



# Action Agenda

*The Puget Sound Action Agenda is a strategy for cleaning up, restoring, and protecting Puget Sound by 2020*

**PugetSoundPartnership**  
our sound, our community, our chance



December 1, 2008

To the People of Puget Sound:

***Puget Sound is in trouble.***

Most of that trouble is caused by the everyday activities of us – the humans who share this beautiful place with millions of other living things.

For the most part, we have not caused the Sound's decline out of malice. The Sound's health has largely been compromised by: how we have covered up the land with houses, buildings and parking lots; how we live and prosper; how we treat our waste; and how we transport ourselves.

In 2007, Governor Gregoire proposed and the Legislature created the Puget Sound Partnership to reverse Puget Sound's decline and restore it to health by 2020. We were to do this restorative work by coordinating the many existing cleanup efforts, holding all levels of government agencies accountable for their part of that work, and at the same time, maintaining the prosperity of the region.

Seven signers of this letter are the members of the Leadership Council appointed by the Governor and charged by the Legislature with overseeing this effort. The eighth signer, David Dicks, is the Executive Director of the Puget Sound Partnership.

Today we are releasing an Action Agenda outlining the immediate and long-term actions necessary to restore and protect Puget Sound. Thousands of people – from scientists to citizens, from Blaine to Olympia to Hoodport to Port Angeles – helped us understand the problems and put forward solutions.

The Action Agenda carefully outlines how to solve the problems that threaten Puget Sound – which include pollutants in stormwater that washes off our city streets, suburban, and rural areas into the Sound, to the more than 21 species that have been listed as threatened or endangered, to massive fish kills in Hood Canal, to continued discharges of toxic substances into the Sound, to loss of habitat for living things throughout the region – whether on land or in fresh and marine waters.

Our environment, our health, and our economy are all threatened by the current trends in Puget Sound's environmental decline. Add to this well over a million more people by 2020 and the effects of climate change, and we find ourselves facing a challenge unmatched in the region.

We are aware that cleaning up our mess – restoring our place – will require new resources. And we know these are hard economic times for the people of Puget Sound. But not taking the steps outlined in the Action Agenda will ultimately place a much higher burden on all of us – both economically, in health costs from exposure to toxic substances, and environmentally, in the loss of the stunning and vibrant life of Puget Sound, the economic engine for our state.

But perhaps the most significant loss would be that of the Puget Sound experience, which so enriches our lives. Many of us were drawn here – and stay here – because of the incredible beauty and natural diversity of our home – our Puget Sound.

It's unthinkable – indeed, unconscionable – that we would not take the necessary steps to make our home prosperous and safe for ourselves and every other living thing whose very existence depends on us.

We call on all citizens of our region to understand what's going on in Puget Sound and pledge to take the steps, individually and collectively, to protect, restore, and maintain our shared place.

A healthy Puget Sound is fundamental to our way of life and a legacy that we all want to pass on to our children.

Now is our chance to make and keep Puget Sound a healthy and prosperous place for all of us.

Sincerely,  
Puget Sound Partnership Leadership Council

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# Puget Sound Action Agenda

*Protecting and Restoring the Puget Sound Ecosystem by 2020*

## Puget Sound Partnership

December 1, 2008

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December 1, 2008

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## **Acknowledgments**

The Partnership extends its sincere appreciation to the countless organizations, agencies, and individuals who contributed to the production of the Action Agenda during the past 18 months. Their dedication to a shared vision for protecting and restoring the entire Puget Sound ecosystem will help make our mission a success.

Working together, we can achieve the region's desire to pass on a legacy of a clean and healthy Puget Sound to future generations.

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## Overview of the Puget Sound Action Agenda

*"[It is our task] to ensure that the Puget Sound forever will be a thriving natural system, with clean marine and freshwaters, healthy and abundant native species, natural shorelines and places for public enjoyment, and a vibrant economy that prospers in productive harmony with a healthy Sound."*

--- Governor Christine Gregoire

When the Puget Sound Partnership was created in 2007, the Legislature gave us three basic charges:

- Define a 2020 Action Agenda that identifies work needed to protect and restore Puget Sound, based on science and with clear and measurable goals for recovery;
- Determine accountability for achieving results including performance, effectiveness, and the efficient use of money spent on Puget Sound; and
- Promote public awareness and communication to build support for a long-term strategy.

The 2020 Action Agenda represents a new way of approaching the management of the Puget Sound. It takes an ecosystem approach from the crest of the Cascades and Olympics to the waters of the Strait of Juan de Fuca and Hood Canal. Building on the Puget Sound region's award-winning work to recover species and clean up polluted waters, the Action Agenda integrates scientific assessment with community priorities, and establishes a unified set of actions that are needed to protect and restore Puget Sound. The Action Agenda also serves as a statement of common purpose across the Sound and forms the basis for cooperation and collaboration among implementing partners.

The Puget Sound Action Agenda is designed to be adaptable and is intended to be changed over time. The Legislature set a December 1, 2008 deadline for the creation of the Action Agenda, and included a regular schedule for updated work plans. In creating the Action Agenda, the Partnership collaborated with hundreds of affected parties, used the experience and expertise of existing regional agencies, and involved local communities and scientists in crafting regional solutions. Local and regional partners implored us to seek practical solutions and to build on existing programs that are working whenever possible. Scientific information about the health of Puget Sound, the threats to the ecosystem, and future challenges and risks has been incorporated throughout the process. Across Puget Sound, federal and state agencies, tribes, city and county governments and other agencies, businesses, environmental organizations, watershed groups, landowners, and individual citizens have stated their support for the Action Agenda and their willingness to implement their role in restoring Puget Sound.

Continued collaboration with the many governments and interests in Puget Sound will be essential in implementing solutions and sustaining actions that support a healthy ecosystem while moving forward with a vibrant economy. The Action Agenda was completed during a time of severe financial strain for our country, state, and citizens. Local governments are already pressed to find ways to provide basic services. The current economic climate underscores the need for the Puget Sound effort to be more efficient with human and financial resources and to set priorities. Our time and energy must be focused on what matters and makes a difference. We hope the Action Agenda provides the roadmap for doing that.

## How was the Action Agenda developed?

The Puget Sound Action Agenda was developed in a fundamentally different way from traditional “top-down” planning approaches, using transparent public forums and soliciting extensive citizen and scientific input. During 2008, the Partnership took the four basic questions framing the Action Agenda to scientists, elected officials, businesses, volunteers, and local communities. Public workshops, expert topic forums, and implementer-focused action area meetings were used to discuss the health of Puget Sound, future threats, what is being done, and what people think is needed. More than 1,600 people attended public workshops, 75 presentations were given to business and community organizations, and 11,182 public comments were received in writing or on-line with ideas and comments on the Partnership’s work.

- Workshops were held in the seven action areas of Puget Sound to discuss the important features of the action area, local stresses and threats, and top priorities for action. The workshops were focused primarily on gathering input from the organizations and individuals who are responsible for implementing much of the work to protect and restore Puget Sound. Results of the workshops are primarily reflected in the action area profiles.
- Topic forums of regional experts were convened to analyze six issues that reflect ecosystem health: land use and habitat; species and biodiversity; water quality; freshwater quantity; human health; and human well-being. Findings on conditions, management approaches, and recommendations are described in the topic forum papers. The work of the topic forums helped in developing Questions 2 and 3 of the Action Agenda.
- Scientific input was overseen by the Science Panel and included development of desired outcomes and indicators to measure ecosystem health, peer-review of the scientific elements of the topic forum papers, and the preparation of a Biennial Science Work Plan that will help refine elements of the Action Agenda as the region moves forward.

**Review of the Action Agenda:** The Partnership reviewed the near-term action ideas with the Ecosystem Coordination Board (ECB) in October and November 2008, and ECB members provided helpful refinements and ideas about prioritization. A two-week public review of the draft Action Agenda was conducted in November. More than 1,000 individual comments came from public agencies, associations and community groups, water groups, business and environmental interests, and individual citizens. The comments fall into several broad categories identified below:

- A wide range of agencies and groups expressed their appreciation and support for the Puget Sound Action Agenda, including affirmation of the actions identified.
- Specific aspects of the Action Agenda that need refinement were identified, including: indicators of ecosystem health; ecosystem targets and benchmarks; better links between goals, indicators, and actions; more detail on the overall accountability, costs, and the funding strategy; and the need to prioritize actions and identify a work plan for moving forward. This information is better described in the final Action Agenda, including next steps to improve each of these areas.
- There were suggestions that the Partnership summarize the areas of focus in the Action Agenda and elaborate on which of areas should be emphasized. A section was added to the Introduction to address this need.

- Numerous technical corrections and clarifications were submitted, as well as refinements to actions and strategies. References, a glossary, and table of contents were requested. Many clarifications were made as time permitted, including a key references section, glossary, and table of contents.
- Other comments and ideas were submitted about specific issues to consider. The Partnership received many helpful comments on a variety of subjects ranging from additional funding ideas, water conservation techniques, specific implementation considerations, and others. Many of these ideas need more consideration than time allowed and we have cataloged them for future discussion.

A comment-response summary and the comment letters are included in the Action Agenda Appendices.

## **Inside the Action Agenda**

The Action Agenda is structured around four basic questions:

1. What is a healthy Puget Sound?
2. What is the status of Puget Sound and what are the biggest threats to it?
3. What actions should be taken that will move us from where we are today to a healthy Puget Sound by 2020?
4. Where should we start?

### **Question 1: What is a healthy Puget Sound?**

A healthy Puget Sound includes a thriving natural world, high quality of life for people, and a vibrant economy. Puget Sound residents overwhelmingly agree that a healthy environment is a legacy that must be passed on to our children and grandchildren, but defining the elements of a healthy system is very difficult. Several goals for a healthy Puget Sound have been set out by the Legislature, and the Partnership has been working with regional scientists to link these goals to specific measures of ecosystem health. The development of a clear set of measurable indicators and benchmarks for the health of Puget Sound is a new effort that will enable us to assess whether progress is being made, adjust our actions, and report back to the public.

### **Question 2: What is the status of Puget Sound and what are the biggest threats to it?**

Although many types of human activities threaten the health of the Puget Sound ecosystem, there is considerable agreement among regional scientists and community leaders that the alteration and loss of habitat and the ongoing input of pollution are the top two immediate and pervasive threats facing Puget Sound. Habitat alteration has occurred throughout the estuaries, rivers, forests, and beaches of Puget Sound, and thousands of pounds of additional pollution enters the waterways on a daily basis. The entire region faces challenges from a growing human population and a changing climate that will exacerbate the many existing pressures on Puget Sound.

### **Question 3: What actions should be taken that will move us from where we are today to a healthy Puget Sound by 2020?**

The Partnership has developed an Action Agenda at both the scale of the Puget Sound ecosystem, and in local action areas designated by the Legislature. Question 3 includes Soundwide actions as well as local fixes that address the unique conditions of the individual action areas.

The Partnership synthesized existing information about Puget Sound and used additional information developed and received during the development of the Action Agenda to create five strategic priorities to achieve progress at the Soundwide scale. These five priorities, along with associated actions, address the major threats to ecosystem health and embrace a new approach to managing and sustaining the Puget Sound ecosystem. This comprehensive, consolidated set of necessary actions is a significant step forward. As the Action Agenda is implemented and we evaluate our progress, the strategies and actions will be adjusted to help achieve the 2020 goals.

#### ***Our strategic priorities are to:***

- Priority A: Protect** the intact ecosystem processes, structures, and functions that sustain Puget Sound. Avoiding problems before they occur is the best and most cost-effective approach to ecosystem health.
- Priority B: Restore** the ecosystem processes, structures, and functions that sustain Puget Sound. Protecting what we have left is not sufficient, and significant effort at an unprecedented scale is needed to undo past damage.
- Priority C: Prevent water pollution at its source.** Many of our efforts have focused on cleaning up degraded waters and sediments, but insufficient resources have been devoted to stopping pollutants before they reach our rivers, beaches, and species.
- Priority D: Work together** as a coordinated system to ensure that activities and funding are focused on the most urgent and important problems facing the region. Many of the programs and laws now used to regulate or support activities in Puget Sound were established on a piecemeal basis to address individual problems. Strategies that will help to address problems more effectively at an ecosystem scale include improved coordination of land use planning, water supply, ecosystem protection, transportation, and species recovery plans. The Action Agenda calls for the reform of environmental regulatory programs as well as improvements to the capacity of local partners to implement actions and compliance efforts across Puget Sound.
- Priority E: Build an implementation, monitoring, and accountability management system.**  
This includes:
  - Using a **performance management system** with adaptive management and clear pathways for decision making, coordinated monitoring, accountability for action, and coordinated data management;
  - Providing **sufficient, stable funding** focused on priority actions;

- Implementing a **focused scientific program** with priorities for research, and developing appropriate measures to improve understanding of the ecosystem and the effectiveness of our actions; and
- Increasing and sustaining **coordinated efforts for communication, outreach, and education.**

***Highlights of the Action Agenda include:***

**Account for anticipated growth and climate change.** Our region is growing fast and changing. We can help accommodate this growth through: projects, regulations, and incentives to better protect intact areas; focusing growth in urban areas; conserving freshwater resources; and protecting working farms and forests. Actions to adapt to and mitigate for climate change are included.

