

VISION 2020+20 Update
Issue Paper on Environmental Planning

Puget Sound Regional Council

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Introduction

Background and Purpose

Puget Sound Regional Council (PSRC) is updating its *VISION 2020 Growth Management Economic and Transportation Strategy for the Central Puget Sound Region*. During an initial scoping comment period, PSRC received over 1,200 comments covering a wide range of broad themes and specific topics. Somewhat a departure from PSRC's traditional transportation and land use focus, many comments emphasized a desire for PSRC to develop an environmental framework for addressing land use, employment, and mobility. The vision and strategy should be long-range and be the driving force that:

- Unifies comprehensive plans and countywide planning policies into a regional environmental framework.
- Develops a regional environmental vision that maintains and restores ecological connectivity, decreases fragmentation of natural systems, and protects critical areas and resources.
- Supports the preservation of habitat for endangered and threatened species.
- Supports the maintenance and improvement of the quality of our air, soils, water, and natural systems and explores the idea of developing minimal regional critical area standards so that jurisdictions throughout the region have more consistent regulations.

By providing an environmental framework, PSRC hopes to enhance the environmental analysis of the various VISION 2020+20 alternative growth scenarios and incorporate appropriate environmental provisions into multicounty policy recommendations. In addition, the work is intended to assist current environmental management efforts and paint a conceptual picture of environmental conditions in a baseline report for decision makers and the general public.

This paper is only the first step in incorporating environmental planning into VISION 2020+20. The purposes of the paper are to:

- Describe ongoing and potential efforts to engage environmental research and management organizations in participating in the upcoming formulation of the VISION 2020+20 Plan and environmental analysis.
- Work toward identification of a shared understanding in the environmental science/management community by describing current and emerging environmental issues, problems, trends, and management efforts.
- Describe existing sources of relevant baseline data and information for incorporation into the plan development and analysis. This baseline information will also be used to evaluate the potential benefits of compact or low-impact development.
- Begin to enumerate the key regional environmental quality questions facing the VISION 2020+20 planning team.
- Suggest next steps for incorporating environmental management into PSRC's regional planning activities.

Since the first VISION 2020 plan was adopted in 1990, our knowledge of the region's ecology has grown substantially. Environmental protection and restoration efforts—spurred by the listing of salmon species, damage to actual areas, human health objectives, loss of forest lands, and other concerns—have also intensified. Today there are literally dozens of resource management agencies, local governments, research institutions, advocacy groups, tribal organizations, and other non-governmental organizations working to improve our environment.

A unifying vision of the ways those efforts interconnect at the regional level would be a valuable contribution to environmental management activities. Such a perspective is a useful goal for the VISION 2020+20 process, possibly leading to a regional environmental planning role for PSRC. This paper takes an initial step toward that inclusive regional vision by summarizing the concerns and activities of some of the most relevant leaders in the field.

Organization of the Paper

Following this **Introduction**, the next section of the paper, titled **Regional Environmental Priorities**, summarizes regional environmental priorities as defined by existing entities working on environmental issues in the Puget Sound region. This effort provides an initial picture of the region's priority environmental concerns. This section also includes issues that are just emerging in research but are not currently being addressed through governmental management efforts.

The third section, **Implications for Regional Planning**, is a discussion of implications for the VISION 2020+20 update. It includes recommendations for developing alternative growth scenarios, environmental analysis, and further regional environmental planning activities.

The implications presented in the third section also describe policy issues that could be addressed in the revised multicounty policies that would be incorporated into the updated VISION 2020 strategy. In most instances, these issues and related implementation actions are only briefly described in this paper. Should they be advanced for further consideration in the update process, additional detail would need to be developed. The additional information would discuss responsible parties or agencies, program specifics, budgetary considerations, and schedule.

Appendix A provides a more detailed description of the environmental priorities of each entity in support of the summary contained in the section on Regional Environmental Priorities.

Process

The primary purpose of this study is to identify the understanding of current regional environmental issues shared by environmental scientists, planners, and resource managers working in the field. Thus, the general method was to contact representatives from these fields and summarize the information and insights they provided. This process included five basic steps:

1. The consultants individually contacted selected environmental scientists, planners and resource managers from applicable agencies, governments, and organizations to seek their opinion regarding key environmental issues and indicators and to ask for their participation in the project.
2. In early January, the consultants conducted a half-day work session to discuss the key issues, relevant information, and project methodology. This meeting helped to focus the scope and direction of subsequent work.
3. Based on the results of that work session, the consultants conducted follow-up interviews and a literature search to describe the issues, identify the key indicators and trends, and acquire and compile the available information. The team prepared a partial draft of the document for presentation to the PSRC Growth Management Policy Board and distributed it to work session participants.
4. The consultants convened a second work session with environmental scientists, planners, and resource managers to take comments on the draft. Based on those comments, the team prepared a second draft that more specifically described the concerns and management activities of individual agencies, governments and organizations addressing environmental issues in the Puget Sound. Each agency, government, and organization was sent their specific section and given an opportunity to comment on and/or update the information. At this time, the team also explored the implications of the environmental issues for the VISION 2020+20 process and began to consider the ways that upcoming regional planning might address them.
5. A second draft was distributed to all participating parties and comments incorporated into the final issue paper draft. When requested, team members met with the entity representatives to address more substantive issues.

Special Considerations for Regional Environmental Planning

An Integrated System

Ecological processes operate in a complex system of integrated functions. Therefore, it is problematic to examine environmental problems as isolated issues. When exploring alternatives for the VISION 2020+20 update, PSRC should work with an integrated environmental framework, such as the one illustrated below, which illustrates the relationship between four human-created conditions (in the four corners) and in-stream or nearshore habitat quality.

