parties to assure cooperative development and implementation

Status
The Council has recently been approached by partners (City of Tillamook, US Fish & Wildlife Service, and others) to assist in the development of projects that solve liability and ecological problems for the region. These opportunities will be enhanced by successful relationships and effective implementation. Assuring the Council has the capacity to build and maintain relationships while completing projects is an important challenge and links to adding capacity to assure effective project development and implementation.

In addition, the council is working in concert with the Tillamook Estuaries Partnership's Comprehensive Conservation and Management Plan to advance common restoration goals.

Actions for Improvement
- The Council will actively recruit agency and land management interests to its meetings to share information and explore cooperative efforts and opportunities.

Membership and Recruitment

Description
The Council has had poor recruitment of new members as a result of staff turnover and poor outreach and education programs in the recent past. The new coordinator

is actively recruiting new members from the broader community with an emphasis on user groups and stakeholders that are currently under-represented. These include landowners in the forested areas of the basin, and in the floodplain, and local business owners. Local recreationists are also being considered, including anglers, paddlers, hunters and birders.

Metrics

- Diversity of Board members
- Number of Board Members
- Representation from the broadest range of local citizenry

Status

One new board member has been recruited since October 2014, when the new coordinator was hired. Additionally, the Council has revived its "Speaker Series" and corresponding community outreach.

Actions for Improvement

- Recruit representative(s) from the dairy farming community to the Board by December 31, 2015
- Provide one (1) annual training to Board members to increase capacity and relationships
- Provide one (1) annual board social event to support board member morale and acknowledge their contributions to the Council
- Develop and distribute a Board Member Manual and review the contents with new members

Resource & Capital Development

Description

The Council's funding falls into three main categories; 1) Council Capacity Grants; 2) Regular Grants; 3) Non-specific/Miscellaneous funding.

1) Council Capacity Grants (formerly known as Council Support) are awarded biennially by OWEB based on an evolving set of criteria and requirements. TBWC has made every effort to meet these requirements, and anticipates that it will receive funding for the upcoming 2015-2017 biennium. OWEB's decision is due in the summer of 2015. The dollar amount for these awards is tied to OWEB's annual budget, and has not yet been determined for the 2015-2017 biennium.

2) Regular Grants encompass the majority of funding opportunities for Council projects, and include those offered by OWEB, US Fish & Wildlife Service, NRCS, BLM, US Forest Service, ODFW and ODEQ. They include, but are not limited to, grants for restoration, technical assistance, monitoring, education/outreach, land protection

and water protection.

3) Non-specific or Miscellaneous funding is a catch-all for all the other funding opportunities that are not tied to a specific project or outcome, but are intended to support the Council's operations and activities. The TBWC has so far sought very few of these opportunities.

Metrics

- Budget forecasting to measure whether general funding is adequate to support staff and office administration
- Successful development and execution of budgets and funding to support ongoing projects

Status

The Council is awaiting a decision from OWEB regarding ongoing Council Capacity funding, due in the summer of 2015. Currently all of the Council's planned projects are fully funded. Additionally, every prospective project includes a detailed funding plan and budget.

Priority Actions

- Initiate one or more education/outreach projects per year
- Initiate one or more restoration projects per year
- Develop and execute a fundraising plan
- Diversify funding channels
- Expand organizational capacity to add another employee within the next year
- Develop a fundraising strategy (as part of increasing staff capacity) that identifies and solicits funding from a diversified portfolio of funders

Ecological Priorities

Use of Watershed Analyses & Other Resource Inventory and Analysis Information

Description

There is an abundance of natural resource information for the tributaries to Tillamook Bay. The documents identify significant issues associated with the unique history of the catchment. The Coast Range tributaries are dominated by a relatively uniform, young (80 years ±) forest following a series of fires in the 1933-1951 period that covered nearly the entire catchment. The steep and deeply divided topography of the Coast Range grades rapidly to the alluvial fans that fringe Tillamook Bay and its broad intertidal expanse. Much of the lowlands in the bay

front has been diked and drained for conversion to dairy pasture and protected from river flooding by levees and tide gates.

The dominant issues associated with the Tillamook catchment are degraded water quality (temperature and bacteria), chronic flooding, and degraded or lost salmon habitat. While the issues are well known, the causes, and remedies are the subject of significant debate and controversy in the local community. There is abundant documentation of the priority areas for salmon production, tidal marsh restoration, riparian enhancement and stream complexity improvement. While additional work to prioritize or further analyze information about the Bay and its tributary streams is not well justified at this time, there will be a continual debate about approaches and desired outcomes.

Status

Given the abundance of information and differences of opinions on solutions and desired outcomes, it is important to identify a restoration strategy that draws on common goals within the TBWC's partnerships. Ecological priorities have been identified by the Tillamook Bay Watershed Data Synthesis & Computational Ecological Restoration Prioritization (CERP) Tool. The information and priorities identified in this document should be used to help guide both outreach and selection among opportunities.

The strategy proposed at this time is to take actions appropriate to the land uses in the catchment and address the factors that adversely affect aquatic habitat forming processes with an emphasis on the connectivity from Tillamook Bay to the areas of high intrinsic productivity in the upper watershed. The other element of the strategy is to take actions that would create and or maintain habitat complexity to allow for a diversity of life history expressions for the focal streams (the reach from high intrinsic potential areas to the Bay).

Priority Actions

- The following "rules of thumb" will be applied when considering future opportunities for the Council when addressing salmon habitats:

    - Streams with upstream "strongholds" should be prioritized over others.
    - Streams with high intrinsic potential should be protected and restored to the extent possible.
    - Connectivity to upper watershed high intrinsic potential areas should be a priority.
    - Addressing upslope (primarily road related) impacts to high intrinsic potential stream segments should be a priority.
    - Look for ways to address habitat complexity from headwaters to the Bay.

- Develop working relationships with land management groups to build a common understanding of goals and effects. This could mean using opinion surveys, targeted applied research to evaluate potential tradeoffs, conducting demonstration projects, and other methods to build understanding.

- The Council will explore additional operating rules for selecting projects that would address water quality and flooding concerns.
-

Project Selection and Planning

Description
The Council is a member of the North Coast Watershed Councils Restoration Assistance Project. A group of four watershed councils (the Nestucca-Neskowin, Tillamook Bay, Lower Nehalem and Necanicum Councils) hires a contractor each biennium to develop eight grant applications for high priority projects on the ground, with each council securing two projects in 2014-2015. Having this high-level of assistance in developing project and grant applications results in better project selection, and provides more time for public outreach and education, operations management and other duties. The contractor's plans include aligning funding requests with available opportunities and project partners to ensure readiness and timely implementation.

New geographic information tools have been developed that evaluate watershed processes and are being applied to the neighboring area (Nehalem basin) as a part of the planning tool to identify projects for a coho salmon implementation plan. These tools (NetMap and associated tools) use information about physical processes rather than area (hydrological units) conditions to identify limitations to the processes that provide habitat for aquatic species. The council could cooperate with Tillamook Estuaries Partnership to apply the NetMap evaluation to the tributaries to Tillamook Bay.

In addition, the Council is using TEP's Culvert Prioritization Plan for guidance in addressing needed culvert replacements in the basin. The Council is also working with the City of Tillamook on a water quality and restoration planning process for Holden Creek, the most impacted urban stream in the Tillamook Basin.

Metrics
- Percentage of grants awarded
- Percentage of partners who return to participate in future projects
- Number of new partners and prospective projects approaching the Council

Status
Project selection and planning has been stymied by staff turnover and poor grant application management recently. However, with the hiring of the new

Coordinator, along with identification of the Ecological Priorities (see page 12), project selection and planning is expected to improve—both in the frequency of projects selected and implemented, and in their ecological contributions to the Basin.

Priority Actions

- Cooperate with Tillamook Estuaries Partnership in providing fish passage using the prioritization tools they have developed.
- The Council should collaborate with Tillamook Estuaries Partnership to apply for funding to conduct an analysis of process-based conditions in the tributary watersheds using a tool such as NetMap that NOAA Fisheries and others are using to develop salmon recovery plans. NetMap can be used to specifically target restoration actions and priorities. The analysis should include an estuarine habitat evaluation as well as stream analyses.
- Continue to look for projects that address habitat priorities and provide the greatest benefit for the community

Tillamook River Conservation Priorities

The Tillamook River supports significant populations of cutthroat trout, steelhead, coho, and Chinook salmon, as well as a remnant population of chum salmon. It has a long history of disturbance including an extensive history of splash-damming and log drives. These abuses have left a legacy of scoured channels that would benefit from restoration and enhancement. The lowlands make up a significant percentage of Tillamook County's highest value dairy lands. Consequently, they have long been diked and leveed to prevent flooding and salt intrusion. These structures have disconnected the river from its floodplain.

The *Tillamook River Coho Restoration Strategy: Habitat Assessment and Limiting Factor Assessment* provides a careful summary of conditions and specific recommendations for habitat enhancement that would benefit coho salmon. The analysis and recommendations provide guidance for project development with the appropriate landowners. The document also provides reach-by-reach recommendations for conservation activities.

Tillamook River Coho Implementation 1

Description

The Council has developed the *Tillamook River Coho Restoration Strategy: Habitat Assessment and Limiting Factors* that identifies twenty-five priority actions.

Metrics

- Number of projects that address identified limiting factors

Status
The council has begun developing projects identified under the habitat and limiting factors assessment, including riparian planting for improved shade.

Priority Actions
- Strive to instigate a priority project each year that addresses a limiting factor identified in *Tillamook River Coho Restoration Strategy: Habitat Assessment and Limiting Factors*

Tillamook River Coho Implementation 2

Description
Don Averill, TEP and the TBWC are partnering to conduct a riparian restoration project on the Averill property along the Tillamook River. The Averill property is agricultural land used to produce feed for livestock. The riparian zone within the property is dominated by invasive plant species (Himalayan blackberry and reed canary grass) and includes areas of active bank erosion. The riparian areas will be planted with a mix of native trees and shrubs. Cuttings of willow, dogwood and/or twinberry will be planted in and around areas of bank sloughing and erosion. Site preparation will include the clearing of all non-native blackberry. 3-4' diameter holes will be scalped in areas of reed canary grass for individual plantings.

Metrics
- Site preparation and planting of approximately .5 miles of Tillamook River riparian area with trees free to grow in 5 years.

Status
The project has been designed and an OWEB small grant has been acquired to complete the work.

Priority Actions
- Complete funded projects and document work in council materials (webpage and/or Facebook page)

Tillamook River Coho Implementation 3

Description
The TBWC is currently working with the City of Tillamook to design fish passage at Skookum Dam, an earthen dam on Upper Fawcett Creek. The dam was used for water supply for the City of Tillamook but is no longer necessary and poses a liability for the City if the dam fails. The U.S. Fish & Wildlife Service has offered to assist in more complete breaching of the dam.

Metrics

- Success of the project and successful fish passage in the future

Status

This is a new project that is in the development stages. Additional development and funding for design and implementation will be required before the project can become realized.

Priority Actions

- Develop a grant application and pursue funding for the design and implementation of dam removal.

Trask River Conservation Priorities

The Trask River is the second largest drainage in the Tillamook Bay Watershed. It supports significant populations of cutthroat trout, steelhead, coho, and chinook salmon, as well as a remnant population of chum salmon. Water quality in the Trask River is considered impaired by excessive summer temperatures. The Trask River is unique in that the mouth of the mainstem was moved and constricted, resulting in increased flooding. The upper watershed has fish passage barriers, and lacks large wood that creates overwintering habitat. In addition, there is a lack of conifers in riparian areas. The lowlands lack riparian cover and have been extensively altered to expand agriculture. Most lowlands are managed for pasture production. Lower river tributaries such as Holden Creek, Gold Creek, and Mill Creek have extensive water quality problems and have barriers that prevent significant fish use.

Trask River Habitat Restoration Implementation 1

Description

The Council has identified Holden Creek as a priority. Holden Creek is the most impacted urban stream in Tillamook County, and contributes significantly to water quality problems in the Trask River and the Tillamook Bay. Much of the land along Holden Creek is city-owned. The creek has many issues including flooding, fish passage, and riparian health. The Holden Creek Working Group partnership meets approximately every 3 months. TBWC staff and Board members sit on this committee and often lead projects to improve Holden Creek's habitat and water quality.

Metrics

- Water quality in Holden Creek
- Riparian health along Holden Creek
- Fish passage and use of Holden Creek

Status

A recent opportunity to develop a project for Holden Creek has been identified. The project would retrofit three 5' tidegates that currently block fish passage with a more fish friendly alternative. The watershed counsel will initiate the process of developing partners and design funding as well as applying for grants to pay the $120,000 estimated to upgrade those tide gates for the water quality and fish passage benefits.

Priority Actions

- Work with the Holden Creek partners to obtain designs and cost estimates for fish-friendly tide gates. Facilitate conversations with NOAA Fisheries and ODFW on the design.

Trask River Habitat Restoration Implementation 2

Description

Mill Creek is a low gradient, roughly five-mile long tributary to the Trask River--one of the lowest tributaries in the Trask system, joining well within the tidal zone, just upstream of RM 5. The Mill Creek watershed includes several significant tributaries and supports populations of cutthroat trout, steelhead, coho, and chinook salmon. Historically the creek is presumed to have supported chum salmon as well, but none have been documented in the basin in several years. State and industrial forestland are the dominant land uses in the headwater reaches while the majority of the stream flows through rural residential areas. It passes through a short section of agricultural land prior to entering the Trask.

This project site begins roughly 1.1 miles upstream of the confluence of Mill Creek and the Trask River and continues for roughly 0.9 miles to the confluence with Bear Creek. The Trask River Watershed Analysis rated in-stream large wood conditions as "100% undesirable" in the lower Trask watershed. It further specified that management actions to improve salmonid habitat should focus on enhancing large wood conditions, improving future large wood recruitment, and reducing mainstem temperatures.

Metrics

- Successful placement of 22 large wood structures
- Enhancement of riparian areas
- Planting of native trees and shrubs in all areas affected by the project, as well as an expanded area on the north side of the creek

Status

The project is funded and is being implemented in 2015.

Priority Actions

- Manage the project for effective completion.

- Develop descriptive material and report on progress and outcomes to the community.