**Engage the private sector in finding practical solutions.** Through creativity and ingenuity, the private sector will be a partner in implementing the Action Agenda. Many businesses are already taking stewardship actions. Incentives for actions, new ways of approaching mitigation requirements, and technological innovation are included.

**Implement the regional salmon recovery plans as an integral part of Puget Sound restoration.** The salmon recovery plans are a cornerstone of the efforts to improve the health of the Puget Sound ecosystem. The data, planning, and community commitment that have gone into the recovery plans overlap with and complement Puget Sound recovery efforts. The Puget Sound Partnership is responsible for implementing the regional salmon recovery plans for Chinook and summer chum salmon that have been approved by the National Oceanic and Atmospheric Administration (NOAA). Salmon recovery plans have been prepared by local groups in all 14 watershed areas of Puget Sound and include detailed actions for protecting and improving habitat, restoring river deltas and estuaries, re-vegetating stream corridors, removing barriers, conserving instream flows, and upgrading hatchery operations. Benefits of implementation extend to many other species, including orca whales, and enhance human well-being.

**Recover the Puget Sound orca whale population.** The viability of J, K, and L pods is tied to overall Puget Sound ecosystem health including our culture and economy. Actions that will address the threats of lack of prey, abate pollution, and reduce disturbance are in the Action Agenda. These include implementation of the killer whale recovery plan, implementation of the salmon recovery plan, and pollution reduction strategies. The Washington State Legislature has also recently passed a new law protecting local killer whales from vessel disturbances

**Control and manage stormwater runoff in an integrated way with protection of vegetated land cover and reduction of pollutants before they reach water.** Many Puget Sound citizens and science groups have emphasized stormwater runoff as a major threat to ecosystem health. The Action Agenda includes large-scale regional approaches that call for: the creation of consistent protection and restoration standards for the region; reducing pollutant inputs at the source; prioritizing and retrofitting existing stormwater management facilities (particularly in areas that were urbanized long ago); and ramping up low impact develop techniques in urbanizing areas.

**Use a watershed approach for protection and restoration efforts.** The Action Agenda builds on a watershed approach that is already underway and calls for: completing watershed assessments to identify priority areas for protection and restoration; conducting mitigation efforts in context of watersheds rather than isolated sites; investigating regulatory compliance at the watershed scale; and better integrating the efforts of existing watershed groups. This approach will also help manage stormwater runoff and be more effective at solving problems than just working within specific local jurisdictions.

**Take immediate actions in areas of Puget Sound that are imperiled, particularly the low dissolved oxygen situations in Hood Canal and South Sound.** The reduction of pollutant loads, substantial improvement to wastewater and on-site sewage treatment systems, and other actions will be directed toward some of the most urgent problems in the Sound, such as the low oxygen conditions in Hood Canal and other identified areas.

**Leverage Puget Sound efforts with other state and regional initiatives.** There is significant opportunity to advance the Action Agenda and emerging state priorities to reduce greenhouse gases and create other ecological and economic benefits. For example, promoting compact, high-density, transit-oriented urban development while discouraging sprawl and conversion of forest and agricultural land is a cornerstone of the Governor's climate change recommendations. These same land use policies will greatly benefit the Puget Sound ecosystem. Cleanup, restoration, and redevelopment of urban bays can also help promote transit-friendly cities that minimize greenhouse gas emissions. The new updates to the Shoreline Master Program are an important opportunity for integrating planning and restoration actions under a new ecosystem approach. Transportation-related actions such as reducing the number of vehicles on roads will reduce pollutant loading, as well as greenhouse gas emissions and long-term road repair and maintenance efforts. Focusing on these types of leveraged actions will optimize regional and statewide efforts, enabling us to solve multiple problems with a coordinated approach.

#### **Question 4: Where should we start?**

The challenges facing Puget Sound are large and the list of things to do is very long. While the Puget Sound Action Agenda will be improved and adjusted for many years to come, the implementation of the set of near-term priority actions will move the region toward long-term ecosystem health. Near-term actions and priorities have been selected based on scientific and community input, ecosystem management principles, and the recognition that many important plans have already been prepared and are poised for implementation. Every unit of government, business, volunteer organization, and individual landowner has a role to play in protecting and restoring the health of Puget Sound.

#### **Funding strategy**

The initial cost for implementing the Action Agenda in the 2009-2011 biennium is estimated at \$601 million. This includes \$199 million in new funding, \$222 million in ongoing capital expenditures, and continuation of \$178 million in ongoing operating expenses. This estimate is primarily focused at the state level and includes state agency costs as well as the pass through of state dollars to assist local governments implement programs and projects identified in the Action Agenda.

The Action Agenda proposes three approaches to long-term financing of the Action Agenda: leveraging existing funding to better align with the Action Agenda priorities, raising new revenue at the state, regional,

and federal level; and using creative approaches to engage the private sector through financial incentives and ecosystem market-based mechanisms centered on protection and restoration of Puget Sound. We are also seeking authorization to create a regional improvement district.

### **Profiles of the Puget Sound Action Areas**

The legislation that created the Puget Sound Partnership also established seven geographic “action areas” in Puget Sound to address problems specific to those areas. Puget Sound is a vast and diverse region, and each action area has unique ecological conditions and communities of people. The profiles describe the different features of each action area, the major local ecosystem threats, and the local priority actions that mirror the regional priorities and address local conditions and issues. The action area profiles were completed with the cooperation of and input from people who live in each area, and who will be implementing many of the actions to restore the health of Puget Sound. Work is expected to continue in 2009 to refine local strategies and priorities, and integrate local actions into an overall ecosystem approach.

### **Conclusion**

Fundamentally people care passionately about Puget Sound and want to ensure it is passed on to future generations. We hope the Action Agenda will enable us to convert this aspiration into reality.

## **QUESTION 1: What is a healthy Puget Sound (and how do we know if we are moving toward one)?**

The natural beauty and biological richness of Puget Sound make it a national treasure and one of the most spectacular places on earth. Snowcapped mountains and marine waters, extraordinary wildlife, lush forests, and dynamic rivers and beaches draw millions of admirers each year. The orcas and salmon that inhabit the waters of Puget Sound are irreplaceable symbols of regional identity, as well as important signals of ecosystem health. Puget Sound provides us with drinking water, seafood, timber, unparalleled opportunities for outdoor recreation, and a buffer from Pacific storms. Puget Sound is also an economic engine. Ocean-related industries generate more than \$3.8 billion in annual wages to the Puget Sound economy and thousands of business establishments use Puget Sound counties as their base of operations. Abundant natural resources and deep water ports create opportunities for thousands of family wage jobs. The quality of life in Puget Sound has also attracted creative and innovative people from around the country and the world. These people write computer code, draft building plans, find cures to diseases, brew coffee, sell virtually anything online, and design and build composite airplanes.

Recognizing the extraordinary cultural and economic value of Puget Sound to the region, Governor Gregoire created and charged the Partnership with developing an Action Agenda to achieve a healthy Puget Sound ecosystem. The Legislature, in full agreement with the Governor, established six goals for the Partnership to achieve by 2020:

- (a) A healthy human population supported by a healthy Puget Sound that is not threatened by changes in the ecosystem;*
- (b) A quality of human life that is sustained by a functioning Puget Sound ecosystem;*
- (c) Healthy and sustaining populations of native species in Puget Sound, including a robust food web;*
- (d) A healthy Puget Sound where freshwater, estuary, nearshore, marine, and upland habitats are protected, restored, and sustained;*
- (e) An ecosystem that is supported by ground water levels as well as river and stream flow levels sufficient to sustain people, fish, and wildlife, and the natural functions of the environment;*
- (f) Fresh and marine waters and sediments of a sufficient quality so that the waters in the region are safe for drinking, swimming, shellfish harvest and consumption, and other human uses and enjoyment, and are not harmful to the native marine mammals, fish, birds, and shellfish of the region.*

The Legislature directed the Partnership to establish “measurable outcomes for each goal...specifically describing what will be achieved, how it will be quantified, and how progress toward outcomes will be measured.” During 2008, the Partnership worked with NOAA/National Marine Fisheries Service and a broad group of regional scientists to refine what these goals mean by identifying a set of desired outcomes, a provisional set of measurable indicators for each goal, and targets and benchmarks that will help us determine whether progress is being attained.

## What does a healthy ecosystem look like?

Puget Sound's vast stands of timber, abundant fish and game, and sheltered bays have supported local tribes for centuries and drew settlers to the area. Though we do not expect Puget Sound to return to the exact conditions experienced by native populations, we still want to derive many of the same benefits from a healthy Puget Sound in the 21st century. To do this, we need to define specific outcomes for our ecosystem goals.

**Outcomes** are qualitative statements of what a healthy ecosystem should look like. Outcomes have been developed to help translate broad goals into measurable characteristics of ecosystem health. For Puget Sound, a healthy ecosystem would have the following desired outcomes:

**Human health** is supported by clean air and water, and marine waters and freshwaters that are safe to come in contact with. In a healthy ecosystem the fish and shellfish are plentiful and safe to eat, air is healthy to breathe, freshwater is clean for drinking, and water and beaches are clean for swimming and fishing.

**Human well-being** means that people are able to use and enjoy the lands and waters of the Puget Sound. A healthy ecosystem provides aesthetic values, opportunities for recreation, and access for the enjoyment of Puget Sound. Tribal cultures depend on the ability to exercise treaty rights to fish, gather plants, and hunt for subsistence, cultural, spiritual, ceremonial, and medicinal needs. The economic health of tribal communities depends on their ability to earn a livelihood from the harvest of fish and shellfish. Human well-being is also tied to economic prosperity. A healthy ecosystem supports thriving natural resource and marine industrial uses such as agriculture, aquaculture, fisheries, forestry, and tourism.

**Species** are "viable" in a healthy ecosystem, meaning they are abundant, diverse, and likely to persist into the future. Harvest that is consistent with ecosystem conditions and is balanced with the needs of competing species is more likely to be sustainable. When ecosystems are healthy, non-native species do not impact the viability of native species or impair the complex functions of Puget Sound food webs.

**Marine, nearshore, freshwater, and terrestrial habitats** in Puget Sound are varied and dynamic. The constant shifting of water, tides, river systems, soil movement, and climate form and sustain the many types of habitat that nourish diverse species and food webs. Human stewardship can help habitat flourish, or disrupt the processes that help to build it. A healthy ecosystem retains plentiful and productive habitat that is linked together to support the rich diversity of species and food webs in Puget Sound.

**Clean and abundant water** is essential for all other goals affecting ecosystem health. Freshwater supports human health, use, and enjoyment. Instream flows directly support individual species and food webs, and the habitats on which they depend. Human well-being also depends on the control of flood hazards to avoid harm to people, homes, businesses, and transportation.

**Water quality** in a healthy ecosystem should sustain the many species of plants, animals, and people that reside there, while not causing harm to the function of the ecosystem. This means pollution does not reach harmful levels in marine waters, sediments, or fresh waters.

A healthy ecosystem also has three important properties: It must be **resilient** to changes that are caused by humans or natural events. It must have **redundancy** – meaning species and habitats are not limited to a single location that puts them at risk of catastrophic loss. It must have a **representative** sample of the species and habitats that historically lived there. A healthy ecosystem does not necessarily need to exist as it once did, but these three characteristics will increase the chances that it will persist into the future. In a healthy ecosystem there are opportunities for growth and prosperity for people, while the other ecosystem benefits we enjoy can be sustained.

### **How will we measure progress toward the goals for Puget Sound?**

As a region, we currently count and monitor many things in Puget Sound, including salmon, birds, water temperature, bacteria near shellfish beds, toxic contamination in fish and marine mammals, streamflow, and the loss or gain of habitat. However, these separate measures are often not linked together in a way that tells us about the ecosystem as a whole. It is possible to organize all of these measurements and focus them on determining the status of the desired outcomes for Puget Sound. Conducting these measurements systematically will ultimately identify trends that will tell us if we are making progress toward achieving our goals. Linking monitoring to actions and outcomes in the Action Agenda will also help us be accountable for the success or failure of our management actions.

**Indicators** are physical, biological, or chemical conditions that can be measured to provide data about the status of Puget Sound. Indicators include things such as drinking water quality, acres of shellfish beds that are closed, number of oil spills, or the abundance of particular species, such as salmon. (This is similar to the way the Commerce Department uses GDP as an indicator of overall economic health of the U.S. economy.) Taken together, a set of indicators will help measure progress toward outcomes, goals, and the health of the ecosystem as a whole.

Working together, the Puget Sound Partnership and NOAA/National Marine Fisheries Service convened a broad group of scientists to identify the best available indicators that might be used to track progress toward the outcomes and goals. Initially, more than 300 possible items currently being measured were identified as indicator candidates. But because it would be impossible to measure, analyze, and report on so many things, the group evaluated the candidates, and pared them back to a set of approximately 100 provisional indicators. The Partnership's Science Panel reviewed the provisional indicators and recommended the Leadership Council's adoption with the condition that additional work is still needed to refine the list (Table 1-1).

Indicators need to be linked to numerical **targets** to specify the desired condition in a way that defines success. This includes "how much" is enough – both as a target endpoint and as interim milestones (or benchmarks) toward the target. Targets and benchmarks are useful for setting a course of action and interpreting progress. To track and report progress in the ecosystem, the Partnership will use quantitative targets and benchmarks as well as qualitative trends. Baseline data for accountability will be reported in the 2009 State of the Sound report.