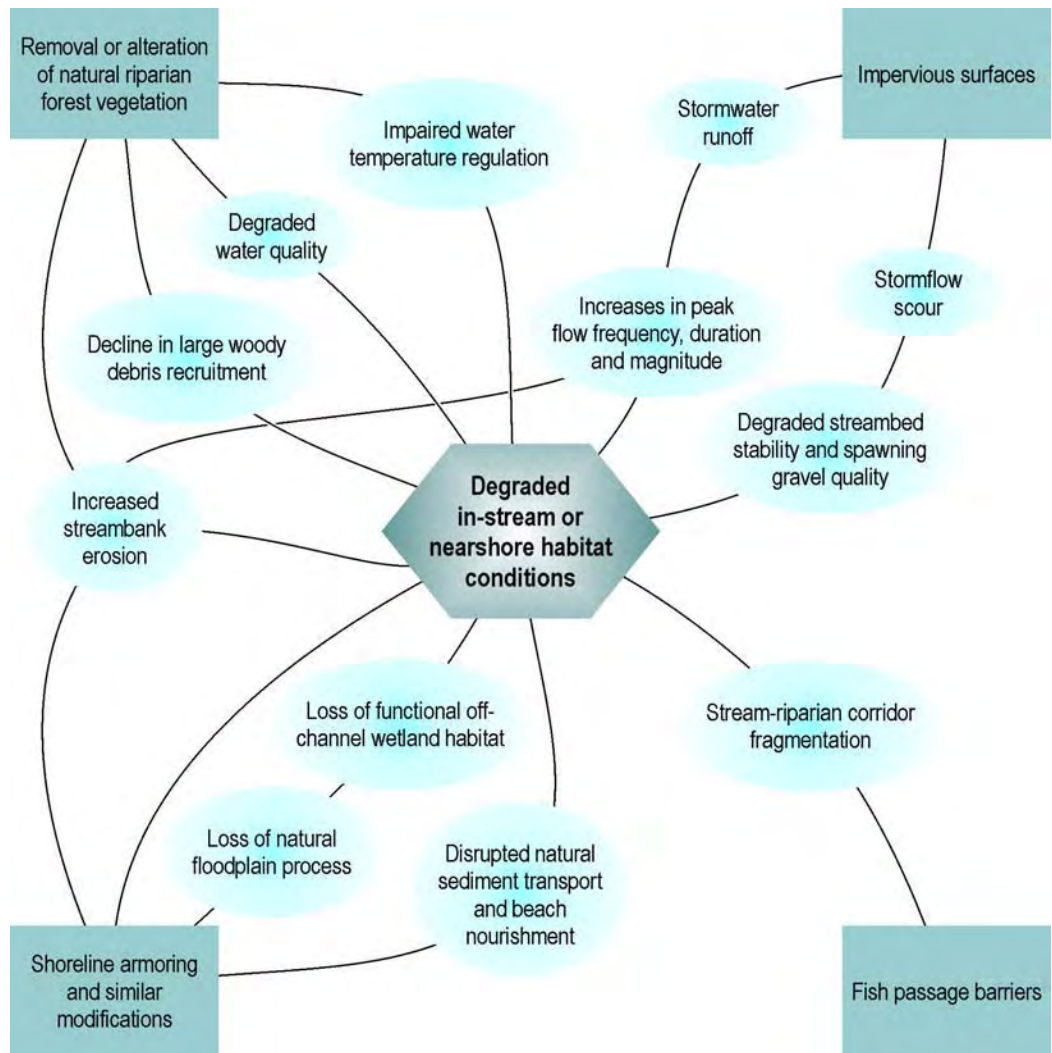


Figure 1. Example of an integrated environmental framework. (Adapted from the 2003 Landscape Assessment and Conservation Prioritization of Freshwater and Nearshore Salmonid Habitat in Kitsap County)

Regional Environmental Priorities

There are numerous agencies, governments, and organizations addressing environmental concerns in the Puget Sound region. Each of these entities has its own view of what the priority environmental concerns are within its jurisdiction.

The matrix on the following page summarizes the current priority environmental issues identified by the contacted entities. The matrix focuses on environmental issues that are either caused or impacted by human development and are thus relevant to PSRC's VISION 2020+20 update.

Table 1. Summary of Priority Environmental Issues Identified by Select Entities

	Agencies				Counties				NGOs			Others					
	WA Dept. of Ecology	WA Dept. of Fish & Wildlife	WA Dept. of Natural Resources	EPA	Puget Sound Clean Air Agency	King County	Kitsap County	Pierce County	Snohomish County	Cascade Land Conservancy	The Nature Conservancy	Northwest Environment Watch	Northwest Indian Fisheries Council	Puget Sound Action Team	Transboundary Working Group	WRIAs & other salmon recovery efforts	Emerging Issues & Research
Air Quality																	
Airborne pollutants	●			●	●	●						●			●		
Traffic congestion hot spots																	●
Terrestrial Habitats and Species																	
Fragmentation of forest habitat		●	●							●	●						
Invasive Species		●	●	●													●
Loss of forest and resource lands		●	●	●		●	●	●	●	●	●				●	●	
Loss of prairies and oak savannahs		●	●				●				●						●
Loss of prime agricultural land		●		●			●										●
Quality of forest habitat		●	●	●			●				●	●				●	
Quality of urban ecosystems				●													●
Terrestrial species sustainability		●	●	●			●			●					●		
Water Quality and Aquatic Habitat																	
Aggregation of impervious surface		●															●
Aquatic species sustainability	●	●	●	●		●	●						●	●	●	●	
Contaminated submerged sediments	●	●	●	●		●							●	●		●	
Impervious surface coverage	●	●		●		●	●		●		●		●	●		●	
Loss of riparian vegetation	●	●					●						●				
Modified shorelines	●	●	●				●	●		●			●	●	●	●	
Nutrients and pathogens		●		●									●	●		●	
Landscape-Scale Ecological Processes																	
Effect of landscape transformation on ecological processes	●	●		●		●				●	●		●			●	●
Ecological connectivity		●	●	●													●
Global Issues																	
Climate change					●												●

Priority Issues

The following is a brief discussion of the environmental problems identified by participants, along with examples of current management efforts addressing those problems and general implications for the VISION 2020+20 process. Issues have been divided into four categories—(1) air quality, (2) terrestrial habitats and species, (3) water quality and aquatic habitat, and (4) landscape-scale ecological processes.

Air Quality



Identified Issues, Problems, and Trends

Air quality is primarily a public health concern, although air quality can also affect plant and animal life and visibility. Particulate matter, a main component of air pollution, is tiny enough to be deeply inhaled and can contribute to various respiratory and cardiovascular ailments. The interplay of various **airborne pollutants** and their combined effect on human health may be more complex than previously thought, and thus it is appropriate to consider air quality in terms of a suite of pollutants, including particulate matter (PM₁₀ and PM_{2.5}), carbon monoxide (CO), nitrous oxides (NO_x), ozone (O₃), sulfur dioxide (SO₂), and air toxics, such as toluene, xylene, benzene, and formaldehyde. Over the last 30 years, the air pollutants of concern have changed. Historically, ground-level ozone, carbon monoxide, and fugitive dust have been the pollutants of concern. Currently and for the future, the pollutants of concern are fine particles, toxic emissions, and ground-level ozone. Adding climate change and visibility to these pollutants produces the list of current air quality concerns. Air quality experts are becoming increasingly concerned that a broad range of air toxics may contribute to cancer and cardiovascular disease.

Urbanization affects air quality by changing the physical environment, such as replacing vegetation with paved surfaces and buildings, by concentrating uses and activities in areas, and by moving people and goods between areas.

These factors cause or contribute to a variety of air quality problems. Conversion of natural areas to paved areas and buildings removes vegetation, changes the

local ambient temperature, and results in more CO₂ in the atmosphere, which are factors contributing to climate change. Concentrating uses and activities in an area, such as homes with woodstoves or wood-burning fireplaces in a valley or densely populated areas, can exacerbate the health problems caused by the fine particles and toxic emissions in wood smoke.

Concentrating uses in an area can involve constructing residential uses next to agricultural uses, which can produce complaints about odors and emissions from the farm. Similarly, converting existing urban areas to new uses, such as industrial waterfronts to mixed-use residential, commercial, and industrial areas, can result in existing industrial uses that generate polluting emissions being surrounded by uses and users that could be harmed by the exposure.