Trask River Habitat Restoration Implementation 3

Description
The Upper South Fork Trask Habitat Restoration Project will involve in-stream habitat enhancement through addition of large wood and decommissioning of an abandoned road. Project may also include fish passage improvements at three nearby road crossings.

Metrics
- The project could address 20 acres of riparian habitat treated, and approximately 2 miles of riparian habitat treated (both sides). Maintenance would include brush cutting and tube maintenance.

Status
Current task is to seek funding for technical assistance with the initial project scoping and planning. In addition, a larger restoration effort is being assessed to address the alder-dominated riparian areas in the East for of the North Fork of the Trask.

Priority Actions
- Obtain technical assistance funding for project design.

Wilson River Conservation Priorities

The Wilson River is the largest drainage in the Tillamook Bay Watershed and supports the watershed's largest runs of anadromous fish. The upper reaches of the Wilson River are relatively high gradient, confined stream channels with local areas of low gradient, broad floodplain channels. The lower portion of the mainstem forms an interconnected network of sloughs and tidal wetlands in conjunction with the Tillamook, Trask, and Kilchis Rivers. The Wilson has a broad alluvial floodplain that is used primarily for dairying. The lower mainstem is extensively diked and is prone to flooding. Red Alder and riparian shrub species such as Salmonberry dominate the majority of the riparian corridor.

Issues associated with the lack of overwintering habitat, elevated summer temperatures, deciduous riparian corridors and altered low gradient portions of the flood plain are common with the Trask.

Wilson River Habitat Restoration Implementation

Description

TBWC is working with ODF and ODFW to place up to 12 large wood structures in the bed of Ben Smith Creek. Ben Smith has been identified as a high priority stream for coastal coho, but it has very little in-stream wood. ODF and ODFW own significant land along the creek, and both are eager to engage in a restoration partnership with the Council to restore fish habitat. An upcoming timber harvest on ODF land bordering Ben Smith Creek will create an opportunity to contribute wood to the creek, spurring the initiation of this project.

Metrics

- Effective placement of large wood.

Status

Planning and design has been completed. A grant application is in preparation.

Priority Actions

- Prepare for OWEB Review Team site visit with explanatory materials and partners.

Miami River Conservation Priorities

The Miami River is the northernmost and smallest of the five rivers within the Tillamook Bay Watershed. The Miami is unique among the five rivers in that it has few dikes and levees. Cutthroat trout, steelhead, chum, chinook, and coho salmon are present throughout the basin. The lower river has excellent potential for chum production. The upper mainstem has an abundance of off-channel habitat. Large wood remains low in the upper mainstem and may be a limiting factor for salmonid production. The Miami exceeds water quality standards for temperature. The lower mainstem is particularly prone to high summer temperatures, making it unsuitable for summer rearing by juvenile coho.\

Priority Actions

- Maintain contact with Oregon Department of Forestry on potential cooperative efforts to address water quality standards for temperature exceedance.
- Explore cooperative funding for a NetMap evaluation of the Miami watershed.

Kilchis River Conservation Priorities

The majority of the Kilchis watershed burned during the series of fires in the first half of the 20th century collectively known as the Tillamook Burn. As a result, the majority of the watershed is composed of relatively young conifers and dominated by Red Alder and riparian shrub species such as Salmonberry. The Kilchis River

supports populations of Coho, Steelhead, Chinook, Cutthroat, as well as Chum in the lower basin.

Priority Actions

- Maintain contact with Oregon Department of Forestry on potential cooperative efforts for fish passage, road treatments and large wood placement. Explore cooperative funding for a NetMap evaluation of the Kilchis watershed.

Tillamook Bay Lowlands Habitat Restoration 1

Description

To raise awareness of habitat forming processes in the Tillamook Bay lowlands, the council will sponsor a science panel discussion on the conditions and processes that form and impacts to the lowlands of Tillamook Bay with other partners in the basin. The forum will be developed with partners that have an interest in the lowlands. Critical partners will be Tillamook Estuaries Partnership, NOAA Fisheries, US Fish & Wildlife Service, Tillamook County Creamery, Oregon Department of Fish and Wildlife and others. The initial idea is to have a panel discussion focusing on the science of lowland habitats and habitat dynamics. The panel will discuss restoration alternatives and concepts as they relate to aquatic habitats important to salmon and other estuarine biota.

Metrics

- Constructive dialog that results from the presentations and leads to greater public awareness and the recruitment of potential landowners for inclusion in future habitat projects

Status

The Council is in the planning stages to sponsor the panel in the fall of 2015.

Priority Actions

- Identify a date and venue, invite and confirm speakers, and develop and deliver outreach for the program (scheduled for 2016)

Tillamook Bay Lowlands Habitat Restoration 2

Description

Explore with the Tillamook Creamery Cooperative, OSU Extension and other partners what opportunities exist to build understanding about the tradeoffs between full utilization of pastures and habitat restoration and enhancement activities. Explore approaches from other areas and develop a communications and research plan for the Tillamook Bay lowlands.

Metrics

- Clear and effective communications with the dairy industry that results in a mutual commitment to explore tradeoffs for utilization of lowlands for ecological habitat values and agricultural values

Status

The Council needs to develop a clear plan of action and initiate discussions with the Tillamook County Creamery.

Priority Actions

- Develop a plan of action and identification of models from other areas
- Engage discussions with TCC and OSU Extension
- Solicit recruitment of willing landowner(s) to develop and test voluntary pilot conservation projects that improve lowland habitats and ecological functions and document the effects of these voluntary practices on pasture utilization.

Ensuring Effectiveness

Council Effectiveness

Description

The TBWC is implementing three main measures to help ensure effectiveness. These measures include more effectively evaluating its restoration programs, monitoring its spending and budgeting, and tracking the level of public involvement from the broader community.

The biennial Self-Evaluations are one of the tools that the TBWC is using to gauge the level of support and involvement of Board members and other volunteers. These evaluations also provide the Council with opportunities to assess which programs and projects it should continue to support, and which programs and projects should be curtailed or modified.

The recent addition of Basecamp, a robust project-management software, is allowing the Council's staff and technical team members to more closely monitor the Council's restoration projects.

In addition, the Council maintains a two-year work plan in Excel that also provides tracking and assessment of the Councils' restoration projects, as well as the

Council's organizational development, staffing, volunteer capacity, and Board status. The work plan also tracks the Council's public outreach efforts and activities.

Metrics

- Do the Self-Evaluations result in meaningful discussions on progress toward Council goals?
- Does the work plan result in actionable items to help improve the Council's capacity and public outreach activities?

Status

The latest Self-Evaluation was conducted during the March 24th meeting of the Council Board.
Base Camp was initiated as the Council and Coordinator's project management program February 1, 2015.
The Council's "Fiscal Policies and Procedures" manual guides fiscal management. In addition, the Council's funds and bank statements are reviewed and reconciled monthly by the Tillamook Estuaries Partnership Accounting Manager (see the "Fiscal Management" section on page 7.).

Priority Actions

- Use the results of the self-evaluation and the Action Plan to identify a work program for the year. Evaluate resources needed to accomplish the work plan and explore means to obtain the necessary resources.
- Review self-evaluation process with Council officers to identify better utilization of this tool to improve council and board effectiveness.

Project Effectiveness

Description

The Council has completed a significant number of projects over the last 15+ years. There has been limited evaluation of the differences made from the implementation of the projects. The council should look towards both evaluating the effectiveness of any collection of projects in a tributary or reach of stream and evaluate the effectiveness of selected individual projects that may be instructive for future efforts.

At the current time the Council reports on the completion and condition of projects as required under grant funding requirements. While this reporting is important, a more robust evaluation of selected projects, perhaps in cooperation with others such as the Tillamook Estuaries Partnership, would help to build information that could be used for public information purposes or in revisiting project designs for the future.

Metrics

- The number of projects that meet priorities for salmon recovery.
- The number of projects that address water quality and flooding issues.

Status
This is a new approach for the Council and will need to be developed. The considerations that need to be made will require additional capacity for the Council either through contracting or employment.

Priority Action
- Apply a NetMap-type of evaluation for the tributary streams of the basin and compare the completed projects with the locations identified and adjust the council's outreach accordingly.

Ten-Year Project and Planning Matrix

The matrix on the following page identifies priority actions for both improving council capacity, and for pursuing restoration activities. The matrix also suggests a time frame for when the actions could begin, and how long these actions will be engaged by the council.

Actions	2015-2017	2017-2019	2019-2021	2021-2023	2023-2025
Council Capacity					
Review Membership composition					
Recruit new members					
Review Attendance					
Access Capacity for Projects					
Build technical expertise					
Add Project Management capacity					
Build capacity in grant applications					
Recruit interest and involvement					
Provide Board Training					
Conduct social and community event					
Develop and distribute Board Manual					
Build Outreach capacity					
Add outreach capacity as developed					
Restoration Activities					
Apply "Rules of thumb" to opportunities as presented					
Cooperate on process evaluation of tributaries					
Complete current projects effectively					
Develop public information materials on projects completed and in progress					
Add project management capacity					
Work with landholders to identify and develop projects identified in process evaluation					
Develop a cooperative evaluation of opportunities to address lowlands					
Develop a basin scale action plan for long-term funding					

MEMORANDUM

April 13, 2015

To: **Tillamook Bay Watershed Council**

From: **Ken Bierly**

Subject: **Tillamook Bay Watershed Assessment Issues and TBWC Action Recommendations**

Introduction

The Tillamook Bay Watershed Council (TBWC) has conducted watershed assessments from 1998 until 2001 covering each of the tributaries to Tillamook Bay (Wilson River, Trask River, Tillamook River, Miami River and Kilchis River). Each of the 5 tributaries (Figure 1) is addressed in a watershed assessment. The assessments conducted for TBWC are primarily summaries of existing information with limited analysis or issue clarification. The Miami and Trask watersheds were subsequently assessed for management purposes by the Department of Forestry in cooperation with the Bureau of Land Management in 2003 and 2005. The assessments provide a useful compilation of information and provide information that can be used for the development of an action plan for the council.

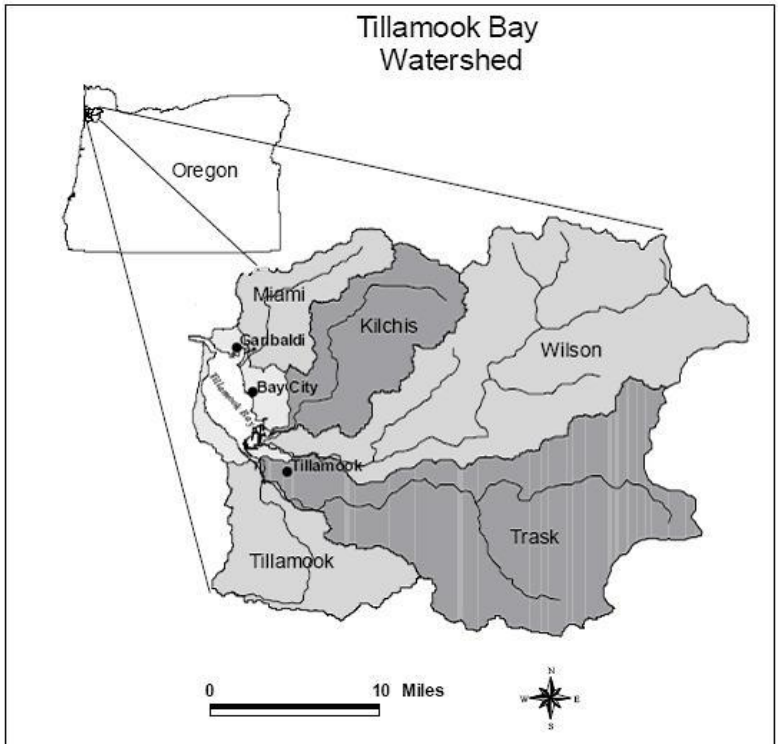


Figure 1: Tillamook Bay Tributary Watersheds

The Tillamook Bay Watersheds also have a great deal of information because of the presence of a National Estuary Program (NEP) that has invested significant financial resources in the evaluation of natural resource conditions and development a resource management program (TBNEP, 1998c.; TBNEP, 1999). The resource inventory and evaluation efforts of the NEP are valuable and usable for selecting appropriate conservation actions.

Fish habitat has been evaluated and prioritized for a number of purposes. Thom and Moore (1997) identified habitat conditions and developed priorities for industrial forest landowners to apply riparian and in-stream restoration practices. Oregon Department of Fish and Wildlife, Oregon Department of

Forestry, and the Wild Salmon Center provided input into prioritization for establishment of salmon "anchor habitats" in the Tillamook Bay watersheds that involve state forest lands. There has been significant evaluation of juvenile fish distribution (biological surveys) and is well summarized in 2007 by Bio-Surveys, LLC (2008). This information has been used to prioritize coho habitat restoration (Demeter Design, 2009) and to provide tools for evaluating priorities (Demeter Design, 2008)

Others have evaluated the lowlands of the bay (Coulton et. al. 1996) evaluating dike breach opportunities (Simenstad et. al. 1999) and tidal marsh restoration priorities (Ewald and Brophy 2012). The specific issues associated with road crossings and tidegates has been evaluated and prioritized (Bailey, 2012 and Charland, 1997).

Water quality of Tillamook Bay has been sampled and found that temperature and bacteria exceed state standards. In response, a Water Quality Management plan for agriculture (North Coast Basin Local Advisory Committee, 2011) and a water quality management plan for the entire basin has been developed by the Department of Environmental Quality (2001) to address temperature and bacterial contamination.

The following information is a summary from each major document that provides resource priorities with notes from the review of the documents. Direct text taken from the documents is presented in *italics*. The brief summaries from the documents is followed by a summary for the catchment and proposed rules of thumb for the TBWC to use in prioritizing outreach, monitoring, and restoration efforts.

Document Summaries

Kilchis Watershed Analysis (1998)

The Kilchis Watershed Analysis identified lack of large wood, lack of riparian forest vegetation, sediment from roads and elevated temperatures affecting habitat for salmon and steelhead. The report suggests reconnection of Hathaway Slough to the Kilchis River to relieve flood flows. The assessment has identified priorities for large wood placement. Recommendations include interplanting conifers in the riparian of the upper watershed and systematically addressing barriers to fish passage.

Trask Watershed Analysis (1998)

Tidal Mainstem RM 0–2: The only area for immediate protection is Hoquarten Slough, which has intact riparian stands and relatively high habitat values, but some problems with water quality. Areas for restoration are: mainstem from RM 0–2 both branches (riparian planting and addition of LWD), and Dougherty Slough (riparian planting and addition of LWD).