As part of the Action Agenda development, we have started the work to identify quantitative targets and benchmarks. For a subset of the provisional indicators, the Partnership will confirm outcomes and quantitative targets and benchmarks by June 30, 2009 (see example Table 1-2). There is a provisional indicator for each goal, with a target, benchmark, and description of the current condition (baseline). Beginning in early 2009, the Partnership will convene a policy discussion, with scientific input, for each goal to select and develop at targets and benchmarks for at least one indicator to track ecosystem health. The work presented in Table 1-2 will be a starting place. Some indicators may need to be adjusted so we better capture the status of the ecosystem.

Over time, the Partnership will work to develop targets and benchmarks for more of the 100 indicators or others that may be identified in the future. As we build a greater understanding of the importance of a particular indicator, the availability of data, and the links to desired outcomes, appropriate targets and benchmarks can be developed. For indicators without set targets and benchmarks, strategies and actions can be directed at improving trends toward ecosystem health (e.g., increasing amount of publicly accessible shoreline).

Adaptive management will be a critical component for reducing uncertainty around defining a healthy Puget Sound. This will include refining indicators, targets, and benchmarks as we better understand the relationships among ecosystem components. In addition to the near-term work to set targets and benchmarks, the provisional set of indicators will be turned into a “final” list by identifying any new indicators and developing indicator indices. Selection of the final set of indicators will be based on several factors, such as data availability, how well the set captures the full range of ecosystem functions, and the cost of monitoring and analysis. A date for the selection of the final set will be identified with the Phase II indicator work (a near-term action).

Puget Sound residents from many different walks of life clearly recognize the value of clean water, recreational opportunities, fisheries and food production, and spiritual values associated with a healthy ecosystem. Question 2 of the Action Agenda looks at the present condition of Puget Sound and the biggest threats facing the ecosystem in the future. By determining what a healthy Puget Sound should look like, our ability to assess where we are today and measure what progress we are making in the future will be more effective in ensuring a legacy of a healthy Sound for future generations.

## **QUESTION 2: What is the status of Puget Sound and what are the biggest threats to it?**

In a scant 150 years, the human population of Puget Sound has grown from 50,000 to 4 million people. During that time, we have been very busy – creating: the second-largest port on the West Coast; global enterprises such as Boeing, Microsoft, and Starbucks; lively ecotourism businesses; world-renowned seafood products; and a timber industry that is still a national and international leader. Some of our industries, such as timber and shellfish production, are directly dependent on the ecosystem. Others rely on Puget Sound for shipping and an attractive quality of life to draw prospective workers and their families. More than 135,000 major businesses in the region employ over 2.2 million people. Puget Sound drives more than \$20 billion dollars in economic activity in Washington.

Puget Sound remains a desirable place to live and work. But there are ominous signs that the ecosystem has been pushed to its limits: 21 species are listed as threatened or endangered, more than 1,000 rivers and lakes are listed as impaired, and there are “dead zones” in Hood Canal and South Sound. A more detailed summary discussion of threats and drivers affecting ecosystem function in the Puget Sound region can be found in the Appendices.

In creating our productive society and economy we: eliminated three-quarters of the saltwater marsh habitat through dikes and drainage; lost 90 percent of estuarine and riverine wetlands; and armored one-third of the Puget Sound shoreline. We removed 66 percent to 84 percent of the old-growth forest in the basin in the past 50 years. We spilled at least 230,000 gallons of oil and hazardous waste (just since 1985), constructed 10 major dams and thousands of small diversions and stream blockages, re-plumbed the Cedar River system, straightened and diked hundreds of small and large rivers, filled wetlands, and introduced almost 100 invasive marine plant and animal species – sometimes intentionally. From 1991 to 2001, impervious surfaces increased by an additional 10.4 percent, leading to further changes in streamflow runoff and expanding a major pathway for a host of other pollutants to enter our rivers, soil, and food supply.

What do these separate, incremental changes tell us about the overall health of Puget Sound? There is broad agreement that the natural resilience of upland, freshwater, and marine systems in Puget Sound has been seriously strained but not irreparably damaged; thus there are opportunities for ecosystem recovery. Identifying the most imperiled and intact parts of the ecosystem, and the primary factors causing problems are key to achieving a healthy system. New approaches are helping to answer the question about the condition of Puget Sound and identify the key threats to ecosystem recovery. In addition to the first steps toward development of a comprehensive set of measurable indicators, described in Question 1, the Partnership and regional scientists have been working together during the past 18 months on three related efforts: a) a “threats/drivers” analysis led by NOAA as part of an ongoing Integrated Ecosystem Assessment of Puget Sound; b) a series of topic forums that assembled the best current information about the Sound; and c) a process to gather and synthesize data at the local level in each of the seven action areas.

Although many types of human activities threaten the health of the Puget Sound ecosystem, there is considerable agreement among regional scientists and community leaders that the alteration and loss of habitat and the ongoing input of pollution are the most immediate and pervasive threats to the ecosystem.

The types and magnitude of threats vary in different places, but the entire region faces challenges from a growing human population and a changing climate that will exacerbate the many existing pressures to Puget Sound.

## How healthy is Puget Sound?

Sorting through the many available studies and statistics to figure out what they add up to in terms of a healthy or impaired ecosystem is a complex and difficult task. One way to describe the status of Puget Sound is to compare existing conditions to the goals and indicators that have been established for ecosystem health:

**Human health:** Human health is closely tied to the ecosystem through contact with water, consumption of seafood, and air quality. Puget Sound is world renowned for specialized oysters, geoduck, salmon, and other seafood products. Although cleanup efforts have resulted in a number of shellfish beds that have re-opened for harvest, approximately 30,000 acres downgraded since 1980 remain closed. Closures of commercial and recreational shellfish areas due to harmful algal blooms appear to be more widespread and more frequent in recent years. In addition, toxic contaminants, especially PCBs and mercury, occur in high enough levels in Puget Sound fish that the Department of Health has issued advisories limiting the number of meals should people eat of Chinook, rockfish in many areas, and flat fish such as English sole in some urban bays. Outbreaks of illness, or even the perception that Puget Sound seafood is contaminated, can have profound economic ramifications to the Puget Sound region.

**Human well-being:** Most of the residents of Puget Sound feel fortunate to live here, enjoying a lifestyle that is closely connected to scenic landscapes, outdoor recreation in forests, beaches and waterways, local foods, and vibrant communities, including a healthy maritime economy. Developing measurable indicators of human well-being has been particularly challenging but the ability to continue the traditions of fishing, harvesting shellfish, watching birds and whales, and earning a livelihood from working farms and forests in Puget Sound depend on ecosystem health. Nearly 200 square miles of forested area were lost from the Puget Sound basin in a recent 10-year period (1991-2001) – representing a loss of nearly 4 percent of the lowland forests. The loss of these forestlands represents a loss of open space, recreation opportunities, and the ability to earn a livelihood in sustainable forest industries. Similarly, the conversion of agricultural lands to urban land uses shrinks the economic viability of the farm community, reduces the sources of local produce, diminishes habitat for migratory birds and other wildlife, and results in a loss of water filtration and absorption with increasing impervious surfaces. Human well-being has also been impacted by the reduction of salmon fishing. Many rivers in the Puget Sound basin no longer have sufficient Chinook to allow any harvest whatsoever and sport fishing days have been reduced in central Puget Sound by more than 75 percent since 1986. Tribal communities are particularly bereaved by the decline of salmon for tribal cultural tradition and identity, as well as the economic loss to fishing families.

**Species and food webs:** Puget Sound food webs are fraying and several species do not appear to be able to maintain themselves at sustainable levels. Hood Canal and the Strait of Juan de Fuca have a uniquely timed run of chum salmon that return in the summer. But eight out of the 16 historic populations of these summer chum are no longer present in their historic watersheds. A recovery plan for the summer chum was federally approved in 2007. Puget Sound Chinook also

have an approved plan developed by local watershed communities, and are one of the few species in Puget Sound that have numerical targets and benchmarks for recovery. Chinook salmon are generally at less than 10 percent of their historic levels in Puget Sound river systems, with some below one percent. An estimated eight to 15 populations of Chinook have been lost entirely. Studies have also shown that Chinook are the preferred food of orcas. The local southern resident killer whale population, which currently numbers only 84, lost seven members this year. Reduced food availability is one factor thought to be limiting the population; the orcas are also impacted by the noise from vessel traffic that interferes with their ability to hunt, and by toxic contamination. Puget Sound contains some of the most toxic marine mammals in the world. Harbor seals in Puget Sound were found to be seven times more contaminated with the persistent toxic chemicals known as PCBs than those inhabiting the adjacent Strait of Georgia in Canada. Species declines are apparent throughout the marine, freshwater, and terrestrial food webs and habitats of Puget Sound. In addition to the 21 threatened and endangered species, Washington presently lists 157 species of concern.

**Land use and habitat:** Freshwater, estuary, nearshore, marine and upland habitats are critical in supporting species health and human well-being. Land cover is an important indicator of ecosystem health because of its importance for upland species of birds and animals, retention of water runoff, and the function of large trees in forming habitat along Puget Sound rivers. In a recent 10-year period, almost four percent of the forest cover of Puget Sound's lowlands was converted to other land uses. By 2001, more than seven percent of the land area of Puget Sound below 1,000 feet elevation was covered by roadways, parking lots, rooftops, and other types of impervious surface – an indicator of the extent to which human activities have changed Puget Sound's landscape. Eelgrass beds are essential spawning areas and nurseries for herring, other forage fish, and salmon, and generate food consumed throughout the marine food web. The overall acreage of eelgrass beds in Puget Sound is a key indicator for ecosystem health, along with their spatial distribution throughout the areas where salmon, Dungeness crab, and other species migrate and grow. In 2006, there were approximately 50,000 acres of eelgrass beds in Puget Sound. Although the total acreage has been relatively stable for a few years, these eelgrass beds are concentrated into a few areas and some regions of Puget Sound, such as Hood Canal, have experienced localized losses. Many other Puget Sound habitats have shrunk in size, diminished in quality, fragmented, and the processes that form and sustain them have been disrupted. During the past 50 years, Puget Sound lost at least two-thirds of its remaining old growth forest, more than 90 percent of its native prairies, and 80 percent of its saltwater and freshwater marshes. In addition, one-third of its natural shoreline has been hardened.

**Freshwater resources:** Freshwater supply is closely tied to snowpack and precipitation. Important provisional indicators of ecosystem health related to water quantity are snowpack and flow patterns, the frequency of achieving regulated minimum flows in watersheds, and the availability of water for human use. Like most states in the West, Washington has a law that allocates water depending on who claimed it first rather than availability, need, or some other socially-based priority. Most watersheds in Puget Sound have rules that establish minimum flow levels, but rules have not been completed in all areas and some minimum levels may need to be reviewed. Several local chapters of the salmon recovery plan specify target flows for recovery. Currently, 11 of 19 Puget Sound rivers are already at levels that impair salmon due to low seasonal flows and over-allocation of out-of-stream uses. Almost every watershed in Puget Sound has local areas where freshwater supplies are not adequate to meet current human demands. The Nooksack,

Snohomish, Lake Washington, Green, White, Puyallup, Dungeness, and Elwha are considered to be “water critical” basins for salmon because of over-allocated water rights and low flow conditions.

**Water quality:** Pollutants and contaminants enter the water where they can harm aquatic life and pose health and safety problems in seafood, drinking water supplies, and beaches. Pollution-related water quality problems in the freshwaters and marine waters of Puget Sound include contamination by pathogens (especially bacteria and viruses), low dissolved oxygen from delivery of excess nutrients, and contamination by chemicals, some of which persist for long periods and accumulate in Puget Sound sediments, fish, and wildlife. The quality of Puget Sound water bodies has been affected by pollution from human and animal wastes, fertilizers and pesticides, and toxic chemicals that run off pavement during storms and are discharged from industrial facilities. More than 1,000 freshwater lakes and streams are classified as “impaired” and low oxygen conditions are increasingly frequent in Puget Sound marine waters. However, Puget Sound freshwaters and marine waters are not universally contaminated from major pollutant sources. Some of the “legacy toxics” from the 1970s have been cleaned up or sealed off where they remain in contaminated sediments underlying urban bays. Wastewater treatment plants remove or transform many (but not all) contaminants. Many bays and marine water bodies in Puget Sound experience hypoxia – the low oxygen conditions that result in widespread kills of marine life. South Puget Sound and Hood Canal are experiencing hypoxia episodes that are more frequent and of longer duration.

In 2009, the Partnership will produce a new “State of the Sound” report that will comprehensively link the conditions in Puget Sound to the goals and indicators of ecosystem health. The report will build on earlier efforts, and the Action Agenda, to describe status and trends within Puget Sound. It will also begin to describe the magnitude of threats overall, and within and between geographic sub-regions.

### **What threatens the health of Puget Sound?**

The current condition of Puget Sound shows signs that the web of life is fraying and that the many benefits we derive from our ecosystem may be in jeopardy. What is causing these problems? It is not only what humans do as we live, work, and play in Puget Sound, but how we go about it that affects the health of the Sound. Some activities are fairly obvious as harmful to ecosystem health, such as the input of toxic pollution and oil spills, and habitat destruction. Other activities that are considered to be potential “threats” – such as the harvest of timber, fishing, shellfish and finfish aquaculture, water withdrawals from rivers and aquifers, and farming – are highly beneficial to people. These activities depend directly on healthy ecosystem conditions but, if not properly managed, can also damage the ecosystems upon which they depend.