While a number of human activities, including indoor and outdoor burning, construction dust, and lawn care, can lower air quality, motor vehicles are by far the largest source of air pollution, responsible in King County for about 55 percent of all pollutants.¹ Between 1985 and 2002, vehicle miles traveled in King County increased by 90 percent.² Over approximately the same time period, since 1990, levels of airborne pollutants have generally decreased, though conditions vary by year and location.³

An increase in vehicle miles traveled with a corresponding decrease in airborne pollutants can be attributed to improved vehicle fuel technology. While improved technology has been mitigating the effects of increased vehicle miles traveled, it is uncertain that this counterbalancing effect can be sustained with current technology, particularly with regard to toxics and CO₂. Air pollution from ships may become an increasing concern as both container and cruise ship traffic in Puget Sound increases.

Current and potential management efforts for addressing mobile-source air pollution involve a coordinated, collaborative strategy with three distinct, but related, components:

- Cleaner vehicles and fuels.
- Alternatives to single-occupant automobile travel.
- Growth management-related strategies.

The cleaner vehicles and fuels component is a technologically based strategy. It involves standards/requirements for cleaner cars and cleaner fuels. Today's cars are 90 percent cleaner than cars built in the late 1960s. New diesel vehicles are approximately more than 90 percent cleaner than those built in the early 1970s. This year, the state legislature passed laws requiring new cars sold in the state to meet the even cleaner California emissions standards. By mid-2006, all of the on-road diesel fuel sold in the country will be ultra-low-sulfur diesel, which reduces particulate emissions by 5 percent to 10 percent and allows new and existing diesel engines to be fitted with devices that reduce those emissions by over 90 percent. The Clean Air Agency's Diesel Solutions is a voluntary public/private partnership that is promoting cleaner fuels and retrofitting existing diesel-powered vehicles and vessels with emission-reduction equipment, such as diesel oxidation catalysts and diesel particulate filters. All of the transit agencies in the region are in the process of retrofitting their diesel vehicles. Through the State School Bus Retrofit program, all of the school districts in the four-county region will be installing retrofit devices on their buses to reduce emissions by 90 percent, or more in some cases.

While air quality trends for the traditionally monitored pollutants, such as CO and particulate matter, have shown improving conditions, there is increasing concern that small amounts of air toxics, including volatile organic compounds such as toluene, xylene, benzene, and formaldehyde, can be carcinogenic.

In addition, elevated levels of CO₂ are an increasing concern because of its effects on climate change, as briefly discussed in the section on energy issues and research.

Examples of Current Management Efforts

The Puget Sound Clean Air Agency is currently implementing a collaborative air quality strategy with three components:

- Cleaner vehicles and fuels.
- Alternatives to single-occupant automobile travel.
- Growth management-related strategies.

The agency's Diesel Solutions Program is a voluntary partnership promoting cleaner fuels and retrofitting diesel vehicles. Through the State School Bus Retrofit Program, all of the school buses in the four-county area will install devices to reduce emissions by 90 percent or more in some cases. The agency also provides technical assistance for programs such as the Commuter Trip Reduction Program. Participation in growth management activities is an emerging focus for the agency, which involves working with PSRC and local governments to implement growth management strategies that reduce vehicle miles traveled and other air quality strategies.

Regulatory measures to reduce pollution from outdoor and indoor fires, dry cleaners, and gas stations, for example, also significantly benefit air quality.

King County is currently engaged in a number of efforts aimed at reducing vehicle miles traveled and/or encouraging the use of cleaner, more efficient vehicles. For example, the county hopes to reduce vehicle miles traveled by promoting transit ridership and by creating bicycle lanes and pedestrian-friendly urban environments. The county is also encouraging the close proximity of houses and jobs in an effort to reduce vehicle miles traveled.

In conjunction with its transportation planning, PSRC reviews proposed transportation projects for their potential impacts to air quality.

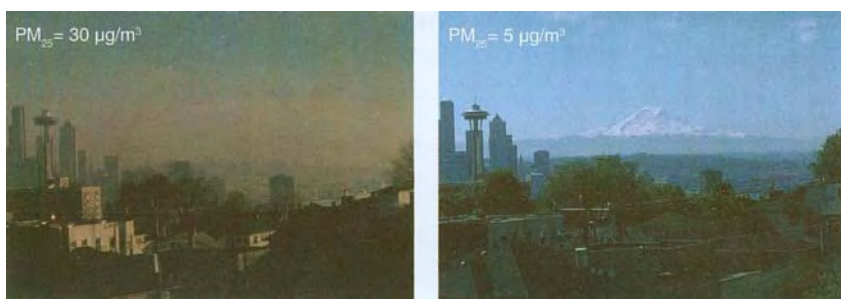


Figure 3. Particulate matter less than 2.5 micrometers in size at 30 micrograms per cubic meter (left) and at 5 micrograms per cubic meter (right).

Implications for VISION 2020+20

1. Since a significant percentage of air pollution is caused by vehicle emissions, reducing the number of vehicle miles traveled could substantially improve air quality. Therefore, comparing the relative vehicle mile projections of the various alternatives is important for air quality as well as other considerations. Strategies to reduce vehicle miles traveled should address both commute and non-commute trips, since commute trips represent only a fraction (approximately 20 percent) of total vehicle trip miles in the region. For example, these strategies might address the functionality within each center through pedestrian connections, mixed-use, etc.
2. Policies to convert public and transit vehicles to cleaner diesel fuel and equipment and other fuel technologies will contribute to emission reductions and reduce a variety of pollutants, including air toxics.
3. Emerging research suggests that areas near 500 feet of congested freeways experience elevated levels of pollution. The various alternatives should evaluate the feasibility of siting dense residential developments, hospitals, and schools within urban environments but away from congested freeways and busy arterials. Given such sitings, however, cleaner vehicles and fuel will be an important mitigating factor. (See also *VISION 2020+20 Update/Issue Paper on Health*, December 2004. This paper discusses three facets of health that should be considered in the VISION 2020 Update: 1) safety, 2) environmental health, and 3) personal well-being.)
4. Puget Sound Clean Air Agency's emphasis on growth management planning as a means of improving air quality presents an opportunity to reinforce PSRC's VISION 2020+20 effort. Better understanding of the links between growth patterns, air quality, and human health would reinforce both agencies' work. Additionally, alternatives to single-occupant vehicles and a wider range of transit options are important air quality improvement measures, and the extent of their effect warrants further study.

Terrestrial Habitats and Species

Identified Issues, Problems, and Trends

Loss and degradation of terrestrial habitat threatens indigenous wildlife and biodiversity. The construction of new homes and roads can result in the **loss of forest and resource lands**. Water quality and aquatic habitat are also negatively impacted by the loss of forest lands, since forest cover is directly related to the proper functioning of aquatic systems.⁴ Over the past thirty years, the central Cascades have lost 1.7 million acres of forest, 28 percent of the area's forest land.⁵ Most recently, during the 1990s, the Puget Sound area lost 10 acres of land a day to development.⁶

Fragmentation of forest habitat is also a major threat to biodiversity and species sustainability. As patches of suitable habitat become smaller, fragmented, and isolated, the likelihood of long-term species survival diminishes due to a loss of gene flow between populations.⁷ The likelihood that chance events, such as fires and floods, will be detrimental also increases.