Mainstem RM 2–10: There are no areas for immediate protection. Areas for restoration are: mainstem RM 2–10 (riparian planting and fencing, addition of LWD, other habitat enhancement

projects), Mill Creek and Holden creek (reduce contaminant inputs, riparian planting), an unnamed creek that enters the mainstem at Trask River Rd. Bridge (riparian planting), and Hanenkrat Creek (riparian planting). Areas that could be restored, but the cost is high are: Gold Creek (restore fish passage at the hatchery, interplant conifers in riparian), and Green Ck. (replace culvert for fish passage, plant riparian on floodplain reach).

Mainstem RM 10–confluence: The only area for immediate protection is on the mainstem

(approximately RM 10.7–11.7), which has high quality riparian and high quality instream habitat. Areas for restoration are: mainstem RM 11.7–confluence (interplant conifers in riparian, other habitat enhancement projects), and small, perennial streams (interplant conifers in riparian). Areas that could be restored, but the cost is high are: the streams between Cedar and Burton Creeks (replace culverts for fish passage under Trask River Rd.).

North Fork: There are no exceptional areas for immediate protection. Areas for restoration are: entire mainstem of North Fork (interplant conifers in riparian), lower Bark Shanty Ck. (instream habitat enhancement projects, if possible remove natural barrier at RM ~1.5), and small, perennial streams (interplant conifers in riparian).

North Fork of North Fork: The only area for immediate protection is the first two miles of the mainstem above the confluence, which has high quality riparian but needs LWD additions to help retain spawning gravels and increase the number of pools. Areas for restoration are: mainstem from RM 2–headwaters (interplant conifers in riparian, addition of LWD), and small, perennial streams (interplant conifers in riparian, addition of LWD).

Middle Fork of North Fork: The only area for protection is the mainstem from RM 3 to Barney Dam, which has both high quality instream and riparian habitat. Areas for restoration are: Elkhorn, Cruiser Creeks and small, perennial streams (interplant conifers in riparian, and addition of LWD). Areas that could be restored but the cost is high are: Barney Reservoir (add fish ladder to allow fish passage to extensive habitat in upper watershed).

South Fork: The only area for immediate protection is the first seven miles of the mainstem above the confluence, which has both high quality instream and riparian habitat. Areas for restoration are: Edwards (RM 0–2.5), Joyce (RM 0–2), and Bill (RM 0–1.5) Creeks and small, perennial streams (interplant conifers in riparian, and addition of LWD).

The assessment recommends protection of Hoquarten Slough and riparian enhancement of Dougherty Slough. The report identifies riparian restoration along the lower main stem of the Trask as a priority. The report emphasizes the interplanting of conifers into deciduous riparian stands throughout the watershed. Addition of large wood in the upper portions of the watershed is consistently mentioned.

Wilson River Watershed Assessment (2001)

The watershed lacks large wood and has low large wood recruitment. The stream system lacks off-channel habitats and the streams have persistent sources of fine sediment. Sediment sources were identified as road instability, rural roads, and slope instability. Nearly 25% of the culverts assessed pose fish passage limitations. The Wilson River is temperature limited and in the lower river has bacterial contamination. The report has 6 pages of recommendations for additional data gathering, analysis and actions.

Miami River Watershed Assessment (2001)

There is a general lack of large wood in small and medium sized streams. Like the Wilson, the stream system lacks off-channel habitats and has chronic sources of fine sediment. More than 40% of the surveyed culverts limited free fish passage. The lower river is temperature limited and has elevated bacterial content. The assessment has similar recommendations to the Wilson River Watershed Assessment (E&S Environmental Chemistry, 2001b)

Trask River Watershed Assessment (2003)

Priority for conifer establishment should be given to areas in and around core salmonid spawning and rearing habitat, such as the East Fork of the South Fork and Elkhorn Creek subwatersheds. Priority consideration should also be given to tributary systems with low in-stream structural complexity, high stream temperature, high streambank erosion, and those that are important salmonid migration corridors.

Investigate causes of streambank erosion within the Elkhorn and East Fork of the South Fork Trask subwatersheds.

These recommendations should be emphasized in subwatersheds with a high incidence of roads on steep slopes and known road washouts. These include the North Fork Trask subwatershed, which has the highest proportion of road slippage problems. The South Fork and Upper Trask subwatersheds were identified in section 4.1.3.4 as priority areas to address erosion issues (sec 4.1.3.4). The North Fork North Fork subwatershed is also a priority because it has a high incidence of near-stream roads on steep slopes.

Pursue cooperative efforts to improve channel structure on stream segments that have multiple ownerships.

However, Elkhorn Creek and the East Fork South Fork subwatersheds should receive priority because of their status as Salmon Anchor Habitat. Areas that might be considered for emphasis because they are most deficient in LWD include the North Fork of North Fork, Middle Fork of the North Fork, South Fork, and Upper Trask subwatersheds.

Measures to improve salmon anchor habitat on Elkhorn Creek should focus on improving density of key LWD pieces, pool depth, and gravel area. Long-term solutions designed to increase conifers in the inner

riparian zone should be emphasized. For the short term, placement of key pieces of LWD should also be considered.

Measures to improve salmon anchor habitat on the East Fork of the South Fork should focus on improving density of key LWD pieces and increasing the area and frequency of pools. Depending upon site-specific conditions, improvements in LWD may result in improved pool characteristics. Long-term solutions designed to increase conifers in the inner riparian zone should be emphasized. For the short term, placement of key pieces of LWD should also be considered.

Identify opportunities to restore and reconnect off-channel wetlands and other high- flow refugia.

Implement the BLM road and culvert survey recommendations in the Elkhorn and the Middle Fork of the North Fork of the Trask River subwatersheds. Complete a similar type of survey for the rest of the BLM land in the Trask River watershed.

Elkhorn Creek subwatershed is the highest priority BLM area in the Trask River watershed for in-stream and riparian restoration work. Recommended projects in this area include releasing conifers and, where appropriate, planting riparian species in the riparian zone. Another priority project is to remove the section of road 2-5-10 that is directly adjacent to, and adversely affecting Cruiser Creek. This would be accomplished by redistributing the rip-rap, using an excavator, or by using other methods to restore connections with the flood plain and increase sinuosity.

he North Fork of the Trask subwatershed is the second highest priority for in-stream and riparian restoration work. In-stream work could include:

- *Increasing habitat complexity by installing instream structures where LWD is lacking. Mimic natural stream patterns as much as possible. Place key LWD pieces in natural deposition points, such as often occur at tributary junctions and below frequent debris flow sites in medium- to low-gradient streams.*
- *Creating woody debris jams to mimic windthrow in intermittent and small perennial streams.*
- *Planting native tree or shrub species in riparian areas to increase shading and/or long term LWD recruitment; this may require fencing to exclude beavers and other large herbivores.*

Work with the Tillamook Watershed Council and ODEQ to further quantify non-point sources of pollution. Expand the temperature monitoring network and locate stream segments where rapid heating occurs, especially in areas used by salmonids.

Pursue a coordinated effort to inventory culverts for fish passage across the watershed, and then prioritize projects across all land ownerships.

Coordinate with ODF to explore the feasibility of establishing a corridor of late-seral forest habitat that would connect the Nestucca Block LSR with the Trask/Little North Fork of the Wilson/Kilchis Late-Successional block. (See pg. 67 Nestucca Watershed Analysis October 1994).

East Fork of South Fork: The only area for immediate protection is the first seven miles of the mainstem above the confluence, which has both high quality instream and riparian habitat. Areas for restoration are: small, perennial streams (interplant conifers in riparian, and addition of LWD). Areas that could be restored but the probability of success is low are: Bales (RM 0–2), Blue Bus (RM 0–1.5), Scotch (RM 0–1), Pigeon (RM 0–2), Steampot (RM 0–1.5), Miller (RM 0–1.5), Boundary (RM 0–1.5), Headquarters (RM 0–1.5), Stretch (RM 0–0.5), and Rock (RM 0–0.1) Creeks (addition of LWD, and other instream habitat enhancement projects).

Miami Watershed Analysis (2005)

Minich Creek: Potential LWD sites in 0.4 miles of stream from downstream property boundary to the first bridge. This site has good access for ground-based machinery.

SF Miami: Potential LWD sites from mouth approximately 1.1 miles upstream to where the stream becomes constrained by hill slope. Only the lowest 0.25 miles is accessible for ground-based equipment. Evaluate with Engineers to determine access needs and potential problems. Identify whether to accomplish by attaching to a future sale, a service contract, or by district personnel.

Diamond Creek: Potential LWD sites from mouth to the forks approximately 0.35 miles. This site has poor access for most ground-based machinery. A "spider" may be suitable for this site as there are conifers fairly close to the stream.

Stuart Creek: Potential LWD sites in 0.6 miles of stream from downstream property boundary to the first bridge. This site needs additional examination for access options.

Stuart Creek is close to the road but has a steep hillslope between the road and the creek. Wood could still be placed in any of these streams using a cable yarder if they were hanging over the stream or by helicopter. Another option might be to use a "spider".

NF Miami: In most locations, wood placement cannot be performed under the current RGP due to size and slope of stream. Future revisions in the RGP may create additional opportunities. Alternatively, a special permit could be sought for wood placement along this stream.

Miami River mainstem. Wood placement cannot be performed under the current RGP because of stream width. Future revisions in the RGP may create additional opportunities. Alternatively, a special permit could be sought for wood placement along this stream.

Moss Creek: Limited ODF ownership and potential impacts to chum salmon. (Restoration projects could result in gravel scour from chum spawning areas. These projects could also create barriers to chum passage.)

Explore partnering with watershed councils, ODFW, and OWRD to address conditions downstream of ODF lands. Potential conditions to be addressed under this recommendation included the following:

- *Improving habitat complexity*

- *Restoring wetlands at mouth of Miami, Doty, and Vaughn*
- *Hardwood "conversion" to conifer or mixed.*
- *Restoration of low flows*

Water quality monitoring at Moss Creek Bridge for fecal coliform, total suspended solids, and nutrients.

Continue efforts to institute the Watershed Scale Effectiveness Study

A temperature monitoring program that stratifies ODF lands at confluences with major tributaries as well as ownership boundaries.

ODF should consider resurveying those ODFW habitat survey reaches that have not been surveyed since 1996. Additionally, ODF should consider expanding the surveys to include other fish bearing streams not yet surveyed.

Oregon North Coast Salmon Conservation Assessment (2008)

Four emphasis zones are described that deserve the highest conservation focus for salmon at the catchment level: the Miami and Kilchis Rivers, the Little North Fork of the Wilson River.

In the Tillamook System, key areas for coho salmon are:

- *The Little North Fork of the Wilson*
- *The Upper Miami*
- *The Upper Kilchis*
- *Devils Lake Fork of the Wilson*
- *Elkhorn Creek*
- *Ben Smith Creek*

In the Tillamook, key areas for steelhead are:

- *Upper Miami*
- *Little North Fork of the Wilson*
- *Ben Smith Creek*

Key areas for Chinook in the Tillamook system are:

- *Middle Kilchis*
- *Little North Fork of the Wilson*
- *Large reaches of the mainstem Wilson*
- *Large reaches of the mainstem Trask*

Miami and Kilchis systems are the most productive chum producers in the North Coast

Areas that had consistently low support for watershed condition are the Tillamook lowlands

A clustered group of watersheds that includes the Miami, Kilchis, and Little North Fork of the Wilson are consistently strong for several species.

Areas with timber that are more difficult to access due to steep topography (Upper Kilchis) tend to have higher watershed condition scores. These are also strong areas for salmonids.

Summary for Anchor Habitats

North Fork of Kilchis River	*Consistently high coho densities (RBA, 2005-07; ODFW 2000 - 07), consistently high coho spawner counts (ODFW, 2000-07), provides cold water to lower watershed, difficult terrain for timber harvest, part of whole watershed strategy for Kilchis, good water*
Miami River	*Unique area for multiple species. One of the highest chum producers in Oregon (ODFW); steelhead, cutthroat, coho juveniles (ODFW); cutthroat and coho abundance, consistently high (RBA, 2005-07)*
Middle Kilchis River	*Part of whole Kilchis watershed. High coho abundance and densities (RBA, 2005-07); steelhead abundance (RBA, 2005-07); high IP for steelhead; hotspot for Chum (ODFW) and Chinook (ODFW).*
Little North Fork Wilson River	*Highest producer of coho in the Tillamook watershed (RBA, 2005-07). This is a hotspot of abundance and diversity for multiple species. Several datasets back this up.*
Kilchis River	*Opportunity for whole watershed protection. High IP for chum, coho, Chinook. High Chinook spawner counts (ODFW, 1998, 2001); chum spawner counts (ODFW, multiple years), high coho densities and steelhead abundant (RBA, 2005-07), above average cutthroat (RBA)*
East Fork of the South Fork Trask River	*IP for steelhead; above average steelhead juvenile counts (2002 and 2004, ODFW); consistently high coho densities and abundance (RBA, 2005-07); above average steelhead abundance and densities (RBA, 2005-07); above average cutthroat (RBA, 2005-07)*
Ben Smith	*Consistently strong coho juvenile densities (RBA, 2005-07; ODFW, 2000-07), consistently strong coho abundance (RBA, 2005-07); consistently strong steelhead abundance (RBA, 2005-07); moderate support for good watershed condition*
Devils Lake Fork Wilson River	*High IP for coho, high coho juvenile (ODFW (1 year), 2000); consistently above average coho abundance and density (RBA, 2005-07); moderate cutthroat (RBA, 2005-07)*

Lower Devils Lake Fork Wilson River	*High IP for coho, high coho juvenile (ODFW (1 year), 2000); consistently above average coho abundance and density (RBA, 2005-07); moderate cutthroat (RBA, 2005-07)*

Dike Breach Report (1999)

Site Number	*Site Name*	*Tillamook Bay Tributary Regions*	*Contiguous Site(s)*
1	*Garibaldi-Miami River*	*Miami River*	
2	*Vaughn Creek*	*Pacific Ocean*	
3	*Kilchis River*	*Wilson & Pacific Ocean*	
4	*Hall Slough*	*Wilson & Pacific Ocean*	*#5*
5	*Wilson River*	*Wilson & Pacific Ocean*	*#4*
6	*Hall Slough East*	*Wilson*	
7	*Memaloose Point North*	*Pacific Ocean*	*#8*
8	*Memaloose Point South*	*Pacific Ocean & Trask*	*#7,#9*
9	*Nolan Slough*	*Pacific Ocean & Trask*	*#8*
10	*Tomilinson Slough*	*Pacific Ocean & Tillamook*	
11	*Tillamook North*	*Tillamook & Trask*	*#12*
12	*Trask North*	*Trask*	*#11*
13	*Tillamook Central 1*	*Tillamook & Trask*	*#16*
14	*Trask South*	*Tillamook & Trask*	
15	*Tillamook Central 2*	*Tillamook*	
16	*Tillamook Iowa*	*Tillamook & Trask*	*#13*
17	*Tillamook South*	*Tillamook*	

Nine sites are also associated in four contiguous blocks, usually separated by cross dikes, minor roads and/or channels. Because we cannot identify the integrity of the separation between these sites, we cannot preclude that returning tidal inundation to one will not result in flooding of a contiguous site. Combined, they may represent the following, potentially larger and more complex, sites:

- *#4-Hall Slough and #5-Wilson River = 198.2 ha combined*
- *#7-Memaloose Point North, #8-Memaloose Point South, and #9-Nolan Slough =158.9 ha combined*
- *#11-Tillamook North and #12-Trask North = 90.8 ha combined*
- *#13-Tillamook Central 1 and #16-Tillamook Iowa = 52.8 ha*

Tidal Wetland Prioritization (2012)

The largest high-priority sites were along the eastern bay fringe; other high-priority sites were identified along Hathaway, Squeedunk, Hall and Hoquarten Sloughs; and in the upper tidal reaches of the Tillamook River. Twenty-one sites (1809A, about 30% of the wetland area) were ranked "medium-high;" the largest of these were located in the Trask and Tillamook sub-basins. Most of the remaining sites (55 sites, totaling 2911A) were in the medium and medium-low

groups. Only 10 sites (430A) were ranked "low;" these lower-ranked sites should not be considered substantially different from the "medium-low" sites due to the factors listed above.