Regional scientists use the terms “threats” to refer to any activities that have altered the ecosystem in the past or present, or are likely to in the future. The Partnership has identified six broad categories of threats: habitat alteration, pollution, surface/groundwater impacts, artificial propagation, harvest, and invasive species, which are described below. Changes to Puget Sound are also driven by large-scale processes – such as weather, volcanoes, earthquakes, ocean circulation patterns, population growth, and climate change and its ancillary impacts – that are likely to amplify the many pressures facing the Sound.

**Habitat alteration and land**

**conversion:** Habitat alteration consists of activities such as clearing forests, armoring shorelines, diking and draining saltmarshes and freshwater wetlands, dredging, filling, and paving the land. Habitat alteration occurs in Puget Sound marine waters and on the sea floor, along the shoreline, throughout river systems, and in the upland forests, meadows, prairies, and brush. In the nearshore, docks and bulkheads cover beaches that produce the plant life,

The alteration of nearshore habitat through the construction of docks and bulkheads provides one striking example of how a localized activity can threaten broad components of the ecosystem. The nearshore environment provides essential habitat for herring. Herring spawn in the shallow zone along Puget Sound shorelines, and are especially vulnerable to the loss of eelgrass. Pacific herring in Puget Sound are a universal source of prey for all species of salmon, as well as seals, sea lions, orcas, hake, halibut, cod, and 14 species of ducks and gulls. Herring also feed loons, herons, puffins, and many other marine bird species. Herring populations have fluctuated dramatically in Puget Sound in recent years and their central position in the Puget Sound food web has the potential for ripple effects throughout Puget Sound species.

insects, forage fish, and shellfish that provide food for fish, shorebirds, and marine mammals. Jetties, groins, and rock walls interrupt the flow of sand that builds Puget Sound beaches. Land conversion in Puget Sound continues to eliminate habitat – between 1991 and 1999 Puget Sound lost an additional 2.3 percent of its forest cover, and impervious surfaces in the lowlands increased by 10.4 percent. Although growth management has been successful in some places to direct density into urban areas, many areas of Puget Sound remain vulnerable to the habitat loss and fragmentation that is taking a toll on our native plants and animals.

**Pollution:** Pollution continues to enter Puget Sound from many sources, even as we clean up contaminants of the past. Vehicles release toxic substances from oil leaks, brake linings, and tire wear. Airborne emissions appear to be a widespread source of loading for some chemicals of concern in the air and water. Emerging contaminants from medication and personal care products, whose effects we are just beginning to understand, often pass through sewage plants without treatment. The half-million on-site septic systems in Puget Sound – when improperly sited or maintained – can be a significant source of nitrogen loading into rivers and marine waters. Where the systems do not function properly, they are major sources of bacteria and viruses. Fertilizers and animal waste add to this mix. Fecal coliform bacteria are one of the most ubiquitous pollutants in the Puget Sound region. Combined sewer overflow outfalls occasionally discharge mixed stormwater and untreated wastewater to Puget Sound during wet weather. Major oil spills in Puget Sound are relatively infrequent, but still pose a potential catastrophic threat.

Pollution enters Puget Sound's rivers, lakes, and marine waters through a variety of pathways, but surface water runoff appears to be the primary transporter of toxic pollution to Puget Sound, with the most concentrated loads coming from developed lands. In the quintessential example of "what goes around, comes around," toxic substances and harmful pathogens end up back in the water and food supply for humans, resulting in closures and consumption warnings for fish and shellfish. Pollutants also result in closures at recreational beaches and lakes and contaminated sediments that contribute toxic substances to the food web for decades. Many Puget Sound businesses such as shellfish aquaculture, depend directly on environmental quality for their continued existence.

Pollution threatens our ability to achieve all six Puget Sound recovery goals and appears to be a significant, far-reaching threat to the health of Puget Sound.

**Surface and groundwater supply and availability:** Water falls all too abundantly in Puget Sound at some times of the year, but in July and August, Seattle receives very little rainfall. During the past 50 years, we have already experienced an 18 percent decline in freshwater flow entering Puget Sound, affecting water temperatures, marine water circulation, and oxygen conditions in water bodies. Reduced availability of water and altered runoff patterns from land clearing are direct factors limiting the productivity of salmon and other species. Water consumption and local runoff also affect the water supplies and runoff patterns for neighbors in many Puget Sound communities – land development can increase flooding on neighboring properties during the wet season and surface and groundwater use affects junior water right holders at dry times of the year.

Snowpack sustains most of our rivers, reservoirs, and aquifers. April 1 snowpack in the low- and mid-elevations of the Cascades has a high sensitivity to surface temperatures. Projected warming in the future will substantially diminish springtime snowpack in these watersheds and cause large changes in the timing of stream flows. Where snowpack and streams are rare, infiltration of precipitation is essential for groundwater recharge. Altered weather regimes associated with climate change will likely compound many existing threats to surface and groundwater supply and availability resulting in: an over commitment of water resources; projected increases in domestic, municipal, commercial, and industrial demand; land use practices that alter streamflow patterns; and modification of stream channels through dams, levees, bank armoring, and ditching. We may be famous for our rain, but land development decisions will increasingly reflect the need to consider flow patterns, water scarcity, and tradeoffs among competing activities.

**Invasive species** enter Puget Sound through the importation of seeds, fruits, plants, and vegetables. Other pathways include ballast water discharges from ships, soil brought in with nursery stock, commercial and recreational boat hulls, and from people releasing exotic pets and plants “into the wild.” The threats from invasive species vary across the Puget Sound action areas. Purple loosestrife, *Spartina* species, knotweed, Scotch broom, and other invasive plants are here now and could transform estuaries and river corridors. Alien invaders in the marine waters of Puget Sound include tunicate species that reproduce quickly and coat the surfaces of docks, pilings, boat hulls, and oyster-growing racks and lines. Domesticated animals can transmit potentially fatal pathogens to native species. While a comprehensive inventory of invasive species across Puget Sound has not yet been conducted, the magnitude of the problem is beginning to emerge from regional studies.

**Artificial propagation** of species is conducted for human use and quality of life benefits. The potential risks to native species, modification of habitat, and aesthetic impacts resulting from aquaculture and hatchery operations vary considerably by site, species, and methods. Hatchery operations to produce salmon have historically had effects such as loss of genetic diversity and genetic fitness, pathogen transfer, overharvest of native species that are co-mingled with hatchery stocks, and habitat impacts from the facilities themselves. Impacts have varied depending on the site, methods of operation, and the production objectives at each facility. Activities to culture many species of plants and animals may contribute pollutants to the environment or facilitate the introduction of non-native species, depending on how they are conducted.

**Harvest** and poaching of plants and animals similarly may impact the Puget Sound ecosystem, depending on how, when, and where it occurs. Harvest is considered to be a historic factor in the decline of Puget Sound rockfish, Pacific hake, pinto abalone, and Chinook salmon. Past harvest management practices focused on individual species and attempted to maximize the sustainable yield for human harvest rather than considering other species and ecosystem needs. For some threatened species, focused harvest management has been able to stem the decline of the target species, but may not adequately consider cross-species impacts, such as by-catch of other fish, birds, and marine mammals, or the loss of food for predators such as orcas. Harvest of plant species (such as trees) that serve as habitat for fish and wildlife species may adversely affect the species that depend on them or remove the building blocks that form habitat.

### **What do these threats mean for the future of Puget Sound?**

Although all of the activities described above represent existing or potential problems for the overall health of Puget Sound, in the near term, the Partnership has focused on those threats with known and extensive impacts and the greatest level of urgency in developing actions for the future. Based on the scientific evidence gathered in many forums, it is clear that the Action Agenda will need to address the continuing loss and fragmentation of habitat, and the ongoing input of toxic substances to Puget Sound as two of the highest priorities for sustaining Puget Sound into the future.

Population growth and climate change are expected to exacerbate the threats that are already affecting the health of Puget Sound. At least 1 million more people will live here in the next 15 to 20 years. At the same time there is compelling evidence that the region's climate is changing. Temperatures in the Pacific Northwest have risen faster than the global average, and Puget Sound waters are warmer. Most climate change models predict increasing temperatures, diminishing snowpack, earlier runoff, reduced summer flows, rising sea levels, and more acidic ocean waters in Puget Sound in the 21st century.

Further compounding these challenges is the fragmented system now in place to manage natural resources. Previous approaches to Puget Sound recovery have lacked a structure to: link problems across jurisdictions and geographic areas; set priorities; or determine the effectiveness of our actions. The Partnership was largely created to resolve this problem by defining key priorities and setting up a system to manage Puget Sound at an ecosystem scale. Question 3 of the Action Agenda outlines strategies to address the overriding threats to the ecosystem, and ways to fix the current management system so it works more effectively and efficiently. Question 3 also describes the unique conditions, threats, and strategies for action that have been identified for each of the Puget Sound regional action areas.

## Assessing status and threats

**Developing the Action Agenda:** The Partnership has woven together the work of three related efforts to assess the status and threats to the Puget Sound ecosystem:

- At a regional scale, NOAA/National Marine Fisheries Service has coordinated the work of federal, state, tribal, and other local scientists to produce a “Threats/Drivers Analysis” demonstrating the connections between threats and status. This work is part of an ongoing Integrated Ecosystem Assessment of Puget Sound (Appendix to be posted on Partnership Web site).
- A series of topic forums were held in 2008 to summarize our current understanding of the status of and threats to each of the six goals for a healthy Puget Sound: human health, human well-being, species and biodiversity, land use and habitat, freshwater resources, and the quality of water and land. Led by scientific and policy experts in each topic area, workshops were held to allow the larger public to contribute and a summary paper was prepared for each topic. This fact-finding process allowed scientists and policy leaders to work together, and gave the public an open opportunity to provide input to the Partnership in advance of publishing preliminary findings. The topic forum papers were also reviewed by the Partnership’s independent Science Panel. (Papers are located in the Appendix.)
- Local implementers working in the field in each of the seven Puget Sound action areas have identified the unique ecosystem features and major constraints facing their region. This information is summarized in the action area profiles, and illustrates the many differences in the diverse Puget Sound ecosystem and the need to combine efforts to achieve overall ecosystem health.

**Improving our understanding over time:** A more comprehensive picture of the health of all parts of the terrestrial, freshwater and marine ecosystem and the relative importance of threats in causing problems will be developed over time. Three important areas of further work identified for this next biennium will help improve our understanding of where the most urgent problems occur in the system, and which threats are most critical to address in the near term.

- Develop a coordinated regional ecosystem monitoring program that will allow us to track changes in priority ecosystem indicators over time.
- Refine ecosystem indicators so no gaps occur in how we measure changes in ecosystem health. Indicator development work will include models that illuminate cause-and-effect relationships and drivers (see next bullet). Part of this work will involve developing a subset of indicators that can be used to communicate to the public through a report card for ecosystem health
- Use existing information to conduct spatial (mapped) analyses to evaluate current ecosystem status and the primary threats and drivers affecting ecosystem health. Together with models and refined indicators, this work will highlight the location and relative importance of threats and drivers across the entire ecosystem, and help identify the features of Puget Sound that are most at risk.

### **QUESTION 3: What actions should be taken that will move us from where we are today to a healthy Puget Sound by 2020?**

The Puget Sound Partnership's principal task has been to "define a strategic action agenda prioritizing necessary actions, both basin-wide and within specific areas, and creating an approach that addresses all of the complex connections among the land, water, web of species, and human needs." The Partnership was required to involve the public, incorporate science, and develop a system for accountability and the efficient use of funding. Questions 1 and 2 of the Action Agenda define what a healthy ecosystem should look like in 2020 and identify the current and future threats to ecosystem health. These are complex and difficult questions, but the next step – determining what to do about it – is the toughest challenge of all.

During the development of the Action Agenda, the Partnership received more than 1,000 suggestions of what should be done, illustrating the difficulty in prioritizing actions for Puget Sound. Comments addressed myriad issues. Individually or in groups, people want to prevent oil spills, save orcas, restore their local creek, recover salmon, regulate geoduck production and harvest, increase recycling in schools, build green, enforce existing laws, ban disposable water bottles, and establish conservation reserves around Puget Sound. All of these actions are helpful, but long lists of unconnected actions provide little guidance on where to start and what would be the most effective use of limited resources.

Building a comprehensive, consolidated list of actions for Puget Sound is a significant step forward. Although the list of things to do for Puget Sound is daunting, and the actions cannot be tackled everywhere all at once, the Partnership synthesized the input into five strategic priorities for Puget Sound. Together, these five priorities address major threats to ecosystem health and embrace a new approach to managing and sustaining the Puget Sound ecosystem. Priorities A through C are related to specific threats facing the ecosystem. Priorities D and E are the management systems needed to effectively implement the other three priorities. The five priority strategies are:

- Priority A:** **Protect** the intact ecosystem processes, structures, and functions that sustain Puget Sound. Avoiding problems before they occur is the best and most cost-effective approach to ecosystem health.
- Priority B:** **Restore** the ecosystem processes, structures, and functions that sustain Puget Sound. Protecting what we have left is not sufficient, and significant effort at an unprecedented scale is needed to undo past damage.
- Priority C:** **Prevent water pollution at its source.** Many of our efforts have focused on cleaning up degraded waters and sediments, but insufficient resources have been devoted to stopping pollutants before they reach our rivers, beaches, and species.
- Priority D:** **Work together** as a coordinated system on priority actions. The programs and laws addressing environmental issues were established on a piecemeal basis to address separate problems in an earlier time, and the system does not address Soundwide and local problems on a coordinated basis at an ecosystem scale.