The **quality of forest habitat** can be affected by many human activities. Clear-cutting of forests has a significant negative impact since "virgin forest... is far richer in native biodiversity [than second or third growth forest]."⁸ Additionally, "excessive grazing, incompatible timber management activities, outdoor recreational activities and many other land-use activities" can negatively affect the quality of forest habitat by contributing to "compacted soils, changes in hydrologic processes and increased invasion of non-native weeds."⁹ Forest health in non-urban areas has been monitored by the Washington Department of Natural Resources for the past fifty years with an annual aerial detection survey that records recently killed and defoliated groups of trees, which is then checked by ground surveys.



"As citizens of Washington state, we have been blessed with an incredible diversity of natural resources: ocean waters, conifer-covered slopes, volcanic peaks, shrub-steppe and grasslands, deep coulees, and more. As stewards of this rich natural heritage, it is our responsibility to retain it for future generations, so that they, too, can learn from it and enjoy it... Natural areas are an important part of providing healthy ecosystems, working landscapes and benefits for all the people of Washington – goals which we believe are overlapping and work together to complement the many activities that occur on private and public lands."

– Washington Department of Natural Resources

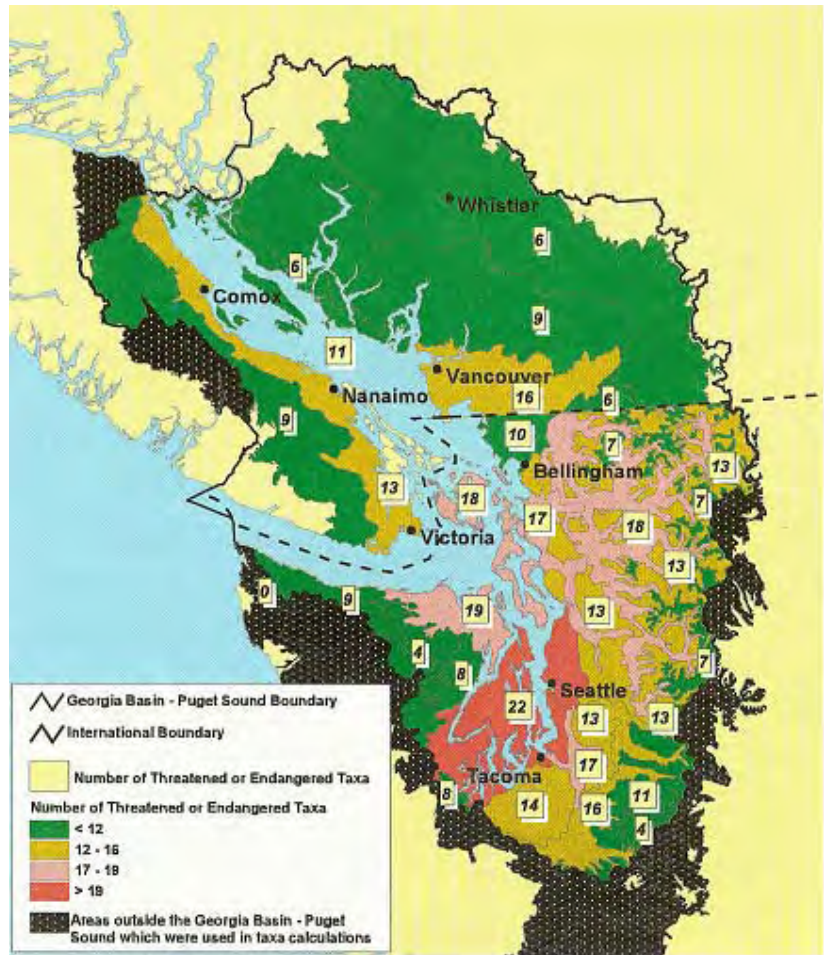


Figure 4. Species at risk in the Georgia Basin-Puget Sound ecosystem.
 (Source: Georgia Basin-Puget Sound Indicators Report, Spring 2002)

The **sustainability of terrestrial species** depends on several important habitats, including coastal lowlands and lowland forests. The lowland forests of the major river valleys have both high species abundance and correspondingly high numbers of species at risk.¹⁰ In the Puget Sound ecosystem, 25 percent of native breeding reptiles are at risk, as are 12 percent of birds and 12 percent of mammals.¹¹ Species at risk are determined by examining the number of species that have been categorized as being vulnerable to extinction.¹²

Examples of Current Management Efforts

One major management effort directed at improving terrestrial habitats and species in the Puget Sound region is the Willamette Valley-Puget Trough-Georgia Basin Ecoregional Assessment. The Washington Department of Fish and Wildlife, the Washington Department of Natural Resources and The Nature Conservancy worked together to develop this document that identifies priority

locations for biodiversity protection based on biological values and conservation suitability. This assessment, along with those developed for other ecoregions of the state, will be used by the Washington Department of Fish and Wildlife to guide habitat acquisition, assist counties in land use planning, direct funding for grant programs, and coordinate conservation efforts with other organizations.

The Washington Department of Natural Resources also offers terrestrial habitats and species within its jurisdiction two types of designations that provide a degree of protection. Natural Resource Conservation Areas protect native habitats of endangered, threatened, and sensitive plants and animals while also offering educational and low-impact public use. Natural Area Preserves provide the highest level of protection to especially rare plant and animal communities.

The Cascade Land Conservancy's *Cascade Agenda* is a strategic plan that is intended to guide regional actions to conserve and care for our environment for the next century. The *Agenda* articulates a vision for the next one hundred years, sets forth a strategy for achieving that vision, and establishes benchmarks for measuring progress toward that vision. The *Agenda* calls for the conservation of approximately 1.3 million acres of land through the use of market-based tools to meet the goals of ecological connectivity and maintenance of high-value ecological functions.

“Populations of native plants and animals are an important part of a healthy ecosystem, our legacy, and are key elements to long-term economic and social well-being. Without adequate conservation strategies and practices, significant numbers of bird, mammal, amphibian, fish, and plant species will continue to be vulnerable to extinction.”

– The Transboundary Georgia Basin-Puget Sound Environmental Indicators Working Group