Many of the prioritized sites were located in sub-basins and other geographic areas prioritized in previous studies of the Tillamook Bay estuary and watershed. For example, the USACE Feasibility Study (USACE 2005) and Project Exodus (NHC and HBH Consulting Engineers 2010) recommended wetland acquisition, restoration and flow management covering several high and medium-high priority sites (Sites 38, 39, 40, 44, 52, and 53, plus parts of several other sites). The large, high-priority tidal marsh sites on the eastern bay fringe were ranked high for juvenile salmonid production potential by Simenstad et al. (1999). The high and medium-high priority sites along the Tillamook River were within sub-basins prioritized for coho intrinsic potential and landowner outreach in the Tillamook Bay Computational Ecological Restoration Prioritization (CERP) tool. Most of the prioritized wetlands were within the lowland floodplain area identified in the Integrated River Management System (Philip Williams and Associates 2002); levee and dike modifications (such as wetland restoration via dike breaching or dike setbacks) were recommended in this area.

This prioritization is a first step in strategic planning for conservation and restoration in the Tillamook Bay estuary. ***In general, the next step in action planning involves outreach to find those landowners interested in restoring or conserving the identified sites.***

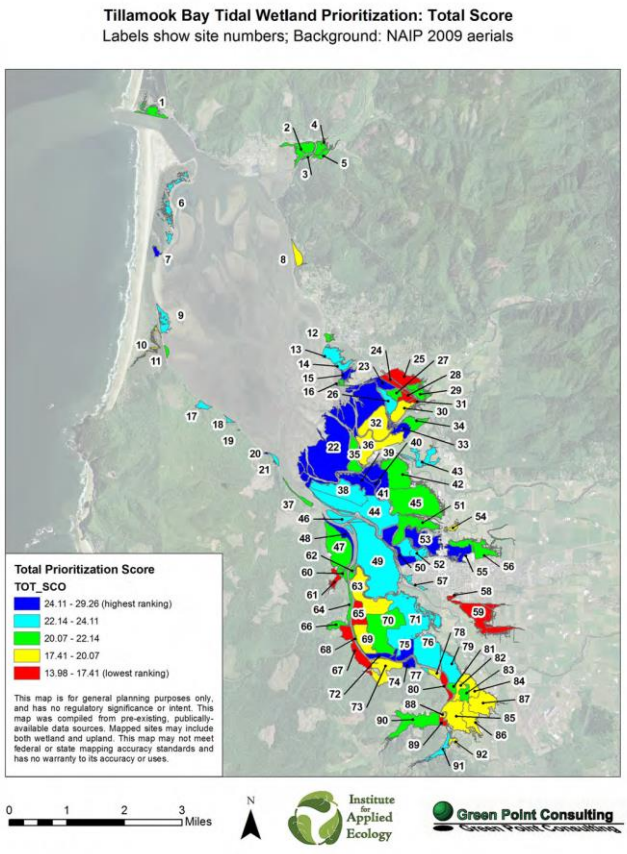


Figure 2: Prioritized Tidal Marsh Restoration Sites from Ewald and Brophy (2012)

Culvert Assessment and Prioritization Plan for Fish Passage in the Tillamook Bay Watershed (2012)

We identified 1,526 potential crossings through the initial GIS-based identification effort discussed above. We did not receive permission to access 362 of the GIS-identified crossing locations that occurred on private lands or required travel on private roadways.

We visited 853 of the 1,526 GIS-identified crossings during field work for this report. In addition, we collected information on 20 crossings not identified by GIS, but which appeared notable to field crews when observed in the field. Therefore, we surveyed a total of 873 crossings for this report. We identified 658 NFC crossings (465 culverts, 190 bridges, two fords, and one hatchery diversion structure) and 215 Fish Culverts: 21 (10 percent) were not barriers to juvenile fish passage (Green), 36 (17 percent) were partial barriers to juvenile fish passage (Gray) and 156 (73 percent) were complete barriers to juvenile fish passage (Red). We lacked sufficient information for two culverts to determine a barrier rating (2 unknown – 1 percent).

Kilchis River Basin - We surveyed 24 fish culverts in the Kilchis River Basin (Table 3). These crossings affected a total of approximately 12.4 miles of upstream habitats (Table 9). There were 10 High Priority culverts in this basin. We rated four culverts in the Kilchis Basin as Medium Priority. Six culverts in this basin received scores that placed them in the Low Priority range. In addition, four culverts in this basin received scores that would have placed them in the Low Priority range, but these did not appear to be barriers to fish passage at the time of our survey.

Miami River Basin - We surveyed 21 fish culverts in the Miami River Basin (Table 4). These crossings affected a t otal of approximately 13.8 miles of upstream habitats (Table 9). There were seven High Priority culverts in this basin. We rated six culverts in the Miami Basin as Medium Priority. Six culverts in this basin received scores that placed them in the Low Priority range. In addition, two culverts in this basin received scores that would have placed them in the Low Priority range, but these did not appear barriers to fish passage at the time of our survey.

Tillamook Bay Tributaries - We surveyed 35 fish culverts on streams that outlet directly into Tillamook Bay or Cape Meares Lake (Table 5). These crossings affected a total of approximately 13.8 miles of upstream habitats (Table 9). There were 13 High Priority culverts on these streams. Notably, 10 of these 13 crossings occur on two streams in the Bay City area: Patterson Creek and Doty Creek. We rated 13 culverts on Tillamook Bay tributaries as Medium Priority. Nine culverts in this basin received scores that placed them in the Low Priority range.

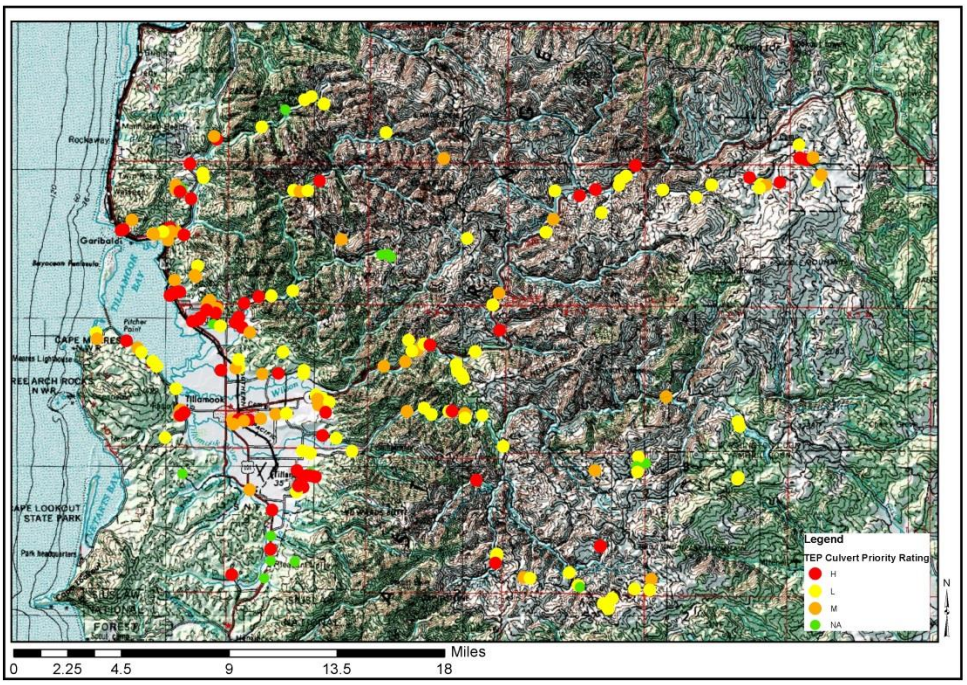
Tillamook River Basin - We surveyed 15 fish culverts in the Tillamook River Basin (Table 6). These crossings affected a total of approximately 35.6 miles of upstream habitats (Table 9). There were five High Priority culverts in this basin. We rated three culverts in the Tillamook Basin as Medium Priority. Two culverts in this basin received Low Priority ratings. Additionally, we surveyed two culverts in this basin that did not appear to be barriers to fish passage at the time of our survey, but received scores that would have placed them in the High Priority range (due

primarily to the quality and quantity of upstream habitats). There were three similar culverts that received scores that would have placed them in the Medium Priority range.

Trask River Basin - We surveyed 64 fish culverts in the Trask River Basin (Table 7). These crossings affected a total of approximately 35.8 miles of upstream habitats (Table 9). There were 17 High Priority culverts in this basin. We rated 11 culverts in the Trask Basin as Medium Priority. Thirty (30) culverts in this basin received Low Priority ratings. Additionally, we surveyed one culvert in this basin that did not appear to be a barrier to fish passage at the time of our survey, but received a score that would have placed it in the High Priority range (due primarily to the quality and quantity of upstream habitats). There were three similar culverts that received scores that would have placed them in the Medium Priority range and two that scored in the Low Priority range.

Wilson River Basin - We surveyed 56 fish culverts in the Wilson River Basin (Table 8). These crossings affected a total of approximately 30.9 miles of upstream habitats (Table 9). There were 12 High Priority culverts in this basin. We rated 10 culverts in the Wilson Basin as Medium Priority. Twenty-eight (28) culverts in this basin received Low Priority ratings. Additionally, we surveyed one culvert in this basin that did not appear to be a barrier to fish passage at the time of our survey, but received a score that would have placed it in the Medium Priority range (due primarily to the quality and quantity of upstream habitats). There are three similar culverts that received scores that would have placed them in the Low Priority range. Finally, two culverts in this basin were on public roads, but we were unable to collect any data on them because we did not have access to the adjacent private property. As a result, we were unable to calculate a prioritization score for these culverts.

Figure 3: Culvert Priority Locations



Tillamook County Nutrient Management (2014)

The Tillamook office of the Natural Resources Conservation Service has adopted a nutrient management program as a Conservation Implementation Strategy for Tillamook County. This effort is to direct federal Environmental Quality Incentive Program (EQUIP) funds to address the issues associated with manure spreading from dairy operations. The program goal is to "*Improve water quality through proper application rates and timing to reduce or eliminate loss of fecal coli forms to surface water adjacent to Tillamook County Pasture and Hay land*." The program is targeted to the lowland portions of the Tillamook Bay basin.

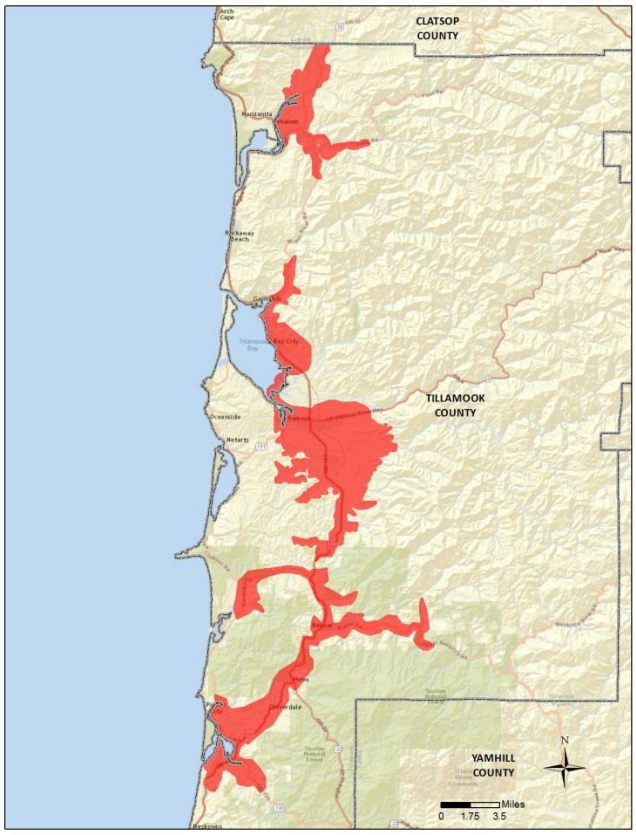


Figure 4: Tillamook County Nutrient Management Conservation Implementation Strategy Area

Tillamook Channel Stability (2012)

This report summarizes a preliminary study of bed-material transport, vertical and lateral channel changes, and existing datasets for the Tillamook (drainage area 156 square kilometers [km2]), Trask (451 km2), Wilson (500 km2), Kilchis (169 km2), Miami (94 km2), and Nehalem (2,207 km2) Rivers along the northwestern Oregon coast. This study, conducted in cooperation with the U.S. Army Corps of Engineers and Oregon Department of State Lands to inform permitting decisions regarding instream gravel mining, revealed that:

Study areas along the six rivers can be divided into reaches based on tidal influence and topography. The fluvial (nontidal or dominated by riverine processes) reaches vary in length (2.4–9.3 kilometer [km]), gradient (0.0011–0.0075 meter of elevation change per meter of channel length [m/m]), and bed-material composition (a mixture of alluvium and intermittent bedrock outcrops to predominately alluvium). In fluvial reaches, unit bar area (square meter of bar area per meter of channel length [m2/m]) as mapped from 2009 photographs ranged from 7.1 m2/m on the Tillamook River to 27.9 m2/m on the Miami River.