**Priority E: Build an implementation, monitoring, and accountability management system.**

This includes: using a **performance management** system with adaptive management, coordinated monitoring, accountability for action, and coordinated data management; providing **sufficient, stable funding** focused on priority actions; implementing a focused **scientific program** with priorities for research, appropriate measures to improve understanding of the ecosystem and the effectiveness of our actions, and clear pathways for informing decision making; and increasing and sustaining coordinated efforts for **communication, outreach, and education**.

Question 3 of the Action Agenda describes what needs to be done, identifies a set of near-term actions, and describes the approach for working together. For each priority, there is a description of the current situation and rationale for taking action, key objectives for attaining desired ecosystem outcomes, and near-term actions to move the region forward. The strategic priorities and their associated actions provide a regional starting place. Prioritization and sequencing of actions, as well as implementation assignments with milestones, is detailed in Question 4.

Many existing laws, policies and programs are critical to Puget Sound protection and recovery, and need to continue. Some but not all of these efforts are mentioned in the Action Agenda. As the Action Agenda is implemented and refined in the future, some programs and policies may need to be modified or even eliminated.

The strategies and actions are primarily aimed at addressing threats, particularly land alternation and water pollution, as well as increased population and climate change. The strategies and actions will be adjusted as the Action Agenda is implemented to help achieve the 2020 goals. As we learn more about the ecosystem and the effectiveness of particular techniques, we can also better link strategies and actions to desired goals and outcomes. Two important efforts will help to continually improve the Action Agenda. The Biennial Science Work Plan, completed in the same timeframe as the Action Agenda, identifies near-term research and assessment that will improve scientific information on ecosystem conditions and strategies. The management system for implementation, described in Priority E, will be used to keep track of the work to recover Puget Sound at the regional and local level, and use adaptive management to improve implementation efforts.

## **How were the priorities and actions developed?**

The Action Agenda priorities and actions have been developed through extensive collaboration between regional experts, scientists, and local community members who will undertake much of the responsibility for implementation. More than 300 inventories of existing programs and priority actions were provided by implementers via an online inventory, at action area workshops, and in written comments. Topic forum papers were prepared to address each Partnership goal, and associated workshops were attended by more than 500 people; the papers generated more than 1,200 pages of comments. Scientific input was obtained from the early results of the scientific assessment of the ecosystem and the topic forums, and findings were peer reviewed by the Science Panel. In all, more than 1,600 people attended workshops to develop the Action Agenda and more than 12,000 comments were received in writing or online.

A key step in the development of the Puget Sound Action Agenda was the development of a set of principles for ecosystem management in Puget Sound that followed from discussion at topic forums and community workshops (see below). The principles, refined by the Ecosystem Coordination Board, Leadership Council, and the Science Panel, were used in the development of strategic priorities and sets of actions.

Using the ecosystem principles, looking across the topic papers as a whole, the Partnership identified Priorities A-D to identify the land alteration and pollution threats. Priority E is the charge assigned to the Partnership. In considering the threats, the ecosystem principles, and the input from the topic forums and from the public, the Partnership selected the high-level actions and near-term actions identified in the topic forum papers and action area workshops, as well as by the Leadership Council. The Partnership also considered some of the many plans that already exist.

## Guiding principles for ecosystem management in Puget Sound

Input from the topic forums and action area meetings in 2008 led to the development of the following principles for ecosystem management. The principles, refined by the Leadership Council, Science Panel, and Ecosystem Coordination Board, were used to develop the strategic priorities and actions.

- a. Address threats and choose opportunities with the highest potential magnitude of impact.
- b. Address threats with the highest level of urgency. (How imminent is the threat; will it result in an irreversible loss; how resilient are the resources that are affected?)
- c. Use strategies that have a reasonable certainty of effectiveness and reflect a balanced precautionary and adaptive approach.
  - Actions should have a realistic expectation that they will be effective in addressing the identified threat.
  - Actions and decisions about the use of resources should err on the side of caution to avoid irreversible ecological consequences.
  - Actions should be designed so they can be measured, monitored, and adapted.
- d. Use scientific input – about the importance, urgency, and reversibility of threats; opportunities for management impact; effectiveness of actions; and monitoring and adaptation – in designing, implementing, and evaluating strategies.
- e. Use strategies that are cost effective in making efficient use of funding, personnel, and resources with realistic expectations of achieving results.
- f. Address the processes that form and sustain ecosystems and increase ecosystem resiliency rather than focus narrowly on fixing individual sites. Consider the Salish Sea ecosystem perspective.
- g. Attempt to address threats at their origin instead of reacting after the damage has been done. Anticipate and prevent problems before they occur, and plan for extreme events. (With more people coming to the region and a changing climate, a proactive strategy is increasingly important.)
- h. Consider the linkages and interactions among strategies.
  - Address multiple threats and their interactions with strategies that work together. We cannot afford to look at problems or develop solutions in isolation.
  - Watch out for unintended consequences. Evaluate strategies so actions to address one problem do not cause harm to other ecosystem processes, functions, and structure, as well as social and economic considerations.
  - Integrate salmon recovery actions with ecosystem management actions.
- i. Account for the variations in ecosystem conditions and processes in different geographic areas of Puget Sound. Some parts of Puget Sound are fairly intact while others are severely degraded, and rebuilding strategies need flexibility to encompass regional differences. Ensure that no region or economic sector bears the entire brunt of the responsibility for implementing solutions.

passed, seek and support one-year funding for fiscal year 2010 and pursue a dedicated state funding option.

4. Obtain delegated authority from the Coast Guard to expand and enhance the scope of authority of the Department of Ecology's vessel and facility inspections, marine incident investigations, and the agency's ability to augment Coast Guard prevention activities and review spill prevention and response plans on behalf of the Coast Guard. Delegated authority will streamline and strengthen spill prevention plans and operations manuals required by both agencies as well as stronger state enforcement.
5. Petition EPA to establish Puget Sound as a No Discharge Zone for commercial and/or recreational vessels to eliminate bacteria, nutrients, and pathogens from being discharged into Puget Sound. Prioritize areas of the Sound that have nutrient and/or pathogen problems, have high vessel use, are significant for shellfish production, and/or that are otherwise especially vulnerable.
6. Implement existing air management plans consistent with the Action Agenda.
7. Implement Shellfish Protection District plans, on-site sewage treatment plans in marine recovery areas, and related projects to restore water quality at tribal, commercial, and recreational shellfish areas that are degraded or threatened.
8. Implement immediate remediation actions to address Hood Canal's low dissolved oxygen concentrations through the Hood Canal Dissolved Oxygen Program.
9. Implement priority strategies and actions to address low dissolved oxygen in South Sound, targeted areas in the Whidbey Basin, and other vulnerable areas. This includes the Ecology-led South Sound Dissolved Oxygen Study.

## **C.2 Use a comprehensive, integrated approach to managing urban stormwater and rural surface water runoff to reduce stormwater volumes and pollutant loadings.**

Surface water and stormwater runoff in urban and rural areas are the primary transporters of toxic, nutrient, and pathogen pollutants to surface and groundwater resources throughout the Puget Sound basin. Comprehensive approaches to reduce stormwater runoff volumes and pollutant loadings differ in urban and rural areas, but include maintaining and restoring natural hydrologic systems of forests and wetlands for infiltration, and managing surface water closer to its source when possible. The region needs to better implement the current programs and regulations now, as well as strengthen efforts moving forward. This work is particularly important as stormwater flows will likely become larger and more frequent with climate change.

*C.2.1 Integrate efforts to manage stormwater discharges with work to protect land cover and reduce pollutants at the watershed scale and across Puget Sound.* This means implementing the land use protection and restoration actions described in Priorities A, B, and D, as well as the loadings reduction strategy in C.1.

C.2.1.1 Integrate stormwater management efforts into integrated watershed planning. This would include actions identified in Sections A and D, as well as Watershed Management Plans and Water Quality Improvement Plans.

C.2.1.2 Investigate, and if appropriate and feasible, establish watershed-scale stormwater permits through Section 208 of the Clean Water Act. Focus permits on the multitude of discharges that occur in logical geographic areas, rather than discharge-specific inputs or jurisdictional boundaries.

- C.2.1.3 Establish priorities and resource needs for creating a coordinated water quality monitoring program under National Pollutant Discharge Elimination System (NPDES). This program would need to be coordinated with the overall regional monitoring program identified in E.3.
- C.2.2 *Manage stormwater runoff in urban and urbanizing areas to reduce stormwater related impacts.*
  - C.2.2.1 Implement the municipal stormwater NPDES Phase I and II permits so that the discharges from municipal stormwater systems are reduced. Achieve overall water quality standards. Provide financial and technical assistance to permitted cities and counties.
  - C.2.2.2 Implement other NPDES permits including those for industrial discharges and the Washington State Department of Transportation.
  - C.2.2.3 Improve stormwater management in communities not currently covered by NPDES permits by providing financial and technical assistance to local governments to create local comprehensive stormwater control programs. Investigate expansion of NPDES permit coverage to include additional jurisdictions with municipal separated storm sewer systems (MS4). Initiate work in areas with documented stormwater-related problems and intact resources that are threatened by surface runoff.
  - C.2.2.4 Provide cities and counties with comprehensive guidance and standards regarding LID practices to incorporate into stormwater codes for development and redevelopment. Assist local governments with revisions to regulations so that all jurisdictions in Puget Sound require the use of LID where feasible, as soon as possible.
  - C.2.2.5 Advance the use of LID approaches to stormwater management. This includes, but is not limited to: a) resolve institutional barriers that limit use of LID for new development and redevelopment and road construction, including an update of stormwater flow control standards; b) implement, assess, and promote successful examples of LID techniques; c) develop incentives for using LID; d) develop focused training for contractors and developers and other stormwater professionals; and e) develop focused training for local government staff on areas best suited for LID and assist them in revising their regulations to allow LID.
  - C.2.2.6 Evaluate the technical and programmatic solutions for Combined Sewer Overflows (CSOs) in the context of improving water quality in fresh and marine water and preserving and recovering the health of Puget Sound. Continue efforts to eliminate discharge of raw sewage.
  - C.2.2.7 Prioritize and implement stormwater retrofits in urbanized areas, including roads. In the near term, develop high-level prioritization criteria for the selection of new projects. Over the long term, link retrofit priorities to coordinated watershed restoration and pollution prevention strategies.
  - C.2.2.8 Improve future, new, and updated NPDES permits by requiring sub-basin planning to better identify specific actions for water bodies, improving collaboration of effort for shared water bodies, incorporating climate change

projections related to stormwater runoff volumes, and meeting other requirements that will need to be identified.

C.2.3 *Manage surface water runoff in rural areas and on working resource lands to reduce pollutant loadings.*

- C.2.3.1 Implement the Forest and Fish agreement, including road maintenance and abandonment plans on public and privately held working forests.
- C.2.3.2 Fund and implement voluntary incentive, stewardship and technical assistance programs for rural unincorporated landowners, hobby farms, working farms, and nurseries.
- C.2.3.3 Implement and ensure compliance with Concentrated Animal Feeding Operations permits.

**C.2 Near-term Actions**

1. Establish a regional coordinated monitoring program for stormwater, working with the Monitoring Consortium of the Stormwater Work Group (see E.3).
2. Provide financial and technical assistance to cities and counties to implement NPDES Phase I and II permits, as well as Ecology for permit oversight and implementation.
3. Assist cities and counties in incorporating LID requirements for development and redevelopment into all stormwater codes.
4. Develop and implement LID incentives. Work with regional experts to develop and implement incentives and remove barriers to the use of low impact stormwater management techniques on development projects.
5. Convene a group of regulating agencies, implementers with key funding responsibilities, and other stakeholders as appropriate to evaluate the technical and programmatic solutions for CSOs to meet overall program goals of improving water quality in fresh and marine water. The integration of CSO solutions into the larger range of solutions to stormwater and other water quality problems may improve cost effectiveness of both programs in urban areas, notably Seattle and King County. This will require flexibility in implementation, timing, and scope of municipal wastewater NPDES program as applied to CSOs.
6. Retrofit existing stormwater systems by: a) developing high-level criteria that can be used in 2009 to determine the highest priority areas around the Sound for stormwater retrofits; and b) implementing stormwater retrofit projects in the highest priority areas based upon these criteria to bring areas into compliance with current stormwater regulations. Retrofits should include low impact stormwater management techniques to the greatest extent feasible. Monitor effectiveness of the techniques.
7. Continue to implement road maintenance and abandonment programs for federal, state (including trustlands), and private timber lands.
8. Implement private property stewardship, incentive, and technical assistance programs (e.g. Conservation Districts, WSU Extension, Washington Sea Grant, local government programs) that focus on reducing sources of water pollution, from commercial and non-commercial farms and other nonpoint pollution sources, particularly in priority areas.
9. Implement NPDES industrial permits and Washington State Department of Transportation permits, including Ecology for permit oversight and implementation.