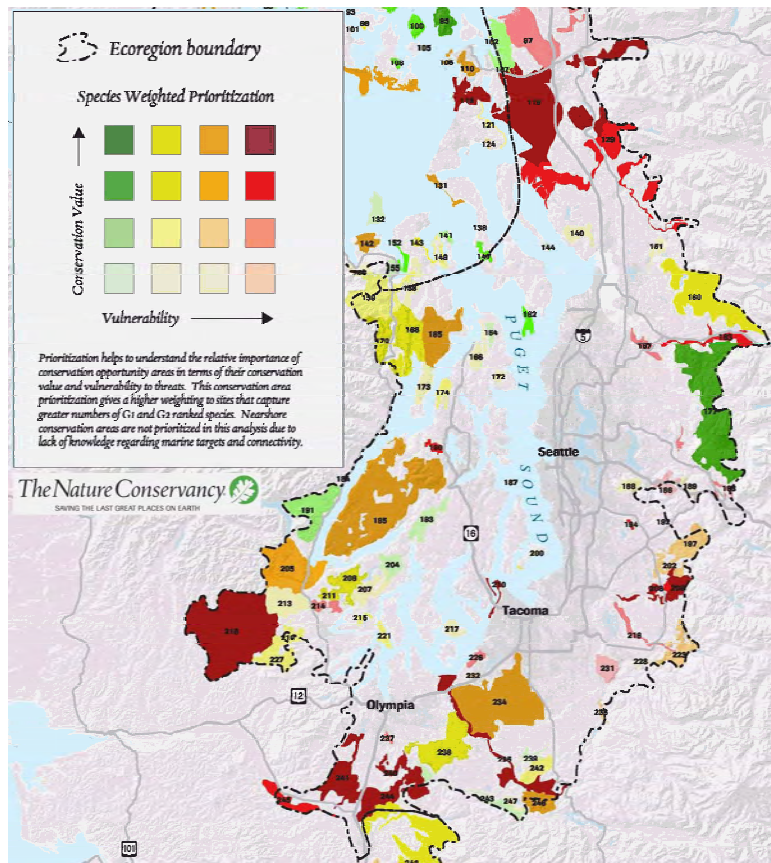


Figure 5. The Nature Conservancy/Washington Department of Fish and Wildlife prioritization scheme for last remaining large blocks of habitat in the Puget Trough Ecoregion.

Implications for VISION 2020+20

There are a number of conservancy efforts in the four-county region that PSRC should continue to actively track. Some of these efforts, such as the Cascade Land Conservancy's, The Nature Conservancy's, and the Shared Strategy for Puget Sound's work, are developing valuable data and analysis. However, PSRC should also be aware of the full spectrum of analysis on conservation and not just focus on certain individual efforts as it moves forward with regional environmental planning.

1. The Nature Conservancy/Washington Department of Fish and Wildlife ecoregional assessments identify areas that are especially important to the conservation of regional biodiversity. Its findings should be incorporated into the alternatives analysis to determine the relative impacts to these areas.
2. The Cascade Land Conservancy's Cascade Dialogues is proposing a comprehensive strategy to preserve and enhance targeted forest lands. The PSRC team should continue to coordinate with the Cascade Land Conservancy and other interest groups and organizations to ensure that conservation lands are incorporated into the alternatives analysis and also explore incorporating relevant management strategies with the VISION 2020+20 analysis.
3. While resource agencies focus primarily on relatively undisturbed lands outside the urban growth area, measures to improve vegetation and habitat within urban areas may also be an appropriate strategy, especially in areas associated with shorelines and aquatic environments. Preservation and restoration measures for urban habitats—such as smart buffers, wildlife corridor enhancements, landscaping with native plant materials, mitigation banking, and identification of special opportunities—merit increased attention.
4. Increased coordination between efforts to enhance terrestrial habitats and those addressing aquatic systems is especially important. While these connections are being made between groups such as the Watershed Resource Inventory Area teams and the Cascade Land Conservancy, regional environmental planning could lead to a more integrated approach within the urban/rural/wilderness continuum and be an important “story line” in the baseline report.

5. Connectivity of habitats is becoming an increasingly important consideration as new development continues to fragment undisturbed areas. This suggests an increased emphasis on establishing wildlife corridors and larger undeveloped tracts, especially in Puget Sound lowlands. Such a strategy may be useful in rural areas and within special areas within the urban growth area.
6. It may be useful to conduct an analysis to identify gaps in current regulations and restoration activities. Such an analysis could build on current The Nature Conservancy/Washington Department of Fish and Wildlife work and deal with urbanizing areas on the edge of the urban growth area. Resources and responsibilities for conducting such an analysis would have to be identified.



The legislature finds that the shorelines of the state are among the most valuable and fragile of its natural resources and that there is great concern throughout the state relating to their utilization, protection, restoration, and preservation. In addition it finds that ever increasing pressures of additional uses are being placed on the shorelines necessitating increased coordination in the management and development of the shorelines of the state.

- The Washington State Shoreline Management Act of 1971, RCW 90.58.020

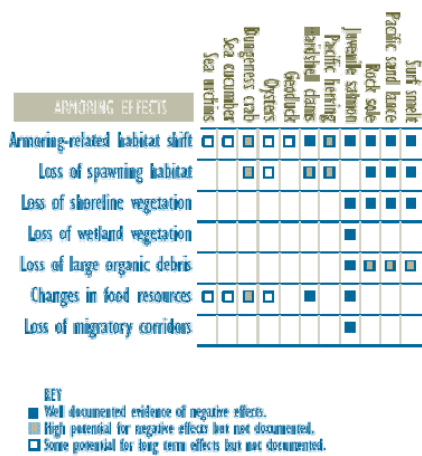


Figure 6. Armoring effects on aquatic habitat and species.¹⁸

Water Quality and Aquatic Habitats

Identified Issues, Problems, and Trends

Of the four major categories of environmental concerns, water quality and aquatic habitats is receiving the most attention by the scientists and resource managers contacted in this study. Moreover, aquatic environmental issues are not confined to water bodies, as some of the most damaging human impacts to water quality and aquatic habitat occur away from the shoreline. For example, an increase in **impervious surface coverage** within a watershed, especially beyond 10 to 15 percent, can degrade the health of aquatic ecosystems.¹³

Similarly, channeled surface runoff tends to be of a volume and velocity that easily overwhelms streams and can cause undercutting and erosion of stream banks, depositing excessive sediment, and altering in-stream fish and wildlife habitat.¹⁴ The location of the impervious surface within the watershed can make a significant difference in its impact. The type of soil being covered, groundwater characteristics, and topography all can affect the impact of impervious surface coverage. Between 1994 and 2001, 1.1 percent of King County's total land area, or 5.3 percent of the County's urban area, was converted to impervious surface.¹⁵

Modified shorelines can also lead to several negative impacts, including beach starvation, habitat degradation, sediment impoundment, exacerbation of erosion, and restriction of channel movement. One-third of Puget Sound's shorelines have been modified,¹⁶ though the pace of shoreline modifications has slowed in recent years due to shoreline management, critical area, hydraulic permit and storm water management regulations, as well as requirements related to salmon recovery.¹⁷

In addition to manmade structures, another form of shoreline modification is **loss of riparian vegetation**, which can degrade the health of a watershed by causing bank instability, fluctuating water temperatures, absence of large woody debris, unregulated micro-climates, lack of nearshore terrestrial habitat, and absence of food, such as insects from trees.

Contaminated sediments pose a risk to human and animal health because the toxins, which bind to sediments at concentrations far above natural conditions, tend to accumulate in the tissues of living organisms and move up the food web. As of 2003, there were more than 5,700 contaminated sites in Washington State. Most contaminated underwater sites occur in Puget Sound's major urban bays, including Commencement, Elliott, and Bellingham, while upland contaminated sites are widely scattered. In general, although some present day activities continue to release toxic chemicals, current pollution control practices are far better than practices before existing environmental laws came into force.¹⁹

Aging or poorly maintained on-site sewage treatment systems can contaminate ground and surface waters with **nutrients and pathogens**, which directly affects shellfish, which filter large amounts of water as they feed. Contaminated shellfish, thus, are an indicator of poor water quality. In the Puget Sound, the number of shellfish growing areas placed on the threatened list has doubled since 1997.²⁰

Toxics largely associated with municipal waste water and storm water runoff, including PBDEs (or flame retardants), PCBs, heavy metals, pharmaceuticals, and personal care products, are also showing up in biota such as marine birds, seals, and orcas.