In tidal reaches, all six rivers flow over alluvial deposits, but have varying gradients (0.0001–0.0013 m/m) and lengths affected by tide (1.3–24.6 km). The Miami River has the steepest and shortest tidal reach and the Nehalem River has the flattest and longest tidal reach. Bars in the tidal reaches are generally composed of sand and mud. Unit bar area was greatest in the Tidal Nehalem Reach, where extensive mud flats flank the lower channel.

Background factors such as valley and channel confinement, basin geology, channel slope, and tidal extent control the spatial variation in the accumulation and texture of bed material. Presently, the Upper Fluvial Wilson and Miami Reaches and Fluvial Nehalem Reach have the greatest abundance of gravel bars, likely owing to local bed-material sources in combination with decreasing channel gradient and valley confinement.

Natural and human-caused disturbances such as mass movements, logging, fire, channel modifications for navigation and flood control, and gravel mining also have varying effects on channel condition, bed-material transport, and distribution and area of bars throughout the study areas and over time.

Existing datasets include at least 16 and 18 sets of aerial and orthophotographs that were taken of the study areas in the Tillamook Bay tributary basins and Nehalem River basin, respectively, from 1939 to 2011. These photographs are available for future assessments of long-term changes in channel condition, bar area, and vegetation establishment patterns. High resolution Light Detection And Ranging (LiDAR) surveys acquired in 2007–2009 could support future quantitative analyses of channel morphology and bed-material transport in all study areas. A review of deposited and mined gravel volumes reported for instream gravel mining sites shows that bed-material deposition tends to rebuild mined bar surfaces in most years. Mean annual deposition volumes on individual bars exceeded 3,000 cubic meters (m3) on Donaldson Bar on the Wilson River, Dill Bar on the Kilchis River, and Plant and Winslow Bars on the Nehalem River. Cumulative reported volumes of bed-material deposition were greatest at Donaldson and Dill Bars, totaling over 25,000 m3 per site from 2004 to 2011. Within this period, reported cumulative mined volumes were greatest for the Donaldson, Plant, and Winslow Bars, ranging from 24,470 to 33,940 m3.

Analysis of historical stage-streamflow data collected by the U.S. Geological Survey on the Wilson River near Tillamook (14301500) and Nehalem River near Foss (14301000) shows that these rivers have episodically aggraded and incised, mostly following high flow events, but they do not exhibit systematic, long-term trends in bed elevation.

Multiple cross sections show that channels near bridge crossings in all six study areas are dynamic with many subject to incision and aggradation as well as lateral shifts in thalweg position and bank deposition and erosion.

In fluvial reaches, unit bar area declined a net 5.3–83.6 percent from 1939 to 2009. The documented reduction in bar area may be attributable to several factors, including vegetation establishment and stabilization of formerly active bar surfaces, lateral channel changes and resulting alterations in sediment deposition and erosion patterns, and streamflow and/or tide differences between photographs. Other factors that may be associated with the observed reduction in bar area but not assessed in this reconnaissance level study include changes in the sediment and hydrology regimes of these rivers over the analysis period.

In tidal reaches, unit bar area increased on the Tillamook and Nehalem Rivers (98.0 and 14.7 percent, respectively), but declined a net 24.2 to 83.1 percent in the other four tidal reaches. Net increases in bar area in the Tidal Tillamook and Nehalem Reaches were possibly attributable to tidal differences between the photographs as well as sediment deposition behind log booms and pile structures on the Tillamook River between 1939 and 1967.

The armoring ratio (ratio of the median grain sizes of a bar's surface and subsurface layers) was 1.6 at Lower Waldron Bar on the Miami River, tentatively indicating a relative balance between transport capacity and sediment supply at this location. Armoring ratios, however, ranged from 2.4 to 5.5 at sites on the Trask, Wilson, Kilchis, and Nehalem Rivers; these coarse armor layers probably reflect limited bed-material supply at these sites.

On the basis of mapping results, measured armoring ratios, and channel cross section surveys, preliminary conclusions are that the fluvial reaches on the Tillamook, Trask, Kilchis, and Nehalem Rivers are currently sediment supply-limited in terms of bed material—that is, the transport capacity of the channel generally exceeds the supply of bed material. The relation between transport capacity and sediment is more ambiguous for the fluvial reaches on the Wilson and Miami Rivers, but transport-limited conditions are likely for at least parts of these reaches. Some of these reaches have possibly evolved from sediment supply-limited to transport-limited over the last several decades in response to changing basin and climate conditions.

Because of exceedingly low gradients, all the tidal reaches are transport-limited. Bed material in these reaches, however, is primarily sand and finer grain-size material and probably transported as suspended load from upstream reaches. These reaches will be most susceptible to watershed conditions affecting the supply and transport of fine sediment.

Compared to basins on the southwestern Oregon coast, such as the Chetco and Rogue River basins, these six basins likely transport overall less gravel bed material. Although tentative in the absence of actual transport measurements, this conclusion is supported by the much lower

area and frequency of bars and longer tidal reaches along all the northcoast rivers examined in this study.

Previous studies suggest that the expansive and largely unvegetated bars visible in the 1939 photographs are primarily associated with voluminous sedimentation starting soon after the first Tillamook Burn fire in 1933. However, USGS studies of temporal bar trends in other Oregon coastal rivers unaffected by the Tillamook Burn show similar declines in bar area over approximately the same analysis period. In the Umpqua and Chetco River basins, historical declines in bar area are associated with long-term decreases in flood magnitude. Other factors may include changes in the type and volume of large wood and riparian vegetation (emphasis added)*. Further characterization of hydrology patterns in these basins and possible linkages with climate factors related to flood peaks, such as the Pacific Decadal Oscillation, could support inferences of expected future changes in vegetation establishment and channel planform and profile.*

More detailed investigations of bed-material transport rates and channel morphology would support assessments of lateral and vertical channel condition and longitudinal trends in bed material. Such assessments would be most practical for the fluvial study areas on the Wilson, Kilchis, Miami, and Nehalem Rivers and relevant to several ongoing management and ecological issues pertaining to sand and gravel transport. Tidal reaches may also be logical subjects for indepth analysis where studies would be more relevant to the deposition and transport of fine sediment (and associated channel and riparian conditions and processes) rather than coarse bed material.

Summary

The Importance of the Tillamook Watersheds for Salmon

Five rivers pour into Tillamook Bay, and together they are among Oregon's most important coastal rivers for salmon and steelhead. This is one of a few places where six different fish stocks return each year from the sea. The Tillamook Bay tributaries are known for wild runs of Chum, Coho, Spring and Fall Chinook, Winter Steelhead and Sea-Run Cutthroat Trout. Within these basins are eight crucial Salmon Anchor Habitats, these are identified as critically important areas for spawning and rearing of various anadromous species. Tillamook Bay hosts an average of 30,000 wild fall Chinook alone. Wild Spring Chinook populations, on the other hand have plummeted to extremely low levels.

There has been significant analysis of salmon use, production and habitat conditions of the tributaries to Tillamook Bay. The information points to the fact that the portions of the catchment that are dominated by igneous geology provide the gravel for spawning and low gradient, unconfined portions of the streams are the areas critical for abundant salmon and steelhead production. Anchor habitats have been identified in the Wilson, Trask, Kilchis and Miami Rivers. While the Tillamook does not have habitats that qualified as "anchor habitats, Low gradient streams are important for coho salmon. The underlying geology and geomorphic structure that provides the building blocks for habitat to support strong populations of

salmonids is illustrated in Figure 5. Assuring there is a complexity of tributary and river floodplain habitats and intertidal marshes will allow for multiple life history expressions of each salmon species.

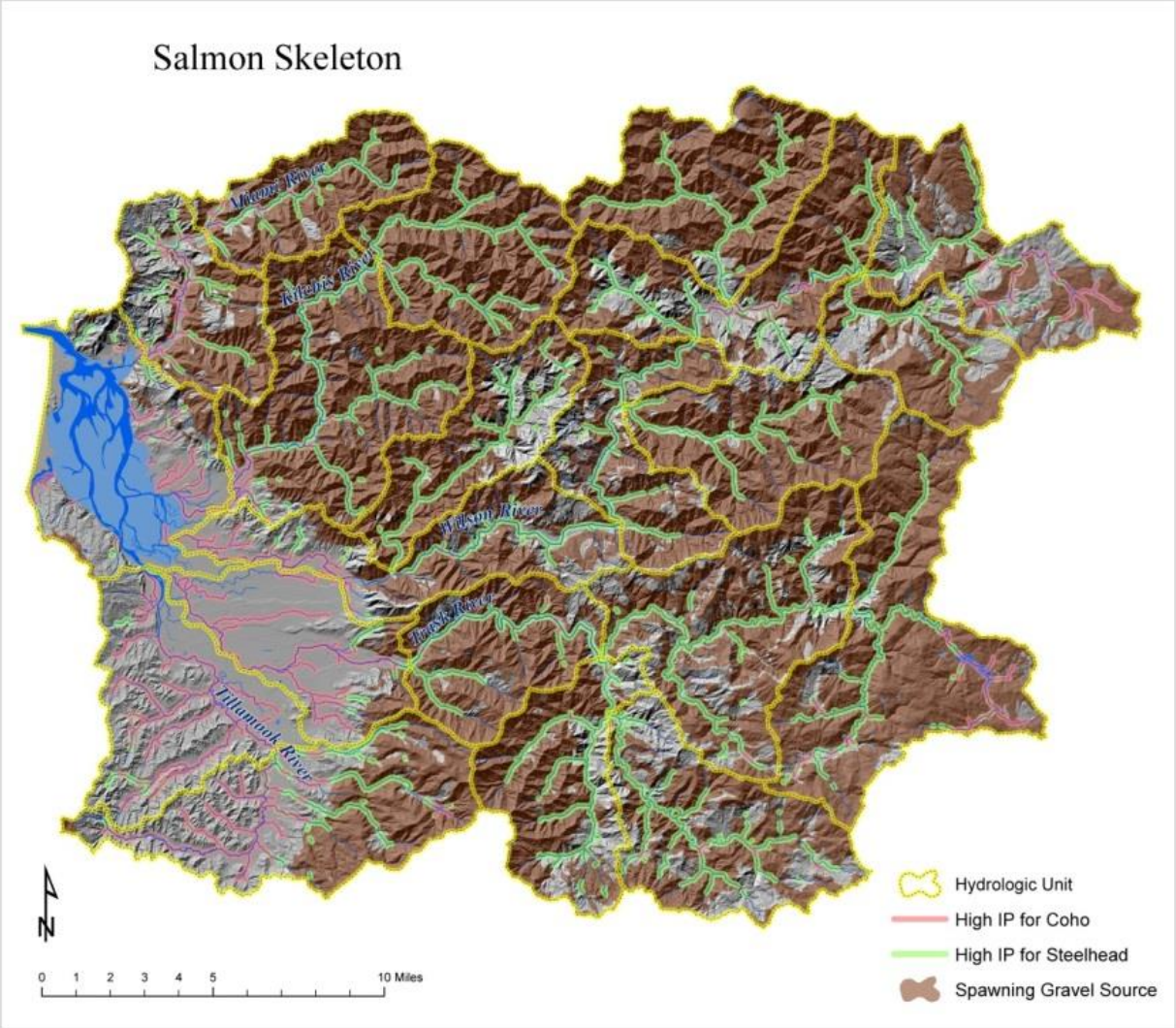


Figure 5: Structural elements that support habitat forming processes for salmon in the Tillamook catchment.

Tillamook as an Altered Landscape

The Tillamook catchment reflects both a result of large-scale natural events (forest fire) and significant human intervention (forest planting, flood control, road building, etc.). Historical changes in the catchment include large scale fires some eight decades ago, increased sedimentation of the estuary, loss of tidal reach through diking and tidegating, reduction of floodplain access by flood control dikes and reduction of stream dynamics by loss of large wood and bank hardening. The historic lowlands were a complex of tidal and non-tidal wetlands

(Figure 6).The catchment has been traversed by roads which present impacts from fine sediment, impedance of fish passage and other effects. Along with over-harvest of anadromous fish, the result is a loss of productivity from the tributary streams. Figure 7 shows the geographic extent of historic fires, human alteration of forest vegetation for agriculture, urban and rural residential development, flood control and conversion of tidelands to pasture and road development. Reversing some of the loss of habitat connectivity and habitat simplification can help to increase aquatic productivity.