Table 4-1 Ranked near-term actions priorities A through C.

Rank	Near-Term Action Description	Action Number
<b>Priority C: Reduce the sources of water pollution</b>		
1	Implement immediate remediation actions to address Hood Canal's low dissolved oxygen concentrations through the Hood Canal Dissolved Oxygen Program.	C.1 (8)
2	Provide financial and technical assistance to cities and counties to implement NPDES Phase I and II permits, as well as Ecology for permit oversight and implementation.	C.2 (2)
3	Retrofit existing stormwater systems by: a) developing high-level criteria that can be used in 2009 to determine the highest priority areas around the Sound for stormwater retrofits; and b) implementing stormwater retrofit projects in the highest priority areas based upon these criteria to bring areas into compliance with current stormwater regulations.	C.2 (6)
4	Assist cities and counties in incorporating LID requirements for development and redevelopment into all stormwater codes.	C.2 (3)
5	Implement priority strategies and actions to address low dissolved oxygen in South Sound, targeted areas in the Whidbey Basin, and other vulnerable areas.	C.1 (9)
6	Assist the Department of Ecology in implementing its PBT program to reduce and eventually eliminate the use of all chemicals on the PBT list, and other programs to reduce toxins such as metals.	C.1 (2)
7	Develop and implement on-site sewage system management plans in each Puget Sound county.	C.4 (1)
8	Pursue stimulus package funding to implement priority upgrades of municipal and industrial wastewater facilities, especially in nutrient sensitive and recoverable shellfish areas of Puget Sound.	C.3 (2)
9	Permanently fund a rescue tug at Neah Bay.	C.1 (3)
10	Implement NPDES industrial permits and Washington State Department of Transportation permits, including Ecology for permit oversight and implementation.	C.2 (9)
11	Implement private property stewardship, incentive, and technical assistant programs (e.g. Conservation Districts, WSU Extension, Washington Sea Grant, local government programs) that focus on reducing sources of water pollution, from commercial and non-commercial farms and other nonpoint sources, particularly in priority areas.	C.2 (8)
12	Continue to implement road maintenance and abandonment programs for federal, state (including trustlands), and private timber lands.	C.2 (7)
13	Implement Shellfish Protection District plans, on-site sewage treatment plans in marine recovery areas, and related projects to restore water quality at commercial and recreational shellfish areas that are degraded or threatened.	C.1 (7)
14	Conduct a focused outreach campaign for the public and businesses to reduce pollutants identified in toxic loading and other studies that are priority threats to Puget Sound.	C.1 (1)
15	Revise the current on-site sewage treatment rule no later than June 30, 2011, so standards are established to address new on-site sewage treatment technologies.	C.4 (2)
16	Petition EPA to establish Puget Sound as a No Discharge Zone for commercial and/or recreational vessels to eliminate bacteria, nutrients, and pathogens from being discharged into Puget Sound.	C.1 (5)

Table 4-1 Ranked near-term actions priorities A through C.

Rank	Near-Term Action Description	Action Number
<b>Priority C: Reduce the sources of water pollution</b>		
17	Implement existing air management plans consistent with the Action Agenda.	C.1 (6)
18	Support federal facilities in reducing nutrient and pathogens, particularly in already impaired areas.	C.3 (3)
19	Continue to fund the shellfish and fish advisory monitoring and advisory programs.	C.6 (2)
20	Develop and implement LID incentives.	C.2 (4)
21	Continue to implement ongoing, high-priority remediation and cleanup projects.	C.5 (1)
22	Enhance and target on-site sewage treatment loan programs and grants to ensure programs are targeted to areas of with demonstrated loading issues and vulnerable waters.	C.4 (3)
23	Convene a group of regulating agencies, implementers with key funding responsibilities, and other stakeholders as appropriate to evaluate the technical and programmatic solutions for CSOs to meet overall program goals of improving water quality in fresh and marine water.	C.2 (5)
24	Continue to fund the swimming beach monitoring program.	C.6 (1)
25	Establish a regional coordinated monitoring program for stormwater, working with the Monitoring Consortium of the Stormwater Work Group.	C.2 (1)
26	Refine the Department of Ecology near-term prioritization criteria for site cleanups to be consistent with the Action Agenda and incorporate criteria into toxic cleanup grant programs.	C.5 (2)
27	Obtain delegated authority from the Coast Guard to expand and enhance the scope of authority of the Department of Ecology's vessel and facility inspections, marine incident investigations, and the agency's ability to augment Coast Guard prevention activities and review spill prevention and response plans on behalf of the Coast Guard.	C.1 (4)
28	Use advanced wastewater treatment where needed in nutrient sensitive and shellfish recoverable areas, such as Hood Canal, South Sound, and the Whidbey Basin.	C.3 (1)

## **South Puget Sound Action Area Profile**

### **Physical description**

South Puget Sound was carved by glaciers into a land of rolling hills and ridges divided by nine long “fingers” of marine water. The area contains four large islands, numerous small islands, and shallow inlets that go dry at extreme low tide. Extensive tidal forces are the major drivers of water circulation in south Puget Sound marine waters, with maximum ranges of 20 feet. Many short streams and two major river systems (the Nisqually and the Deschutes) drain the action area along approximately 450 miles of shoreline. South Sound is the farthest portion of Puget Sound from the cool waters entering from the ocean. An underwater sill at the Tacoma Narrows further impedes the exchange of water to the nine major inlets. The shallow configuration and slow circulation make up a marine environment that is highly susceptible to low oxygen and warm temperatures.

### **Land use, population and economy**

The South Puget Sound Action Area is the home of the state capital of Olympia, and is one of the fastest-growing areas in the state. Population growth in this region has consistently exceeded the state growth rate since the 1960s and is expected to grow by an additional 30 percent in the next 20 to 30 years. The South Puget Sound Action Area is also the home of two major military facilities – Fort Lewis and McChord Air Force Base. Fort Lewis in particular is experiencing high levels of growth, with an estimated current population of 29,000 active duty soldiers, plus families and civilian personnel. Most of the population in the South Puget Sound Action Area is clustered along major transportation corridors and cities; outside of these urban areas the population is concentrated along the shorelines.

Historically, the South Puget Sound Action Area was the home of the ancestors of the Nisqually, Squaxin Island, and Puyallup tribes, who were supported by rich shellfish resources, salmon, and wildlife in the upland forests. Timber and shellfish still form the basis of important economic sectors in the area. Recreational use of the shorelines for swimming, kayaking, canoeing, fishing, and beach combing is popular. As in other portions of Puget Sound, the flat river delta areas were converted to agricultural farmland more than a century ago, and agriculture remains a substantial land use in the Nisqually watershed.

The South Puget Sound Action Area has a long-standing history of regional partnerships working to sustain and restore ecosystem health. Fort Lewis communicates regularly with local and tribal governments to discuss land use planning and environmental issues. The Nisqually Watershed Council has been operational for more than two decades, and the Key Peninsula-Gig Harbor-Islands and Chambers-Clover Creek watershed councils are also active. Public and private land managers, including timber companies with extensive holdings in the uplands, have worked on preservation and restoration of habitat to protect important upland and aquatic species.

### **Unique ecosystem characteristics and assets**

The waters of south Puget Sound provide some of the finest shellfish habitat in the world. Commercial production of oysters, clams and mussels from these waters and tidelands contributes significantly to Washington’s position as the nation’s leading producer of farmed bivalve shellfish. South Puget Sound commercial shellfish harvest is estimated to generate approximately \$50 million annually and is half of the statewide shellfish industry revenue. Abundant personal and recreational shellfish harvest occurs in addition to the commercial harvest. Clean water is the essential catalyst for the continued success of the

shellfish industry. Southern Puget Sound is also an important feeding area for salmon and trout originating throughout Puget Sound and British Columbia. The Nisqually River has the largest undeveloped delta area in Puget Sound and is among the 10 most important rivers in Puget Sound for salmon recovery. The Nisqually National Wildlife Refuge is a popular area for wildlife viewing. The Nisqually and Puyallup/White watersheds support threatened populations of Chinook, steelhead, and bull trout. These watersheds, along with the Deschutes and Kennedy-Goldsborough, support other unique populations of chum, pink and coho salmon, as well as coastal cutthroat trout. The South Puget Sound Action Area also includes portions of Mount Rainier National Park, and several state and local parks.

Unfortunately, the south Puget Sound's configuration of shallow bays and inlets – while ideal for growing clams and oysters – also make the region highly susceptible to water quality deterioration from the input of nutrients. These inputs come from a variety of sources including human and animal waste and stormwater runoff. The marine waters of the south Sound do not circulate well and the nutrient input promotes the growth of microscopic plankton. This cycle of input, bloom, and die-off consumes oxygen to levels that affect the health and survival of marine life.

### **Action area status and threats**

Historically, the South Puget Sound Action Area was an important center for timber processing and paper production. The industrial use of the urban bays in Shelton, Chambers Bay and Olympia led to contamination of these inner bays with wood wastes and spent sulfite liquor from pulp and paper mills, which closed between the late 1950s and the 1990s, as well as more concentrated contaminants such as creosote. The shallow bays limit the passage of commercial vessels leaving and entering the Port of Olympia and Oakland Bay at Shelton, and maintenance dredging of channels is necessary for larger vessels. Other major historical modifications to the environment in the action area include the creation of Capitol Lake in the heart of Olympia in the early 1950s, which was formed as a result of damming the Deschutes River, and the construction of the railroad line along the shoreline from Nisqually to Point Defiance in the early 1900s.

In addition to these historical changes, a number of threats to the ecological health of the South Puget Sound Action Area have been identified by the residents and regional scientists. Many of these apply to the larger Puget Sound region, including climate change, population growth, stormwater/wastewater discharge, emerging contaminants from pharmaceuticals and household products, loss of forest cover, and the fragmentation and loss of habitat function. Models predict that because of geological subsidence and climate change, level rise in the south Puget Sound region will be the highest in Puget Sound, with an increase of 3 feet by the end of the century.

Other specific threats to the action area include the legacy contaminants in the sediments of Budd Inlet and Shelton Harbor, and the loss of estuary and nearshore habitat. Shoreline armoring and fill associated with bulkhead placement, ramps, overwater structures, and railroad maintenance are major ecosystem constraints in south Puget Sound, as these activities eliminate or disrupt the habitat for forage fish, salmon, and other nearshore species. It is estimated that 40 percent, or 180 miles, of shoreline has already been armored or otherwise modified in the South Puget Sound Action Area. Polluted runoff and shoreline modification have impacted native species and the shellfish industry in south Puget Sound. Harvest methods for geoduck and shellfish species that are artificially propagated have been flagged as an issue of concern by some area residents. Impacts vary depending on the site, species, and methods of operation.

## Key strategies

The South Sound Action Area has numerous protection and restoration plans ready for implementation, including salmon recovery workplans, water conservation and reuse, stormwater retrofits, water quality cleanup plans prepared by the shellfish protection districts, and septic and wastewater upgrades. Priority actions for protection are to safeguard remaining undeveloped shorelines; several sites such as Gull Harbor and Devil's Head have been targeted for acquisition. Protection of unique prairie habitats and species is also a priority. Several industrial pollution sites are located in Budd Inlet, Oakland Bay, and Chambers Bay and these upland and in-water sites need to be prioritized for cleanup. Continued inter-jurisdictional collaboration and coordination is a key strategy for the action area.

South Puget Sound Action Area						
Land (# acres)	% impervious surface	Urban Growth Area Incorp. + Unincorp.		% of land that is publicly owned	Marine shoreline # linear feet	Marine shoreline % modified
		# acres	%			
1,059,495	6%	151,853	14%	29%	2,355,554	40%

Projected population change for South Sound Action Area counties			
County	2000 Census	2025 Projection	% change
Kitsap	231,969	299,073	29%
Mason	49,405	75,018	52%
Pierce	700,820	999,657	43%
Thurston	207,355	336,511	62%

Notes: Based on data from WA OFM, medium growth projection for 2025. Population data is not available by action area. Major portions of Pierce, Mason, and Kitsap counties are not located within this action area. A small portion of Lewis County is located within this action area.