Ballast water from ships is also a concern, as it is a major source of aquatic nuisance species.

All of these issues, which affect the quality of aquatic habitat, can negatively impact **aquatic species sustainability**, including salmon. Habitat degradation, barriers to fish migration, and harvesting have all contributed to variations in salmon return that are lower than would be expected with natural fluctuations.²¹ In fact, despite record salmon runs in 2001, salmon abundance has fallen far below historical averages, with 18 percent of the state's evaluated wild salmon stocks extinct and another 38 percent at risk.²²

Examples of Current Management Efforts

Recognizing the complexity of factors affecting water quality and aquatic habitats, the state legislature in 1998 passed "The Watershed Planning Act," which set a

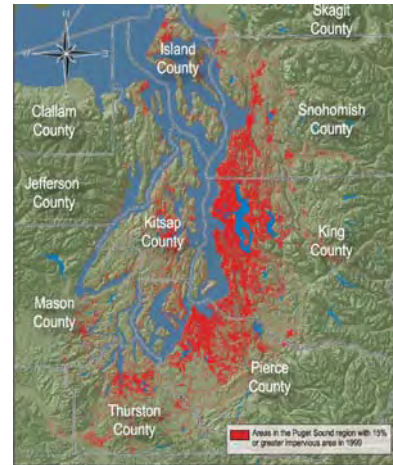


Figure 7. Areas in the Puget Sound region with 15 percent or greater impervious cover in 1999. (Source?)

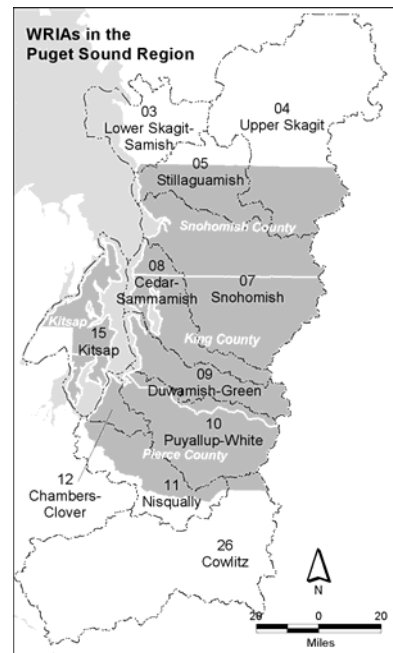


Figure 8. Watershed Resource Inventory Areas in the Puget Sound region.

framework for developing local solutions to watershed issues on a watershed basis. The purpose of the Act is to develop a more thorough and cooperative method of determining what the current water resource situation is in each Watershed Resource Inventory Area of the state and to provide local citizens with the maximum possible input concerning their goals and objectives for water resource management and development. The Washington Department of Fish and Wildlife administers grants to Watershed Resource Inventory Areas, and also provides technical assistance and scientific expertise.

The Puget Sound Action Team is an interagency, intergovernmental body that defines, coordinates, and puts into action the state's environmental and sustainability agenda for Puget Sound. Though not charged with regulatory authority, the Puget Sound Action Team conducts research and makes recommendations on key issues affecting the health of Puget Sound, including cleaning up contaminated sites and sediments; reducing continuing toxic contamination and preventing future contamination; reducing the harm from storm water runoff; preventing nutrient and pathogen pollution caused by human and animal wastes; protecting shorelines and other critical areas that provide important ecological functions; restoring degraded nearshore and freshwater habitats; and, conserving and recovering orca, salmon, forage fish and groundfish populations.

The four counties in the central Puget Sound region are each engaging in management efforts directed at improving water quality and aquatic habitat. King County is instituting broader stream buffers and limiting new development, particularly in the rural areas where habitat conditions are still relatively high quality and can be conserved. Watershed Resource Inventory Areas 7, 8, 9, and 10 are completing their science-based salmon recovery plans in 2005 and are currently exploring ways to coordinate efforts through a Puget Sound Recovery Plan with a shared strategy. The first ten years of implementation will begin in 2006.

The Shared Strategy for Puget Sound, a nonprofit organization for the recovery of Endangered Species Act-listed salmon, is compiling the results of the Watershed Resource Inventory Areas plans into a single compre-

hensive plan by early July 2005. This has special utility for regional environmental planning because it will be a point source for information and coordination with the individual Watershed Resource Inventory Area efforts.

The Department of Ecology administers the Washington State Shoreline Management Act. Local governments prepare shoreline master programs containing policies and regulations to protect and restore the shoreline environment, provide public access, and give priority to uses that are dependent or benefit from a shoreline location.

In 2003 the Department of Ecology adopted new shoreline management guidelines that call for significantly improved environmental protection and enhancement practices. Now, when local governments amend their shoreline master programs, they must conduct a comprehensive environmental characterization of their shorelines and identify measures to protect and restore shoreline ecological processes. This new measure can be an important vehicle for translating watershed objectives and analysis into implementable local regulations because local governments must now show that there will be “no net loss” of ecological functions on a comprehensive basis.

The Department of Ecology and the Environmental Protection Agency have scheduled remediation in 2,874 of the 5,700 contaminated acres in about 110 sites because they exceed cleanup triggers. The remaining contaminated acreage may naturally recover without remediation if the sources of contamination are controlled.

The Washington Department of Natural Resources works to ensure the sustainability of aquatic habitat within its jurisdiction by administering a number of programs, including sediment quality management, invasive species control, conservation leasing, aquatic reserves management, and numerous research efforts.

Implications for VISION 2020+20

1. Assess the relative amount of impervious surface produced by each alternative in the environmental analysis phase. The King County Benchmark 2004 report advises that “keeping any change to impervious surface to a strict minimum in the rural areas is essential for protecting habitat, preventing flooding, and maintaining the “air cleaning” qualities of forest cover (e.g., creating “carbon sinks” which offset the negative effects of the CO₂ emissions which drive climate change.)”²³
2. Coordinate with Watershed Resource Inventory Area and “Shared Strategies” activities. The currently emerging Shared Strategy for Puget Sound may provide an excellent opportunity for integration into PSRC’s VISION 2020+20 update because of their emphasis on focusing growth, protecting key areas within the watersheds, and improving development practices. As improved development models and tools to achieve shoreline management goals are being developed in the region, a regional analysis of processes and functions that identifies the highest priority restoration and protection areas could be useful. These high priority areas could serve as “mitigation banks” that would allow for some loss of ecological function at lower priority sites. Resources and responsibilities for conducting such an analysis would have to be identified.
3. Explore opportunities for landscape-scale restoration efforts in the alternative growth scenarios and/or when considering mitigating measures in the environmental analysis. Restoration projects identified by the Watershed Resource Inventory Areas or The Cascade Dialogues strategy for restoring a targeted amount of riparian areas might be organized into a watershed wide or regional restoration strategy (e.g., prioritized according to established criteria) and their impacts on land use identified. Resources and responsibilities for conducting such an analysis would have to be identified.
4. Consider an ambitious estuary restoration option in one or more of the analysis alternatives. This could include measures to restrict new development along shorelines or to ensure that new development does

not impact shoreline processes. While emerging critical areas ordinances and shoreline master programs will reduce the susceptibility of shorelines to impacting development, it may be useful to consider strategies to remove harmful development from sensitive shoreline areas such as industrialized estuaries. Sediment contamination is also a significant issue, and the growth scenarios should examine opportunities for contaminant cleanup and the potential for polluting discharges.