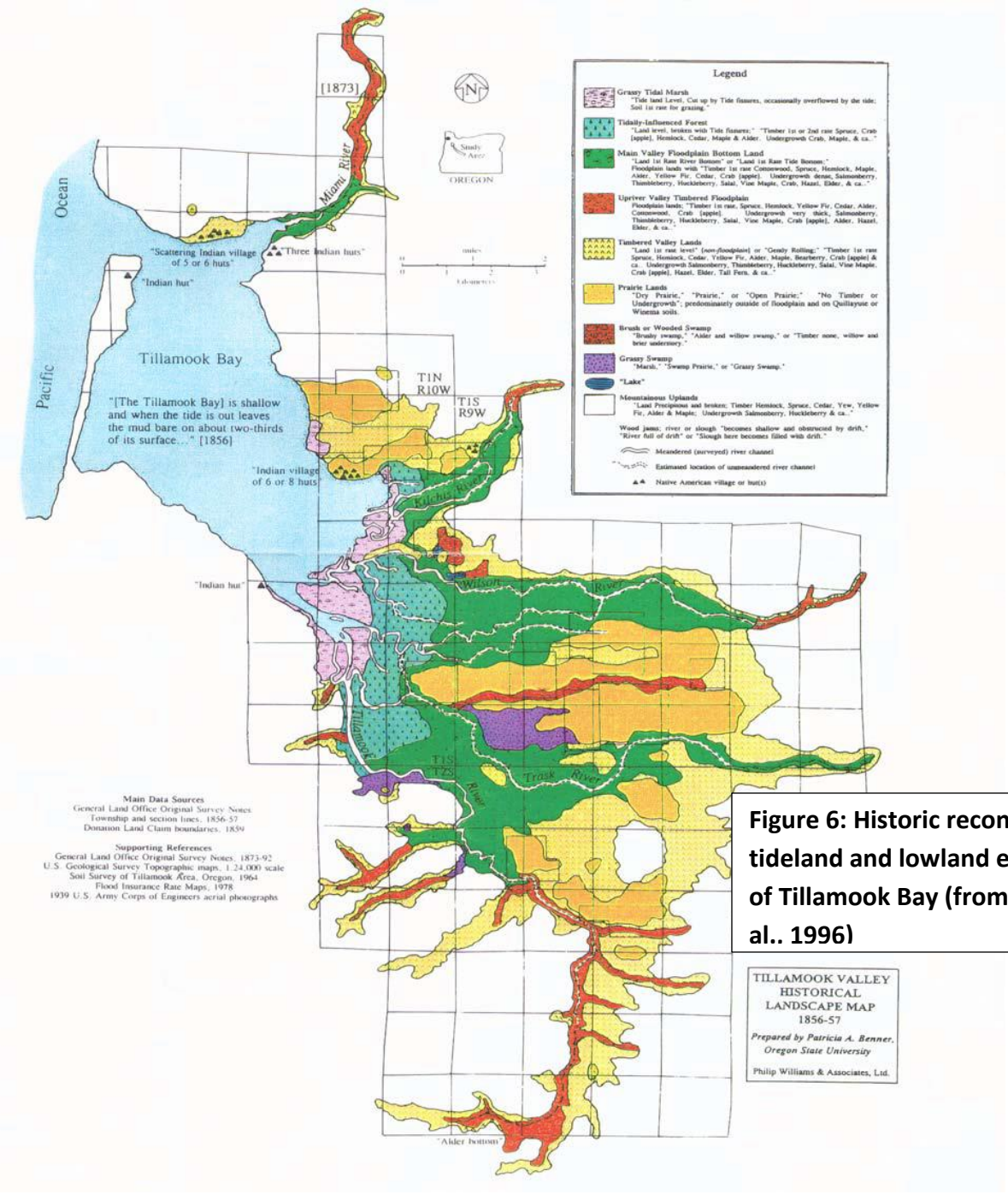


Figure 6: Historic reconstruction of tideland and lowland environments of Tillamook Bay (from Coulton et. al.. 1996)

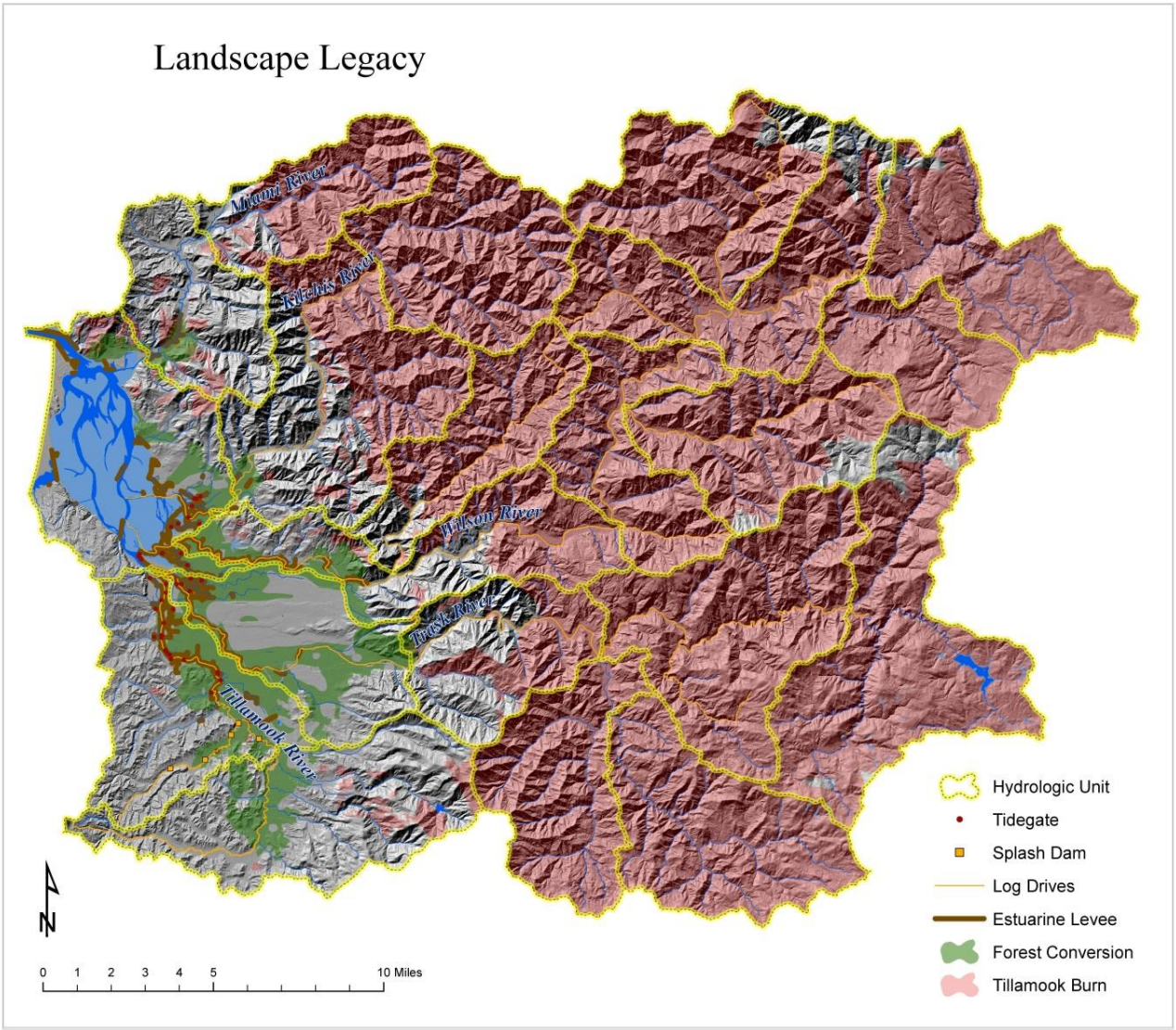


Figure 7: Dominant landscape alterations in the Tillamook catchment.

Current Land Use and Management Emphasis

The history of the Tillamook catchment has a significant effect on current management and land uses. The two dominant forces have been the Tillamook Burn fires and replanting of the forest and subsequent state management of the Tillamook State Forest and the flood control and conversion of tidelands and other wetlands to agricultural uses, especially dairy use.

Forest Lands: The Tillamook basin is unique in the recovery following large-scale fires in the catchment. As the Tillamook State Forest approaches commercial harvest age according to industry standards, there will be significant pressure for reentry and harvest. Management of the Tillamook State Forest will have a significant effect on the catchment that drains to

Tillamook Bay. The Tillamook State Forest is manages using a "structure based management" concept that is intended to provide older stand characteristics on the landscape through time. Structure-based management is designed to emulate many aspects of natural stand development patterns and to produce structural components found in natural stands, but in fewer years. By anticipating future patterns of forest development, foresters predict the potential for individual stands to produce specific characteristics such as a multi-layered canopy. The management also includes terrestrial and aquatic "anchor habitats" that emphasize current high diversity and productivity areas for terrestrial and aquatic species. Oregon Department of Forestry is currently updating their forest management plan.

"The Oregon Board of Forestry concluded in 2012 that the current approach for managing state-managed forestlands was not financially viable. A Board of Forestry subcommittee was formed to address these financial viability issues. Outcomes included directing the State Forests Division to examine alternatives to the current Forest Management Plan (FMP) for Northwest Oregon" (from ODF Staff report of November 5, 2014).

Both the U.S. Forest Service and Bureau of Land Management operate under the Northwest Forest Plan developed in 1995. While neither federal agency has extensive holdings in the Tillamook Bay watersheds, their lands are managed with an emphasis on either Adaptive Management or Late Seral management emphasis. U. S. Forest Service ownership (limited to a small area of the Trask watershed) is managed dominantly for late seral characteristics. The Bureau of Land Management parcels are relatively small and scattered in the lower Trask, Wilson and Kilchis drainages.

Private industrial forests are managed as tree plantations with a relatively short harvest rotation (typically 40 years).

The Garibaldi Forest managed by Ecotrust Forest Management (EFM) is managed for conservation and timber values. Ecotrust is a 501(c) nonprofit organization. Ecotrust Forest Management is a for profit affiliate of Ecotrust that does manage for conservation values but also does harvest timber on Garibaldi Forest under FSC certified practices using variable retention harvest, small openings, longer harvest rotations, no herbicide use in forest production, retention of older trees and forest structure, and other ecological forestry concepts.

Each entity that owns and manages forest resources in the Tillamook Bay catchment will have a different interest and need for assistance in identifying and implementing restoration projects. Care should be taken to recognize the various interests and limitations and challenges they pose. The council will need to build strong relationships with the private forest landowning community and have an understanding of the management directions for each of the different public owners. Forest land ownership patterns and management directions will change with changes in the economy and political changes at the state and federal levels of government.

Evaluating whether broadcast herbicide spraying is entering the aquatic environment could be a monitoring effort if done in conjunction with both industry and state forest landowners.

Agricultural Lands: The lowlands of the Tillamook Bay catchment have been significantly altered historically. An estimated 85-90% of the tidal freshwater and salt marshes in the Tillamook Bay catchment have been converted to other uses. While most of that conversion was done in the past, often with federal assistance there has been little cumulative effects analysis.

Farming produces almost 20 percent of the County's income on only 5 percent (approximately 35,000 acres) of its land. The North Coast Basin Agricultural Water Quality Management Area Plan characterizes the Tillamook catchment as: *"Of the five rivers in the Tillamook watershed, the Tillamook River flows through the most agricultural acres of the five Tillamook coastal plain rivers. It is also the slowest with the most meanders, making its way through the area's poorest drained soils. The other four major rivers emanate from steeper watersheds and move much faster through the system to the bay. Most dairies are in the Tillamook Basin… There are nine drainage districts in Tillamook County, incorporating several hundred acres in tidal lands. It is estimated that at least one-quarter of Tillamook agricultural lands are in these drainage districts."*

There has been a long-term dialog about the effects of habitat restoration on the viability of Tillamook Bay agriculture. Recognition of this perception and consideration of the economic viability of the agricultural industry will be an important factor in the evaluation of potential habitat restoration projects. The concern about loss of productive lands to conservation is not unique to Tillamook. Research in Australia (Aarons, 2011; Aarons & Gourley, 2012; Aarons et.al., 2013) show that the concern over lost productivity has complex considerations.

Managing nutrients from dairy waste has been a long term and chronic issue in Tillamook County. The listing of Tillamook Bay for exceedance of bacterial criteria and the frequent closure of shellfish harvest has resulted in conflict and the development of a TMDL for bacteria. NRCS has dedicated both evaluation (NRCS, 2001) and funding (NRCS and Tillamook SWCD, 2014) to reduce bacterial contamination in Tillamook Bay. While some progress has been made, it has been incremental.

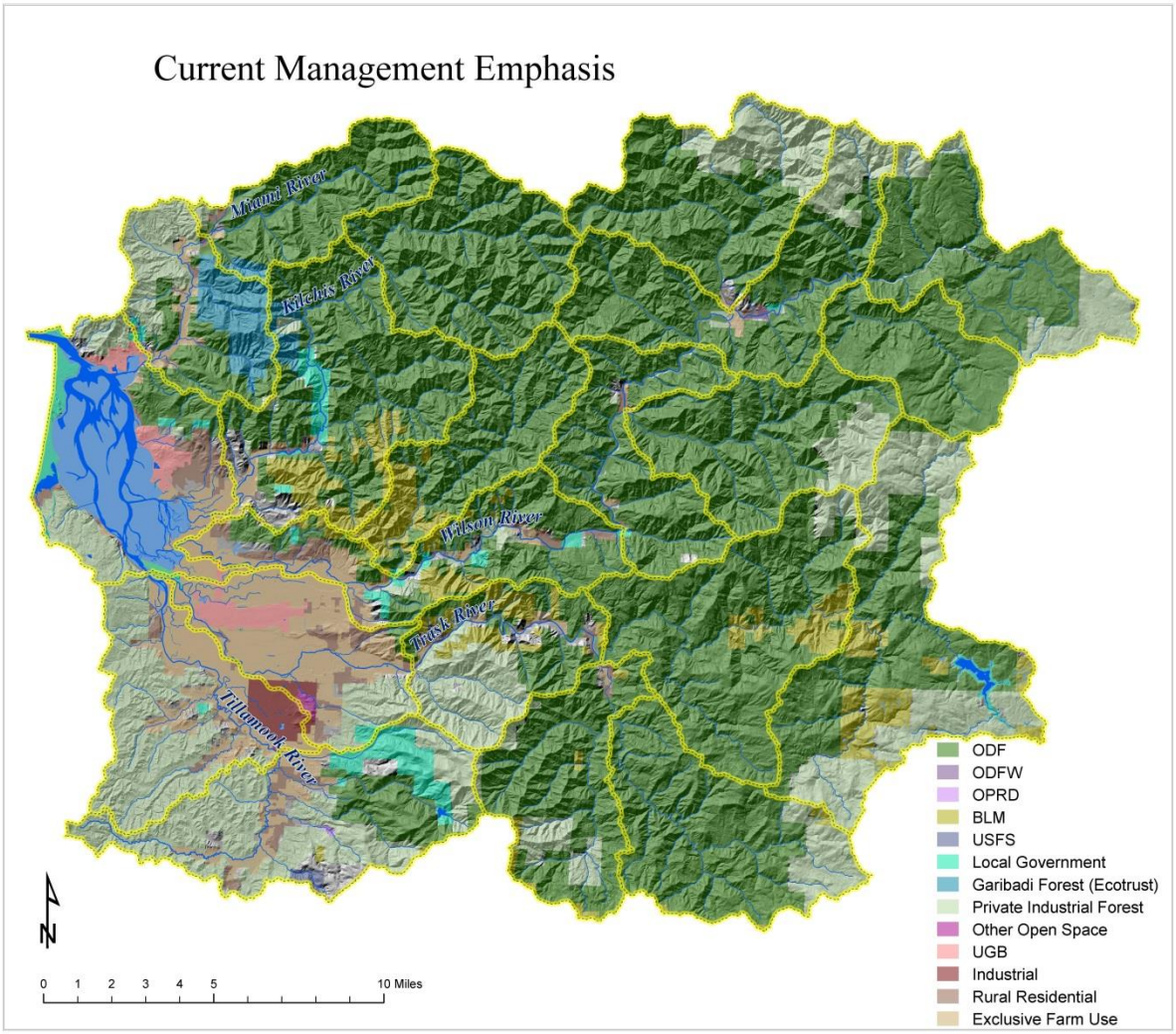


Figure 8: Current Land Ownership and Uses in the Tillamook Bay catchment

Tributary Summaries

From the information in the reports reviewed, the following is a brief summary of the conditions, challenges and opportunities for each tributary to Tillamook Bay (Figure 9). The Watershed summaries are taken mostly from the CERP document (Demeter Design, 2009).