**South Sound Action Area**

Ecosystem benefits provided by action area	Local threats to ecosystem benefits	Priority Action Area strategies
<p><b>Unique habitat types and ecosystem processes</b></p> <ul style="list-style-type: none"> <li>Marmelstuary. Nisqually River is largest undeveloped estuary in Puget Sound and largest National Wildlife Refuge in Puget Sound; important salmon, wildlife and bird habitat</li> <li>Marmelstuary. Nursery area for multiple Chinook populations</li> <li>Shoreline. Forage fish spawning areas</li> <li>Upland. Large areas of intact shoreline</li> <li>Upland. Unique prairie habitat with endemic species</li> </ul> <p><b>Food and timber (harvest)</b></p> <ul style="list-style-type: none"> <li>Nationally renowned shellfish, one of the largest shellfish producing areas in state</li> <li>Recreational and tribal clamming, crabbing and fishing</li> </ul> <p><b>Freshwater resources</b></p> <ul style="list-style-type: none"> <li>Hydropower for city of Centralia and city of Tacoma</li> <li>Leadership in reclaiming municipal wastewater</li> </ul> <p><b>Recreation and tourism</b></p> <ul style="list-style-type: none"> <li>Recreation: clamming, crabbing, Mount Rainier National Park, kayaking, boating</li> </ul> <p><b>Community and economy</b></p> <ul style="list-style-type: none"> <li>Numerous commercial and residential centers</li> <li>Center of state government</li> <li>Ports of Olympia and Shelton</li> <li>Homestead security: Fort Lewis &amp; McCord Air Force Base</li> <li>Nisqually Tribe</li> <li>Physalup Tribe</li> <li>Squamish Tribe</li> </ul>	<p><b>Habitat alteration</b></p> <ul style="list-style-type: none"> <li>Marmelstuary. Loss of riparian and estuary habitat, some intertidal alterations</li> <li>Marine nearshore. 40% of shoreline modified; BNSF rail along eastern shoreline</li> <li>Freshwater. Blocked habitat including dams and culverts on Deschutes River, Millor I-5 on Nisqually River</li> <li>Upland. Loss of prairie habitat through land conversion; loss of hydrologic function from existing and expanding impervious surfaces</li> </ul> <p><b>Pollution</b></p> <ul style="list-style-type: none"> <li>Toxics. Industrial pollution in bays and contaminated sediments including Oakland Bay, Chambers Bay, Budd Inlet; military sewage treatment plant at Taisolo Point</li> <li>Bacteria contamination. Bacteria and pathogens from human and animal waste</li> <li>Nutrient loading. Low dissolved oxygen in Budd Inlet, Case Inlet, and Carr Inlet</li> <li>Air quality. Poor air quality due to particulate pollution (wood smoke, diesel emissions, etc.)</li> </ul> <p><b>Freshwater resources</b></p> <ul style="list-style-type: none"> <li>Low flows in WRAs 11, 12, 14, flow issues in WRIA 13</li> </ul> <p><b>Invasive species</b></p> <ul style="list-style-type: none"> <li>Potential negative ecological impacts on native populations</li> </ul> <p><b>Artificial propagation</b></p> <ul style="list-style-type: none"> <li>Fish hatcheries. Salmon production has potential negative ecological and genetic impacts on natural populations and other hatchery populations and may compromise ability to develop viable, locally adapted populations; Shellfish production. Potential ecosystem impacts related to some aquaculture practices</li> </ul> <p><b>Harvest</b></p> <ul style="list-style-type: none"> <li>Fishing and bycatch, logging, and hunting practices: Local pressures need to be identified</li> </ul> <p><b>Localized climate change impact</b></p> <ul style="list-style-type: none"> <li>Sea level rise. Significant loss of estuarine beaches; inundation of tidal flats; flooding at downtown Olympia</li> <li>Flooding of urban and rural areas</li> </ul> <p><b>Other</b></p> <ul style="list-style-type: none"> <li>Conflicting use values of marine shorelines</li> <li>Harmful algal blooms in fresh and marine waters</li> <li>Increase in population by 2025: 44%; more than 520,000 people in Thurston, Pierce, Mason, Kitsap counties</li> </ul>	<p><b>A. Protect intact ecosystem processes, structures and functions</b></p> <ul style="list-style-type: none"> <li>Protect high value habitat <ul style="list-style-type: none"> <li>Protect undeveloped shoreline and support efforts to prevent development in floodplains</li> <li>Acquire high priority marine and fresh water habitat, including but not limited to: Gull Harbor in Budd Inlet, Lower Ed Inlet Shoreline Conservation, Twin River Ranch at Oakland Bay; Hanline Island Shoreline; Flacey Bay Farm and Shoreline; Devils Head; Lower Ohop Protection Project</li> </ul> </li> <li>Update and implement regulatory programs. Complete and implement Shoreline Master Program updates, complete and implement Critical Area Ordinances</li> <li>Protect and conserve water flows. Continue and expand LOTT Alliance water reuse facilities and nutrient removal</li> </ul> <p><b>B. Restore ecosystem processes, structures and functions</b></p> <ul style="list-style-type: none"> <li>Implement priority ecosystem restoration projects: <ul style="list-style-type: none"> <li>Complete restoration of Nisqually estuary</li> <li>Implement Salmon Recovery three-year workplans (WRAs 10/12, 11, 13/14, 15)</li> <li>Restore shorelines using WRAs 11, 12, 13, 14, 15 nearshore assessments</li> <li>Implement existing basin protection and restoration plans in key Peninsula, Clover/Chambers, and Nisqually basins; develop plans for other South Sound basins</li> <li>Develop and implement a multi-species recovery and management plan for salmonids and forage fish not addressed in Chinook Recovery Plans</li> <li>Support habitat and shoreline restoration efforts in Budd Inlet and Hammersley-Oakland Bay</li> <li>Develop and implement conservation and recovery plans for prairie-dependent species</li> <li>Restore estuaries and pocket estuaries throughout South Puget Sound</li> <li>Revitalize waterfront communities. Support and encourage Port of Shelton and Port of Olympia strategic redevelopment plans, including stormwater retrofits, complete Deschutes Estuary Restoration</li> </ul> </li> </ul> <p><b>C. Reduce sources of water pollution</b></p> <ul style="list-style-type: none"> <li>Prevent pollution. Implement existing Watershed Action Plans, Shellfish Protection Districts, and other water pollution cleanup plans in a coordinated way; implement the Oakland Bay Sea-Heb-Via-Wish Initiative and the Oakland Bay Clean Water District strategies; reopen key shellfish-producing areas in North Bay, Oakland Bay, Henderson Inlet, Buley Lagoon</li> <li>Manage stormwater runoff. Develop and implement LID where feasible; retrofit outdated, existing legacy systems; support development of local surface water management utilities and associated fees</li> <li>Upgrade and manage wastewater treatment plants. Shelton, LOTT, Chambers Bay, Solo Point and others</li> <li>Manage on-site sewage systems. Implement on-site management plans for Pierce, Thurston, Mason and Kitsap counties; prioritize areas with shellfish production, low dissolved oxygen, and high nutrient and pathogen loading; implement Shellfish Partners, and enhance on-site grants and loans programs for septic and connection to sewers</li> <li>Prioritize in-water and upland toxic clean up sites. Clean up industrial pollution in Budd Inlet, Oakland Bay, and Chambers Bay</li> </ul> <p><b>D. Work together as a system on priority actions</b></p> <ul style="list-style-type: none"> <li>Coordinated program strategy: <ul style="list-style-type: none"> <li>Continue recent collaborative work in watershed coordination; investigate whether more formal collaboration is needed</li> <li>Maintain Nisqually hatchery operations to conserve Chinook species</li> <li>Integrate nearshore and marine efforts (e.g., Shoreline Master Program) with watershed recovery efforts (e.g., Critical Areas Ordinances, Salmon Recovery Plan)</li> </ul> </li> </ul> <p><b>E. Implement the Action Agenda</b></p> <ul style="list-style-type: none"> <li>Science and monitoring: Implement Ecology best management practices guidelines for geoduck aquaculture; resolve shoreline use conflicts</li> </ul>

## **South Central Puget Sound Action Area Profile**

### **Physical description**

People are a major driver of change throughout the Puget Sound ecosystem, but none of the Puget Sound action areas illustrates this more dramatically than the South Central Puget Sound Action Area. In this area, people are the drivers – both in terms of their millions of daily car trips, and in the way they have reshaped the physical and biological structure of the region. The South Central Action Area is the most urbanized portion of Puget Sound, with commercial and residential buildings, huge areas of pavement, a heavily modified shoreline, and a pervasive road network. Although portions of the action area have been intensively developed, approximately 77 percent of the area is not considered urban, with vast tracts of agricultural lands in rural King and Pierce counties, and undeveloped wilderness in Mount Rainier National Park and the Mount Baker-Snoqualmie National Forest. The three major river systems originate in the Cascades near Snoqualmie Pass, Cascade Pass, and Mount Rainier, travel through forests and farms, and empty into Lake Washington and Puget Sound. Glacial melt from Mount Rainier feeds the Puyallup/White River system, while the Green/Duwamish and Cedar/Sammamish are supplied by snow melt and rainfall. Lowland areas receive an average rainfall of 40 inches per year. In highly urbanized portions, many streams or stream segments have been placed in drainage pipes and re-assert their presence during storms and flood events.

The two largest bays in the region are Seattle's Elliott Bay and Commencement Bay by Tacoma. Vashon and Maury are the largest regional islands. The major currents within the saltwater basin of central Puget Sound generally flow northward along the west side of Vashon Island, and southward through the East Passage. The marine waters of Puget Sound form warm layers at the surface during the summer months because of river input and solar heating. These layers are mixed during winter months by seasonal winds and cool weather. An underwater sill by the Tacoma Narrows also alters the pattern of marine water circulation.

### **Land use, population, and economy**

South central Puget Sound is the economic driver of the region, and largely of the state of Washington. This action area generates approximately \$165 billion in annual economic activity, comprising approximately 62 percent of the gross state product. Major commercial and industrial enterprises are concentrated here, including technology, aerospace, finance, insurance, health care, business and professional services, commercial fishing, recreation, and tourism. These industries are served by international port facilities in Seattle and Tacoma, along with Sea-Tac International Airport, Boeing Field, and passenger and freight railroad services. The region has 14,900 acres of designated manufacturing industrial centers in six locations: Ballard Interbay, Duwamish, North Tukwila, Auburn/Kent, Overlake, and the Port of Tacoma. Water supply for most of the population of the area is provided by the City of Seattle and the City of Tacoma, through their operations on the Cedar and Green rivers, respectively.

Historically, south central Puget Sound was the home of the ancestors of the Muckleshoot and Puyallup tribes, who were supported by rich shellfish resources, salmon, and wildlife in the upland forests. Today, the 2.5 million residents of the South Central Action Area live in three of Washington's largest cities – Seattle, Bellevue, and Tacoma, and in suburban and rural residential development that reaches across unincorporated King and Pierce counties. The northernmost portion of the action area is located in southwest Snohomish County. Following the adoption of the Growth Management Act in the 1990s, land use strategies have been effective in containing some of the sprawl, as 96 percent of the growth in King

County has been concentrated within the designated urban growth boundary. Significant tracts of commercial forest and agriculture remain in the eastern and southeastern portions of the area. Local government staff report challenges in trying to retain habitat features and natural amenities while trying to accommodate a projected 750,000 new residents in the next 20 to 25 years. Land use jurisdictions and the management of utilities and transportation systems are spread among hundreds of city and county governments and special purpose districts.

### **Unique ecosystem characteristics and assets**

The many ports and waterways of south central Puget Sound have made it an international shipping center for regional and national industries, natural resource extraction (logging, fisheries, mining), and agricultural products. Urban estuaries support many small marine, ship-building/repair and industrial enterprises. Public transportation to Kitsap County and Vashon Island is provided by the Washington State Ferries system and other vessel traffic consists of passenger ferries, fishing boats, research vessels, small recreational craft, and cruise ships. Recreation spots include Lake Washington, Lake Sammamish, and Lake Tapps; Puget Sound beaches such as Alki Beach in West Seattle, Seahurst in Burien, and Point Defiance in Tacoma; and along Interstate 90's Mountain to Sound Greenway, the middle Green River, and the White River above Enumclaw. The headwaters of the major rivers are protected through their status as parklands managed by the National Park Service; wilderness areas managed by the USDA Forest Service, and the headwater source areas of the water supplies of Seattle and Tacoma.

The federal listing of Puget Sound Chinook was the first time a threatened species listing for salmon had occurred in such an urban environment. Despite the extensive urbanization of south central Puget Sound, six populations of Chinook salmon and other salmon species spawn in the major rivers and lakes. Unique salmon populations include the spring run of White River Chinook; Issaquah Creek and Cedar River summer and fall Chinook; Lake Sammamish kokanee; and Lake Washington sockeye. The White River early-run Chinook population is the last existing early-returning "spring" Chinook population in southern Puget Sound. The Green River is one of the top 10 steelhead rivers in Washington and supports substantial natural and hatchery populations of salmon. Bull trout, coho, rainbow, and coastal cutthroat trout as well as chum and pink salmon, are also present in some of the river systems. Strong community efforts and watershed partnerships are directed at salmon recovery throughout the area, and many restoration programs are regionally financed. While other fish, wildlife, and bird communities are abundant in undeveloped portions of the action area, those species that co-exist well with humans are generally present in the urban sectors. Interestingly, Elliott and Commencement bays contain six-gill sharks, which seem to prefer urban areas.

### **Action area status and threats**

Historical modification of the ecosystem is at an entirely different magnitude in the South Central Action Area than in other parts of Puget Sound. This region was re-plumbed when the White, Cedar, and Black rivers were re-routed, and the Hiram M. Chittenden Locks were constructed. The locks and ship canal dropped the level of Lake Washington by nine feet, and eliminated the marshes along much of its shoreline. Several large dams or diversions are present in the action area on the Cedar (water supply), Green (flood management and water supply), and Puyallup and White rivers (hydroelectric and flow management). Attempts have been made to achieve improvements in altered flows associated with the dams and diversions but instream flows remain a severe challenge. Flows are also substantially modified in this action area because of the extent of development and impervious surface. Other major habitat alterations occurred when the lower Puyallup and other rivers were heavily diked and straightened, cutting off

meanders, side channels, flood plains, and wetlands that provided extensive habitat for salmon and birds. Industrial actions left toxic contamination in the lower Duwamish River (Seattle) and Commencement Bay in Tacoma, which became EPA-designated Superfund sites. Several hazardous waste facilities are present in the action area and are presently undergoing cleanup actions. Some toxic sites have become re-contaminated and repeated action has been necessary.