5. Evaluate the effectiveness of current storm water management regulations and practices. Given the importance of maintaining the natural hydrological surface and groundwater flows, the environmental analysis should analyze the current regulations' effectiveness and the implications for treating and mitigating new development. For example, redevelopment of an existing site—such as the proposed renovation of Seattle's Northgate Shopping Center, which includes storm water treatment improvements to the Thornton Creek watershed—can improve existing water quality and flow characteristics. The individual and cumulative effects of such improvements merit further research. Resources and responsibilities for conducting such an analysis would have to be identified.
6. Encourage regionwide applications of low-impact development standards and practices. Low impact development is a comprehensive land planning and engineering design approach with a primary goal of maintaining and enhancing the pre-development hydrologic system of urban and other altered watersheds.

Landscape-Scale Ecological Processes

Identified Issues, Problems, and Trends

WAC 173-26-201(2)(c) states that managing shorelines for protection of their natural resources depends on sustaining ecosystem-wide processes, which includes processes “associated with the flow and movement of water, sediment and organic materials; the presence and movement of fish and wildlife and the maintenance of water quality.” For example, land use activities can significantly alter the hydrology of streams and rivers which in turn affects the type of habitat present in these aquatic systems. Clearing forests and paving the land in the uplands can dramatically change the rate of water run-off, alter the watershed’s hydrological response, and simplify instream habitats and exacerbate flooding. Filling wetlands impacts the processes/functions of surface water flow (flood water storage) and removal of toxins (removing metals & toxic organics) that wetlands typically perform.

Environmental scientists are becoming increasingly aware of the **effect of landscape transformation on ecological processes** and of the importance of maintaining ecosystem processes in order to achieve shoreline management goals, including flood protection, habitat conservation, water quality and erosion control. The preface of a paper by Stephen Stanley, Jerry Brown, and Susan Grigsby, *Protecting Aquatic Resources Using Landscape Characterization: A Guide for Puget Sound Planners* (Review Draft, May 2005), states the problem succinctly:

To sustain aquatic ecosystems we must take a holistic, comprehensive approach. This means consideration of environmental factors outside of the currently accepted “human defined” boundaries of aquatic systems. These boundaries (i.e., based on scientific classification schemes) have boxed aquatic systems into convenient categories such as bogs, lakes, streams, marshes, rivers, salt marshes, and marine shorelines. As a result of these defined boundaries, our laws have evolved primarily to protect each of these categories in isolation from the whole. In implementing these laws we have found that many of our efforts to protect and manage aquatic resources have been unsuccessful.

Continuing scientific research has revealed that these aquatic systems represent a “continuum” across the landscape. It has become clear that they are all driven and

controlled by similar environmental factors. These environmental factors exist, to a large degree, outside of the boundaries of our defined aquatic resources. We now understand that our unsuccessful protection/management efforts are in large part due to a lack of consideration of these environmental factors.

Examples of Current Management Efforts

Washington State Department of Ecology's guidance document, referenced above, is intended to assist local governments in managing aquatic resources through a process-based planning analysis. The paper describes and provides examples for landscape characterization (Figure 10) within a landscape-scale environmental planning framework (Figure 9). This "adaptive management" planning framework, summarized by the diagram below, includes characterizing aquatic resources, prescribing solutions, taking action, and monitoring. The initial characterization step requires identifying, mapping the geographic location of, and analyzing the key landscape processes important to aquatic resources and the degree of "risk" that human activities pose to these processes and resources. The second step identifies what steps are necessary to protect and restore the altered processes (i.e., reduce the level of risk) and frames a comprehensive strategy based on the ecological needs of the whole area, rather than looking only at its isolated parts, as has been typical of previous management efforts. Implementing the strategy through regulations, incentives, physical improvements, and other measures is Step 3, and Step 4 establishes a monitoring and adaptive management program to evaluate progress and modify actions as necessary to meet goals.

This planning framework has promise as an invaluable tool in making environmental planning and management activities more efficient by:

- Coordinating efforts across a range of geographic scales and locations (e.g., identifying what actions are necessary throughout the watershed to protect and restore estuarial habitats).
- Integrating research and management programs between various governments, resource agencies, institutions, and organizations (e.g., shoreline management, salmon recovery, storm water management, and critical area protection).

Figure 9. A general framework for planning at the landscape scale. This represents a suggested framework that local governments could use in protecting and managing aquatic resources through land use planning.

(From *Wetlands in Washington State Vol 2*, Ecology Pub. 05-06-008)

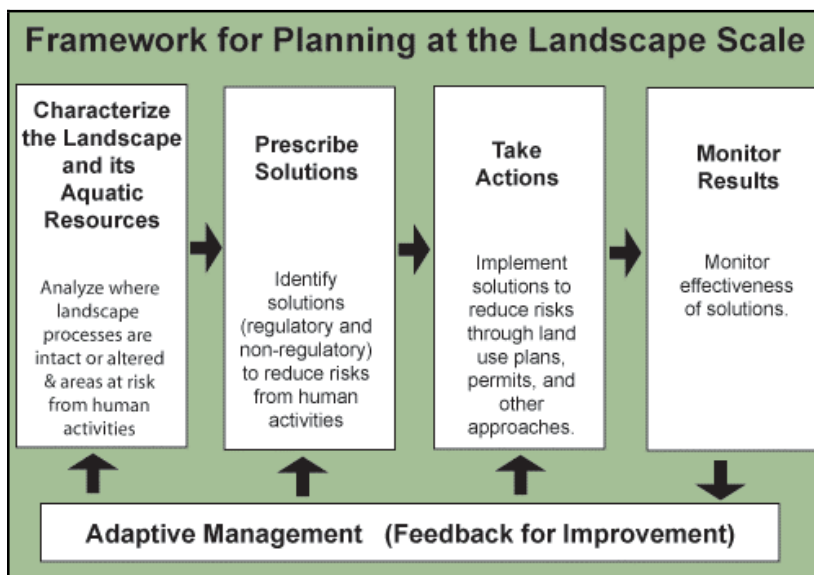
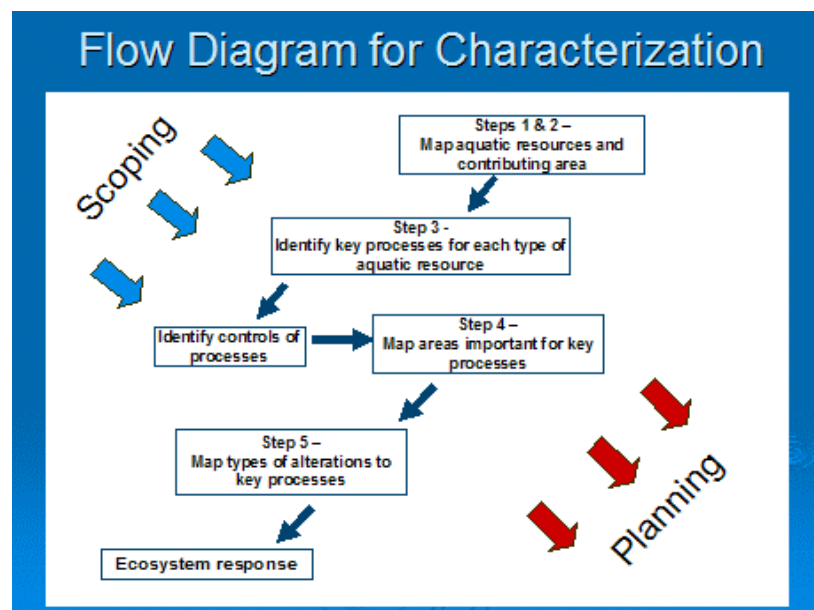