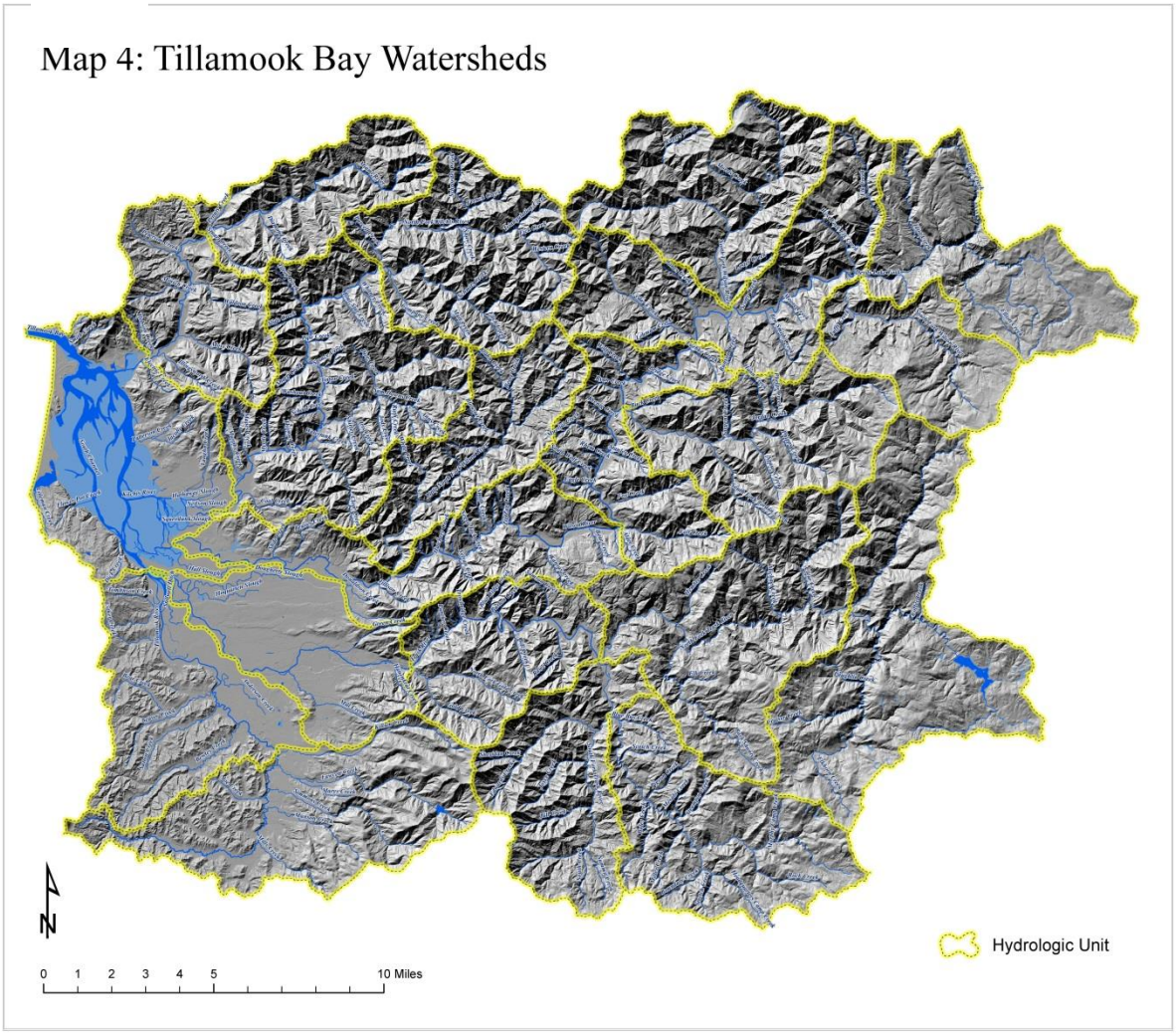


Figure 9: Tillamook Bay Catchment and Tributary Watersheds

Tillamook River

The Tillamook River is the southernmost basin in the TBW. The Western portion of the watershed is underlain by sandstone geology, resulting in low gradient streams with broad floodplains. The eastern portion of the watershed is dominated by a volcanic geology, resulting in higher gradient streams, with larger substrate size and narrower floodplains. Historically the lower portion of the mainstem formed the same interconnected network of sloughs and tidal wetlands as the other four rivers although diking reduces much of this historical network. The

basin is ~60 square miles. The Tillamook River watershed is a heavily altered, relatively low gradient stream with sandstone geology. The Tillamook historically produced coho salmon because of the low gradient and complex channel network. The history of log drives and splash damming has left the Tillamook scoured and simplified. The conversion of the lower river to pasture has left a legacy of altered stream courses and reduced aquatic productivity.

Coho, Steelhead, Cutthroat, Sturgeon, and Chum utilize portions of the Tillamook River Basin. Steelhead populations are largest within the higher gradient, volcanic streams of the Eastern Basin (Killam, Fawcett, Munson, and Simmons). Coho populations are largest in the upper Mainstem and Bewley Creek. The 2008 ***Tillamook River Coho Restoration Strategy; Habitat Assessment and Limiting Factors Analysis*** (Demeter Design, 2008) completed for the TBWC provides significant detail on the historical impacts and factors limiting coho and chum salmon and steelhead production from the Tillamook watershed.

Legacy Impacts: While the Tillamook drainage was generally spared from the Tillamook burn fires, it has been heavily logged, and the lowlands have been extensively altered by dikes and levees. The highly erodible sediments in the bulk of the watershed limit the inherent capacity of the Tillamook River to support a diversity of salmon. The low gradient stream sections are, however, important historical producers of coho and chum salmon.

Current Management Emphasis: The uplands are nearly all in private industrial forest ownership and managed as tree plantations. The lowlands are pastured for dairy and have a significant number of the dairy cows in the Tillamook Bay catchment (Strittholt et.al., undated).

Restoration Challenges/Priorities: Summer temperature is the consistent limiting factor for the Tillamook River. Water quality in the major streams of the Miami River watershed would be considered impaired because of the frequency of exceedence of the evaluation criteria for temperature, nitrogen, and bacteria. A primary issue is the lack of undisturbed stream reaches on mainstem channels. The Tillamook River watershed is not meeting potential conditions and many improvements can be made to increase Coho smolt survival, specifically riparian planting along the mainstem and log placement in the eastern tributaries. There are 5 high priority fish passage barriers identified for the Tillamook River. The 2008 report identifies twenty five high priority restoration projects and four conservation priorities. These projects and priorities remain important for TBWC.

Miami River

The Miami River drains approximately 36.7 sq. mi. of land and is the smallest watershed of the Tillamook Bay drainage. The watershed is characterized by steep forested uplands and flat alluvial lowlands. Much of the higher elevations have been harvested for timber or were burned as a part of the Tillamook Burns and are now second growth forests. The lower Miami River drains agricultural and rural residential areas and enters Tillamook Bay adjacent to the City of Garibaldi. There is a marked contrast between conditions in the uplands where forest and natural resource uses are dominant and the lowlands and valley bottoms where

agricultural, rural residential, and urban uses prevail. In general, aquatic and riparian resources are the most heavily impacted in the lowlands, while conditions are the best in the uplands. Many of the stream reaches in the Miami watershed are low gradient channel types sensitive to disturbance and important habitat for anadromous salmonids.

Cutthroat, Chum, Steelhead, Chinook, and Coho Salmon are present throughout the basin. The Miami was the least productive basin for Coho of the five rivers tributary to Tillamook Bay. The mainstem produces the vast majority of the Coho, with Moss, Illingsworth, Peterson, and Prouty Creeks producing significant numbers of juveniles as well. The lower river has excellent potential for Chum production.

Legacy Impacts: The Tillamook Burn, road building, salvage logging, and timber harvest, conditions has resulted in sediment in the rivers and streams of the Miami River watershed. Roads are the primary source of sediment related to human activity. Levels of in-stream LWD and current and future recruitment from upslope and streamside forests are the primary factor limiting aquatic habitat conditions. Based on aquatic habitat survey data, only two stream reaches are considered to have adequate pieces or volume of large wood on ODF lands.

Current Management Emphasis: The upper watershed is managed by Oregon Department of Forestry. The Garibaldi Forest managed by Ecotrust Forestry is lower in the watershed from Tillamook State Forest lands and is managed for conservation values and timber production.

Restoration Challenges/Priorities: The Oregon Department of Forestry has identified the following restoration activities for the Upper Miami watershed: alternative vegetation management to improve large wood recruitment potential; in-stream enhancement to improve habitat complexity; enhance conditions on lands downstream from ODF lands; and upgrades to further minimize potential road related risks to aquatic and riparian resources. Restoration of riparian vegetation and prevention of livestock grazing near streambanks will lessen sediment contribution from streambank erosion. There are 7 high priority fish passage barriers identified for the Miami. The Miami Watershed Assessment has identified specific stream reaches and priorities for these actions.

Kilchis River

The Kilchis River is the third largest drainage in the TBW. The Kilchis River is dominated by a highly resistant volcanic lithology that forms the high-gradient, confined stream channels found throughout much of the stream network. The lowest reaches of the mainstem consist of an interconnected network of sloughs and tidal wetlands. The watershed encompasses ~65 sq miles and has a peak elevation of 3,294 ft.

The Kilchis River from the Little South Fork to Sharp Creek has high intrinsic potential for coho salmon. The Kilchis river supports populations of Coho, Steelhead, Chinook, Cutthroat, as well as Chum in the lower basin. It is the third largest producer of Coho among the five rivers.

Legacy Impacts: The Cedar Butte fire burned portions of the Kilchis Watershed in 1918. The Tillamook Burn profoundly affected the use of forest lands in the Kilchis watershed. The majority of the uplands of the Kilchis are in the Tillamook State Forest. There is a small acreage of Bureau of Land Management lands and private forest lands. The Kilchis County Park lies along a portion of the mainstem Kilchis River. The Kilchis Park contains a rare remnant pocket of old growth forest and undisturbed river corridor.

Early settlers came to Tillamook beginning in 1851 primarily to farm and they recognized the rich agricultural potential of the lowlands. Within 30 years of the initial settlement, much of the lowland forest was cleared, diked, and drained to increase the amount of land available for agriculture. A significant portion of the lower intertidal and freshwater wetland areas was converted to pasture by the early 1900s (Coulton et al. 1996).

Current Management Emphasis: The upper Kilchis is dominantly State Forest land managed by the Department of Forestry. The lowlands are dominantly dairy pasture.

Restoration Challenges/Priorities: Much like the Miami, Wilson and Trask, the Kilchis uplands have been altered by fire and salvage logging that nearly eliminated large wood from channels and have hardwood dominated riparian areas. There are 10 high priority fish passage barriers identified for the Kilchis.

Wilson River

The Wilson River is the largest drainage in the TBW. The Wilson River is dominated by a resistant, volcanic lithology. This results in relatively high gradient, confined stream channels throughout much of the upper stream network. However, local areas of low gradient, broad floodplain channels are found throughout the upper basins. Devil's Lake Fork is an example of such a segment. The lower portion of the mainstem forms an interconnected network of sloughs and tidal wetlands in conjunction with the Tillamook, Trask, and Kilchis Rivers. The watershed encompasses ~194 sq miles and has a peak elevation of 3,691 ft.

The Wilson is the single largest producer of Coho in the TBW. Additionally, the Wilson supports Steelhead, Chinook, and a small Chum population. The Little North Fork, Devil's Lake Fork, Jordan Creek, and the North Fork Wilson represent the most important destinations for Coho spawning and rearing.

Legacy Impacts: The majority of the Wilson watershed burned during the Tillamook Burn. As a result, the majority of the watershed is composed of relatively young conifers. Douglas Fir is dominant in the upper watershed, although the Swiss Needle Cast virus has motivated conversion of many forestry lands to Western Hemlock. Large portions of the lower watershed are dominated by grasses as a result of dairying. The majority of the riparian corridor

is dominated by Red Alder and riparian shrub species such as Salmonberry. Historically much of the riparian corridor was dominated by large conifers. Knotweed is present up to Idiot Creek.

Current Management Emphasis: The upper portion of the Wilson is predominantly managed for forestry with ODF as the majority landowner. Private Timber companies own industrial timberland in the upper watershed and BLM owns a relatively small portion of the watershed. The Wilson has a broad alluvial floodplain that is used primarily for dairying. The lower mainstem is extensively diked and is prone to flooding. The Wilson river floodplain contains the lowest portion of State Highway 101 that is lined by commercial development.

Restoration Challenges/Priorities: Like most of the Tillamook Burn, large wood was actively removed during the 1970s and naturally occurring logjams are still actively removed to allow for boat passage. The net result is a simplified stream channel throughout much of the stream network resulting in low quality habitat fos salmon and steelhead. The lower river has elevated summer water temperatures that adversely affect juvenile salmonids. There are 7 high priority fish passage barriers on the Miami and tributaries.