Saltmarsh habitat at the mouths of the major rivers is essentially gone, and riparian forest has been eliminated along many water courses. Armoring of the shoreline to create the port facilities, railroad corridors, and other facilities that have supported the regional economy has been extensive. Along south central Puget Sound, an estimated 75 percent of the marine shoreline has been modified. The interruption of sediment movement from shoreline armoring has led to erosion and deposition problems in some locations. Overwater structures on the larger lakes in the region have a high density per shoreline mile. Forestry and agriculture removed forest cover along many rivers and streams. A complex web of roads, bridges, and culverts support the human transportation system but have impacted the natural infrastructure of rivers and streams, and created barriers to the movement of fish and wildlife. In the marine areas, vessel traffic poses a risk of invasive species arriving from foreign ports, as well as major and minor oil and chemical spills.

Currently, polluted stormwater and industrial discharges that originate in South Central Puget Sound are some of the biggest threats to ecosystem health. Freshwater quality has been impaired in local streams from the metals and hydrocarbons that wash from roads and parking lots. “Endocrine disrupting compounds” from pharmaceuticals and personal care products have been found in water samples in King County. Industrial outfalls are concentrated in this region – 80 percent of the waste discharged from point sources comes from south central Puget Sound. Small communities in the South Central Action Area, such as Vashon Island, face substantial challenges in addressing wastewater treatment and water supply. Despite new wastewater treatment facilities, the size and capacity of current treatment plants is inadequate in parts of the action area.

The historical decline of ecosystem health has not been universal or irreversible in all parts of the South Central Action Area. Lake Washington was heavily polluted in the 1950s from sewage, but local residents funded a highly successful cleanup program. Local areas are greatly committed to salmon recovery programs and several restoration and protection projects have been implemented such as those in the upper White and tributaries, including Huckleberry Creek. Toxic sites are being cleaned up and land conservancies are working to maintain forest cover, wildlife corridors, recreational greenways, and rural farmlands. The South Central Action Area has developed low impact and “green” building programs and techniques that are national models. Restoration progress is difficult as the lack of staff capacity among local governmental entities is inhibiting implementation of salmon recovery and other plans, and budgetary cutbacks are becoming worse.

## **Key strategies**

The South Central Action Area is expected to receive half of the projected growth in Puget Sound in the coming decades. Action strategies for this area are largely directed at preventing additional loss of ecosystem function related to growth, setting priorities for restoring degraded areas and contaminated sites, and improving the region’s capacity to implement recovery plans. Active stewardship and acquisition programs and other priority actions are designed to restrict additional shoreline armoring, conserve water, restore instream flows and fish passage in several rivers, and expand functional salmon habitat by setting

back levees and improving flood plains. Stormwater management and wastewater treatment are the major focus for protecting water quality in urban areas, along with on-site septic systems in rural areas. Many of the jurisdictions in the South Central Action Area have recently worked together to complete the Vision 2040 plan which lays out a strategy for regional growth in central Puget Sound, with policies related to planning, transportation, public services, housing, economy and the environment.

<b>South Central Puget Sound Action Area</b>						
Land (# acres)	% impervious surface	Urban Growth Area Incorp. + Unincorp.		% of land that is publicly owned	Marine shoreline # linear feet	Marine shoreline % modified
		# acres	%			
1,435,235	12%	443,577	31%	39%	944,167	75%

<b>Projected population change for South Central Action Area counties</b>			
County	2000 Census	2025 Projection	% change
King	1,737,034	2,192,868	26%
Pierce	700,820	999,657	43%
Snohomish	606,024	898,715	48%

Notes: Based on data from WA OFM, medium growth projection for 2025. Population data is not available by action area. Most of Snohomish County is not located within this action area.

**South Central Action Area**

Ecosystem benefits provided by action area	Local threats to ecosystem benefits	Priority action area strategies
<p><b>Unique species</b></p> <ul style="list-style-type: none"> <li>• More than 17 unique populations of salmon, trout and steelhead</li> <li>• Endemic species of beetles</li> <li>• Remnant <i>Margaritifera</i> mussel populations</li> </ul> <p><b>Unique habitat types and ecosystem processes</b></p> <ul style="list-style-type: none"> <li>• Freshwater: Core area for Bull Trout recovery (Puyallup/White)</li> <li>• Upland: Inland upland forest in and around Mount Rainier National Park</li> </ul> <p><b>Freshwater resources</b></p> <ul style="list-style-type: none"> <li>• Water supply for city of Seattle, city of Tacoma, and surrounding metropolitan areas; many water supply watersheds are protected</li> </ul> <p><b>Food and timber (harvest)</b></p> <ul style="list-style-type: none"> <li>• Recreational harvest: Lake Washington sockeye and Isaquah Creek Chinook</li> <li>• Significant agriculture areas</li> <li>• Commercial, recreational, and tribal fishing</li> <li>• Hatcheries provide harvest opportunities and population stability while wild salmon stocks rebuild: White River spring Chinook, Puyallup steelhead</li> </ul> <p><b>Recreation and tourism</b></p> <ul style="list-style-type: none"> <li>• Mount Rainier National Park, Mount Baker-Snoqualmie National Forest, Lake Washington, Lake Tapps, Lake Sammamish, Mount Rainier to Sound Greenway, Alpine-Lakes Wilderness, boating, sport fishing, diving</li> </ul> <p><b>Community and economy</b></p> <ul style="list-style-type: none"> <li>• Population center for Puget Sound with more than three million residents</li> <li>• Commercial &amp; industrial hub, generating 63% of the gross state product</li> <li>• Significant rural areas</li> <li>• Home of the North Pacific fishing fleet</li> <li>• International port facilities and cruise ship terminal</li> <li>• Largest wastewater treatment system in the state with innovative BigWater Treatment Plant</li> <li>• Marine trade</li> <li>• Leadership on low impact development and green infrastructure approaches, including Bull, Green and Mudslide tool, Tribe</li> <li>• Puyallup Tribe</li> </ul>	<p><b>Habitat alteration</b></p> <ul style="list-style-type: none"> <li>• <b>Marine estuary:</b> Major loss of estuary habitat in Duwamish and Puyallup River estuaries and creation of an artificial estuary created by the Ballard Locks</li> <li>• <b>Marine nearshore:</b> 75% of shoreline modified, including overwater structures, shoreline armoring, dredging, filling, and marine shoreline vegetation removal</li> <li>• <b>Freshwater:</b> Over 100 miles of diked habitat with dams and diversions (Green, White, Puyallup), significant alteration of rivers, floodplains and shorelines; river straightening and channelization (Duwamish, Puyallup, Cedar, Sammamish); floodplain development; extensive alteration of surface hydrology, especially Lake Washington, Ballard Locks, White, Cedar, Puyallup, Duwamish and Black Rivers; significant diversion of water to drinking water supply and wastewater systems to Puget Sound, altering migration routes for salmon, modifying hydrology</li> <li>• <b>Upland:</b> Loss of working farms and forests through conversion; 34% impervious surface in urban growth area; increasing urban and rural development</li> </ul> <p><b>Pollution</b></p> <ul style="list-style-type: none"> <li>• <b>Toxics:</b> Duwamish and Commencement Bay Superfund sites; recontamination of previously cleaned up sites; risk of pollution from maritime activities</li> <li>• <b>Bacterial pollution:</b> Failing septic systems in nearshore areas and throughout watersheds; agricultural runoff</li> <li>• <b>Nutrient loading:</b> Especially in areas with limited flushing, (Shishole Bay, Quartermaster Harbor, and Dumas)</li> <li>• <b>Surface water runoff impacts:</b> Major source of urban stormwater runoff and pollutants into Puget Sound</li> </ul> <p><b>Freshwater resources</b></p> <ul style="list-style-type: none"> <li>• Limited water availability for people, farms, and fish: Low summer flows and high peak stream flows in WRRIAs 8, 9, 10, 12; 6.3-10.72; low mainstream winter flows</li> <li>• Increased future water demand for higher population</li> <li>• Localized areas of saltwater intrusion into groundwater</li> </ul> <p><b>Invasive species</b></p> <ul style="list-style-type: none"> <li>• Potential negative ecological impacts on native populations: Japanese knotweed, reed canary grass, and butterfly bush invasions along riparian corridors; non-native fish species in most lakes; nutria, manna invasive species including unicatals</li> </ul> <p><b>Artificial propagation</b></p> <ul style="list-style-type: none"> <li>• Fish hatcheries: Salmon production in Lake Washington/Sammamish, Green and White rivers have potentially negative ecological and genetic impacts on natural salmon. Shellfish production: not identified as a local issue</li> </ul> <p><b>Harvest</b></p> <ul style="list-style-type: none"> <li>• Fishing and bycatch, logging, and hunting practices: Local pressures need to be identified</li> </ul> <p><b>Localized climate change impact</b></p> <ul style="list-style-type: none"> <li>• Significant source of Puget Sound carbon emissions as 50% of carbon emissions are transportation related</li> <li>• Sea level rise: Risk of conversion of upland to shoreline, loss of estuarine beaches, limited sea level rise impacts in Tacoma</li> </ul> <p><b>Other</b></p> <ul style="list-style-type: none"> <li>• Population increase by 2025: 34% in King, Pierce, Snohomish counties (more than one million people)</li> </ul>	<p><b>A. Protect intact ecosystem processes, structures, and functions</b></p> <ul style="list-style-type: none"> <li>• Growth and development: Implement Vision 2040 Plan</li> <li>• Protect high value habitat: <ul style="list-style-type: none"> <li>◦ Acquire high priority habitats (e.g., Lower Puyallup transition zone habitat, White River PSE properties, South Prairie Creek, Middle Puyallup forest lands, Middle Green River, Vashon Island, Upper Cedar River)</li> <li>◦ Implement White River Biodiversity Stewardship Plan</li> <li>◦ Implement Habitat Conservation Plans (forest &amp; fish plans, Cedar, Green, Tacoma)</li> </ul> </li> <li>• Implement Pierce and King counties transfer of development rights programs, cluster development, and increase density in urban areas; utilize conservation easements and Public Benefit Rating System</li> <li>• Update and implement regulatory programs: Shoreline Master Program updates (King and Pierce counties, all relevant cities), critical Area Ordinance updates (all relevant cities); restrict additional shoreline armoring</li> <li>• Protect and conserve water flows: Establish and implement instream flow agreements in Green, White, Lake Washington, Puyallup; promote water conservation and reclaimed water use</li> <li>• Protect and support long-term stewardship of working farms, forests and shellfish farms</li> </ul> <p><b>B. Restore ecosystem processes, structures, and functions</b></p> <ul style="list-style-type: none"> <li>• Implement priority ecosystem restoration projects: <ul style="list-style-type: none"> <li>◦ Implement Salmon Recovery three-year work plans for WRRIAs 8, 9, 10, 12</li> <li>◦ Implement existing basin protection and restoration plans in King and Pierce counties</li> <li>◦ Implement large-scale floodplain reconnection projects to restore habitat and protect public safety</li> </ul> </li> <li>• Provide fish passage at Howard Hanson Dam on Green River, Election Dam on the Puyallup River and Buckley Diversion Dam on the White River</li> <li>• Restore upper Green River riparian corridor, increase channel complexity, and decommission old logging roads</li> <li>• Set levees back along the Cedar, Sammamish, Green, Puyallup, White and Carbon Rivers</li> <li>• Protect and restore Duwamish and Puyallup estuary (transition zone habitats)</li> </ul> <p><b>C. Reduce sources of water pollution</b></p> <ul style="list-style-type: none"> <li>• Work with Puyallup Tribe, local public health departments, and homeowners to restore shellfish beds in Quartermaster Harbor and other areas</li> <li>• Prevent pollution: Coordinate implementation of existing clean water plans and Watershed Management Plans; implement Puyallup River Watershed Action Plans; maintain spill response efforts</li> <li>• Manage stormwater runoff: Implement significant stormwater retrofits; implement low impact development strategies; implement NPDES permits</li> <li>• Manage on-site sewage systems: Implement Pierce, King and Snohomish counties onsite management plans; expand Pierce County's onsite grant and loan program</li> <li>• Prioritize invertebrate and upland toxic cleanup sites: Continue to implement Superfund cleanup at Duwamish River, Commencement Bay, Lake Union</li> </ul> <p><b>D. Work effectively and efficiently together on priority actions</b></p> <ul style="list-style-type: none"> <li>• Coordinated long-term strategy: <ul style="list-style-type: none"> <li>◦ Continue to encourage tribal participation in recovery efforts</li> <li>◦ Integrate resource and infrastructure planning for water quality, water quantity &amp; salmon recovery</li> <li>◦ Continue to advance regional cooperation in South Central Puget Sound</li> <li>◦ Continue voluntary program for access coordination in White River; integrate hatchery production at Issaquah Creek and Soos Creek hatcheries with salmon recovery</li> <li>◦ Continue Kokanee conservation planning and implementation</li> </ul> </li> </ul> <p><b>E. Implement the Action Agenda</b></p> <ul style="list-style-type: none"> <li>• Education and outreach: Continue and build on STORM education and outreach program; continue pharmaceutical take-back programs</li> </ul>