Trask River

The Trask River is the second largest drainage in the TBW. The Trask has a mixed volcanic/sedimentary lithology. This results in a complex mix of stream channel types in the upper watershed ranging from high gradient, confined to broad, low gradient reaches. Upon leaving the Coast Range, the Trask enters a broad, alluvial floodplain. The lower portion of the mainstem forms an interconnected network of sloughs and tidal wetlands. The watershed encompasses ~175 sq miles and has a peak elevation of 3442 ft.

The Trask Watershed supports large populations of Coho, Steelhead, and Chinook. The Trask is second to the Wilson in Coho abundance. The primary spawning destinations of Coho are Elkhorn Creek and the East Fork Trask. The mainstem Trask provides important habitat for summer and fall Chinook.

Legacy Impacts: Large wood was actively removed during the 1970s in an effort to improve fish passage and address concerns about low dissolved oxygen. The Tillamook Burn and subsequent salvage logging operations decreased the quantity of wood available for future recruitment to the stream channel. The net result is a simplified stream channel throughout much of the stream network. The lower portion of the watershed has been heavily diked for flood control and conversion to pasture. The mouth of the Trask River as it drains to Tillamook Bay has been relocated.

Current Management Emphasis: The upper Trask is primarily managed for forestry. ODF is the major landowner in the basin with private, and BLM also managing land within the

watershed. The lower Trask River is extensively used for dairying. Holden Creek, one the few urban streams within the watershed, drains into the lower Trask river.

Restoration Challenges/Priorities:

The majority of the watershed is composed of relatively young conifers. Douglas Fir is dominant in the upper watershed, although the Swiss Needle Cast virus has motivated conversion of many lower lying forestry lands to Western Hemlock. Large portions of the lower watershed are dominated by grasses as a result of dairying. Major sub-basins in the lower watershed such as Holden Creek, Gold Creek, and Mill Creek support minimal salmonid populations due to water quality issues and barriers to passage. Water quality in the Trask River is also considered impaired by excess summer temperatures. The Trask River is unique in that the mouth of the mainstem was moved. The artificial mainstem channel is subject to flooding. There are 17 high priority fish passage barriers on the Trask River and its tributaries.

Setting Priorities and Considering Opportunity

There is a growing literature on the role of opportunity and willingness to participate in conservation activities. The consideration of the social and economic factors that limit the application of biological or ecologically identified priorities need to be specifically considered (Smith et. al., 2009; Knight et. al. , 2011; Cowling, et. al., 204; Nuno, et. al. , 2014; Knight and Cowling, 2007; Guerrero et. al. , 2012). This literature suggests the identification of social and economic limitations is as important as identifying biological/ecological priorities. When applied to the Tillamook Bay Watershed it means that specific consideration must be given to the different forest landowner types (federal, state, private), agricultural land uses (primarily dairy) and urban commitment. In Oregon the limits of urban development have been relatively well confined and described (urban growth boundary). The land allocation to agricultural and forest lands have also been relatively clearly proscribed.

These considerations can best be summed up by a quote from Aldo Leopold (1935) "*One of the anomalies of modern ecology is that it is the creation of two groups, each of which seems barely aware of the existence of the other. The one studies the human community as if it were a separate entity, and calls its findings sociology, economics and history. The other studies the plant and animal community and comfortably relegates the hodge-podge of politics to the liberal arts. The inevitable fusion of the two lines of thought will, perhaps, constitute the outstanding advance of the present century."*

It is important to engage the "hodge-podge" to identify effective restoration and conservation opportunities (Knight et.al., 2011). In the Tillamook Bay watershed that means working with the different land users, understanding their limitations and opportunities and building a shared understanding of the social and economic relationships that affect each community. Building the understanding and communication among the different ownership interests and building a better understanding of the benefits and risks of habitat restoration will be a significant challenge for the council. One of the priorities of the council could be to build a

stronger understanding of the social and economic dynamics of the land management stakeholders and explore with greater nuance how they might relate to habitat restoration actions. The work of Knight et.al., (2010) provides one approach to building understanding of the human and social dimensions of conservation opportunities on private lands.

Restoration Rules of Thumb

The extensive biological information available for the Tillamook Bay catchment and the previous prioritization work remains quite valid. The biological priorities as identified for salmon species (Demeter Design, 2008; Bio-Surveys, 2008; Meiwald et.al., 2008) and estuarine habitat restoration (Simenstad et.al., 1999; Ewald and Brophy, 2012) remain appropriate as guides for outreach and exploration of restoration opportunities. Using an approach that recognizes the limitations posed by human institutional factors makes the job of pursuing priorities more complex.

The TBWC was developed to represent the entire catchment and has the mission to "***…build collaborative, voluntary partnership with communities and landowners, to protect, maintain and improve the health of the Tillamook Bay Watershed…***" One of the ways to accomplish this mission is to be open to opportunities that fit within a larger conceptual strategy. To accomplish the mission, the following "rules of thumb" for prioritizing the work of the council are suggested.

Rule of Thumb #1: Work from Strength: Recognize the Inherent Productive Capacity of the Watershed

There are watersheds in the basin that have inherent features that provide better habitat for anadromous fish than others. Watersheds dominated by igneous rock are typically more productive that watersheds dominated by marine sandstones. Reaches of low gradient, unconfined stream conditions have more productive capacity for salmon and steelhead than confined higher gradient stream segments. These areas provide the "skeleton" for salmon habitat in the basin. While salmon and steelhead use nearly all the watershed that they can reach, the areas with more abundant spawning gravel (igneous watersheds) and complex habitats (low gradient, unconfined segments) are the areas that have the greatest capacity to produce healthy runs.

The high production watersheds are those areas identified for potential "anchor habitats. Focal basins should be the Kilchis and Miami Rivers in their entirety. The East Fork of the South Fork of the Trask and the North Fork of the North Fork of the Trask (Elkhorn Creek) and the Devils Lake Fork and Ben Smith Creek watersheds of the Wilson River are important production areas.

Rule of Thumb #2: Create, Maintain, or Enhance a Full Range of Habitats from the Headwaters to the Bay

As you work from the areas of high productivity ensure there is continuity throughout the basin to Tillamook Bay. A number of recent studies have shown that a number of species of salmon have complex life history expressions that reflect the habitats available throughout the basin. As you work in the upper watershed, conduct outreach lower in the basin to landowners providing them with information about the work and explaining how their reach can help to benefit the desired species. Connectivity through elimination of barriers and ensuring a sequence of complex habitats is necessary to maintain resilient populations of salmon and steelhead.

Continuing efforts throughout the Kilchis and Wilson Rivers from forested uplands to the agricultural lowlands will be important. Looking for opportunities along the corridor from the headwaters to the Bay in these basins will be important. Priority lowland marsh habitats in the Hall Slough area should be evaluated.

Rule of Thumb #3: Take Actions Relevant to the Dominant Land Uses in the Basin

There is a pronounced distinction of land uses in the Tillamook Bay catchment. The uplands are dominated by forest management, which varies by ownership. The lowlands are dominated by agriculture and the historical investment in conversion of floodplain and tidal surge plain into dairy pastures. Each land use presents challenges for aquatic habitat restoration and will require different strategies and opportunities for developing both relationships and restoration projects.

Rule of Thumb #4: Encourage the Development of Life History Diversity

Salmon are adapted to diverse habitats that vary both spatially and temporally by life history adaptations. The location of rearing, movement patterns and ocean entrance may vary significantly depending on the availability of different habitats within a river system. Recent research on the Oregon coast has demonstrated at least five life history expressions when a broad range of habitats became available (Jones et.al., 2014). What this guidance suggests is that as projects are evaluated look for the opportunities to create a diversity of habitats throughout a tributary system. Do not focus only on mainstem habitats: look for opportunities to expand the types of habitats throughout the tributary watershed that would allow for diverse life history expression.

Applying the Rules of Thumb

The rules of thumb cannot all be applied to the same project or opportunity. They are suggested as an approach to be used when opportunities are presented to the Council or when the Council wishes to create the opportunity for projects. For example, as the Tillamook-Nestucca Fish Passage Partnership implements their first few projects, the TBWC could follow

up with projects that provide habitat diversity to the tributary systems made accessible by adding large wood, reconnecting off-channel habitats, restoring conifer dominance to riparian habitats, etc. This applies Rule of thumb #4 and #2. Since you would be working in the tributaries affected by barrier removal you likely would not address Rule of Thumb #1 or #2. The primary purpose of the Rules of Thumb is to be intentional about how the opportunities fit into a larger view of how the watershed functions.

Using Existing Priorities

The CERP project (Demeter Design, 2009) developed the following priorities: "• ***Bewley*** *– Listed as outreach priority #1, long-term Coho priority #10.* A Limiting Factors Analysis is taking place within Tillamook River Basin. Coho abundance, intrinsic potential, and land-use data were the primary factors in the outreach determination. Additionally, disturbance scores drove the long-term priority score. Outreach within this basin might focus on long-term actions aimed at restoring Coho populations such as increasing channel complexity and shade. This basin should be part of a broader Tillamook River outreach effort including the mainstem.*

• ***Upper and Lower Tillamook Mainstem*** *– Upper Tillamook Mainstem is #8 on the outreach priorities. Lower Tillamook mainstem is outreach priority # 11, long-term Coho priority #4, long-term Chum priority #3. A Limiting Factors Analysis is taking place within Tillamook River Basin. Outreach activities within this basin might focus on long-term restorative actions aimed at increasing Coho populations such as increasing channel complexity and shade. Additionally, Chum usage in the lower watershed should be evaluated. Immediate actions could include riparian plantings, wood placement, and wetland reconnection.*

• ***Coal Murphy*** *– Listed as outreach priority #2, immediate Chinook restoration #4, immediate Steelhead #3, and Immediate Chinook Conservation #5. There has been one known dam removal within basin. Outreach efforts might focus on large wood placement in mainstem channels and set-asides in large wood supply basins. Discussions of natural wood migration might be important within this basin. Riparian set asides and property purchase should also be considered in minimally disturbed areas. Restoration of tidal wetlands will benefit existing Chinook and Chum populations.*

• ***Lower Trask Mainstem Holden*** *– Outreach priority #5, long-term Coho priority #1, long-term Chinook priority #2, long-term Chum priority #2. There is ongoing water quality testing within the basin. This basin has been severely modified. With the high urban and rural residential development that occurs on the banks of Holden Creek and the significant entrenchment of other tributaries within the basin, any restoration efforts within the basin will take many years to complete. Outreach within this basin might be more effective if conducted in multiple stages with the assumption that properties may change hands within the time it takes to complete restoration projects. Additionally, outreach may be most effective by addressing high and low density areas separately. This basin should be addressed as part of the broader Trask outreach efforts which includes the Middle Trask Mainstem.*

• ***Middle Mainstem Trask*** *– Outreach priority #6, immediate Chinook restoration #6, immediate Chinook conservation #10, long-term Coho priority #8, long-term Chinook priorities #7, long-term Chum restoration #5. Outreach efforts should be consistent with restoring habitat function for all Salmonid species. Additionally, mainstem riparian easements or acquisition should be discussed in Chinook spawning areas.*"

These are appropriate starting points for the Council. The individual efforts should be looked at through the lens of the Rules of Thumb and consider the roles and opportunities of the Council in relation to other restoration partners (Dept. of Forestry, Tillamook Estuaries Partnership, etc.).

Priority Considerations

The following are recommendations that flow from the efforts previously conducted to identify ecological priorities and from experience from successful locally led conservation efforts from across Oregon.

1. Select the high value watersheds (Upper Kilchis, Trask, and Wilson) for emphasis.
2. Consider working with the Tillamook Estuaries Partnership to conduct a process based evaluation of restoration opportunities similar to the work in the Nehalem basin.
3. Become familiar with the landownership and land use patterns of these watersheds.
4. Identify and document where projects have been implemented in these watersheds.
5. Use the Restoration Committee to identify landowners and projects that would have the greatest benefit to aquatic habitats.
6. Develop a consistent approach for outreach and landowner contact so there is a consistent and available approach to address landowner interests when expressed. (Consider the model used by the Mid-Willamette watersheds or North Coast Watershed Council Assistance grant (OWEB #214-1015).
7. Have in mind priority restoration actions by land use that can be a sieve for both outreach and for responding to landowner interest. For example, agricultural lowlands should be looked at in terms of restoring floodplain connectivity, reducing potential bacterial contamination, restoring riparian forest conditions, etc. while forested lands should be looked at to restore stream complexity for overwintering habitat, restoring connectivity by eliminating barriers, restoring stream complexity and reducing road impacts.
8. Explore the utility and value of monitoring temperature in the lower rivers.
9. Use the council to reinforce the priorities and ask them to contact the interests they represent with a specific list of opportunities keyed to land use dominance.

Upper Watershed Emphasis

The bulk of the habitat restoration work in the uplands is similar across the five watersheds, replacement of large wood and restoring a conifer component to the riparian vegetation to promote future large wood delivery.

Lower Watershed/Estuary Emphasis

The lower watershed of the tributaries to Tillamook Bay have been significantly altered by flood control efforts such as diking, tidegating and other actions designed to reduce flood impacts and to expand usable dairy lands. Working with the dairy industry to identify opportunities to remove or relocate dikes and to open blocked channels would improve juvenile salmon rearing

habitat. Assuring riparian forest vegetation is available to provide shade and future large wood is also important in the Tillamook Bay lowlands.

Evaluating Progress

Monitoring the outcomes of the combined actions of the conservation partners in the Tillamook Bay watersheds is important to both learn what it takes to get a "signal" from the actions and to document whether or not the restoration efforts are having a measurable effect. A cooperative monitoring effort among NRCS, OWEB, DEQ, and ODA evaluated the effectiveness of restoration actions in the Wilson River drainage in reducing bacteria.

A unique and important feature of all the streams that enter Tillamook Bay is the relatively high level of juvenile salmon fish usage of the lower rivers for rearing. These areas of the basin could be sentinels of the conditions of each watershed. Consistent temperature measurements over a long period of time at the head of tide, and the main stem above the head of tide, could provide a useful indicator of the cumulative effects of land management and restoration actions throughout the catchment above.

Close cooperation and communication with the agencies monitoring conditions in the catchment could identify a specific role for the TBWC in monitoring effectiveness of restoration and land management actions.

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"***Conservation will ultimately boil down to rewarding the private landowner who conserves the public interest.***"

Aldo Leopold from Conservation Economics (1934) in River of the Mother of God