Figure 10. Detail of steps required for landscape characterization.
(From *Protecting Aquatic Resources Using Landscape Characterization: A Guide for Puget Sound Planners* DOE pub. 05-06-013)



Implications for VISION 2020+20

Because this landscape-scale approach requires regional environmental planning and interagency/governmental cooperation, it is congruent with the PSRC VISION 2020+20 effort. Furthermore, it suggests a framework by which the programs and proposals, such as the Watershed Resource Inventory Area salmon recovery, Cascade Dialogues, shoreline management, and cleanup of urban estuaries, might be coordinated.

The VISION 2020+20 process should coordinate closely with those entities addressing landscape-scale processes—most notably the Department of Ecology, King County, Watershed Resource Inventory Area teams, and the Puget Sound Action Team—during the ongoing analysis to identify information that may be useful in shaping the alternatives. If sufficient information is available, the importance of these landscape-scale processes could be a key element in the baseline report.

Emerging Issues and Research

There are several emerging issues that are not currently being directly addressed by the entities contacted during this effort. Some of the issues listed, such as invasive species and loss of agricultural land, have been recognized for at least a decade. They are described here because either they are receiving greater scrutiny or new technologies are emerging to address them. The following identified emerging issues are listed in alphabetical order:

■ **Aggregation of Impervious Surfaces**

While science recognizes the impact of impervious surface on water quality, emerging research suggests that the aggregation of paved surfaces is more important to ecosystem function at the catchment scale than is total impervious surface coverage.²⁴

■ **Climate Change**

Climate change has the potential to impact almost every other issue identified in this paper. Evidence suggests that human-induced climate change, largely the result of increases in greenhouse gas emissions since the Industrial Revolution, has caused a 1.1 degree Fahrenheit increase in the global average surface temperature, an approximately 40 percent decline in Arctic sea ice thickness during late summer and early fall, and a four- to eight-inch rise in global average sea level.²⁵

In the Pacific Northwest, the average temperature has increased 1.5 degrees Fahrenheit over the past 80 years in both urban and rural areas. Spring snowmelt is occurring earlier in the year, snowpack levels are declining, and glaciers in the region have lost approximately 30 percent of their girth.²⁶

Climate change is an important and overarching problem that is currently not being addressed by many entities. Though it is a global issue, local governments can play an important role in a solution. The Puget Sound Clean Air Agency recommends adopting policies to maximize energy efficiency and increase renewable energy; reduce greenhouse gas emissions of new vehicles; reduce motor vehicle miles traveled; protect natural landscape and forest biomass; increase recycling and composting rates

and reduce waste; and promote public education and citizen/corporate/government action.²⁷

■ **Ecological Connectivity**

Ecological connectivity is a broad concept that includes the connections and interactions between land and water. For example, ecological connectivity is impaired when a stream is channelized and separated from its flood plain; when shoreline structures or bank armoring block sediment flows and coastal/shoreline enrichment processes; when dams are built or culvert installation blocks fish passage; when impervious surface prevents ground water aquifer recharge; when alterations to aquatic habitat interfere with riverine hyporheic zones; when roadcuts into hill slopes disturb seepage areas, springs, and subsurface drainage; or, when removal of native vegetation and forest cover diminish the ability to capture, retain, store, and infiltrate precipitation.

■ **Invasive Species**

Invasive species are becoming an increasingly difficult problem. In some cases, invasive species proliferate in disturbed areas and prevent the natural plant succession and regeneration of the area. The regional Environmental Protection Agency office has identified invasive species as a priority problem through an executive order and has assigned a local staff person to the issue.

■ **Loss of Prairies and Oak Savannahs**

The loss of terrestrial habitat tends to focus on forest lands. Prairies and oak savannahs are an equally important habitat type, and it is estimated that only two percent of historic quantities remain in the Puget Sound region, mostly in Pierce County. This issue has also been identified by the Environmental Protection Agency.

■ **Loss of Prime Regional Agricultural Land**

The loss of agricultural land to urban development in the Puget Sound region has implications for air quality, water quality and quantity, and our region's self-sufficiency. The agricultural land in this region tends to be the most arable farmland in the state. When the region loses this resource, its populace must rely on food from other, more distant locations,

which often require irrigation. Air and water quality are impacted by the increased distance food must be transported, which may lead to more vehicle emissions and surface runoff pollutants. In addition, food produced on less arable farmland requires a greater quantity of water. The Cascade Dialogues proposes a strategy to retain existing agricultural land. County governments are addressing resource land preservation through Growth Management Act-consistent comprehensive planning.

However, retaining agricultural lands remains a challenge. For example, SR 167 construction between the Port of Tacoma and Puyallup will remove significant amounts of prime arable land.

■ **Quality of Urban Ecosystems**

Much attention is given to preserving natural habitat, yet it is important to address the quality of the region's urban ecosystems. The quality of urban ecosystems could be improved by adhering to low-impact development standards that include minimizing clearing of native vegetation, minimizing building footprints and impervious cover, and using native plants. Green building and sustainable design practices that minimize impervious surface and energy consumption will also improve the quality of the urban ecosystem.

Nevertheless, there are a number of urban environmental management questions and issues that merit attention. These include, for example:

- Appropriate shoreline setback and buffer widths.
- Restoration/redevelopment techniques for urbanized estuaries.
- Incentives for urban stream restoration.
- Effectiveness of urban storm water management measures. (For example, does redevelopment of brownfields mean that water quality improves, and does it improve sufficiently to reasonably improve ecological processes?)

One action might be to monitor the activities of local cities and counties working on specific projects to learn what practices are effective. For example, Seattle is undertaking comprehensive water quality improvements on Thornton Creek, which might, with

sufficient monitoring, provide lessons applicable to other urban situations. Resources and responsibilities for developing and maintaining such a monitoring program would have to be identified.

■ **Air Quality in Traffic Congestion Hot Spots**

Concentrations of motor vehicle pollutants can occur around areas of traffic congestion.²⁸ Topography and wind patterns undoubtedly play a role in these variations. While these effects require more study, proximity to concentrations of traffic congestion should be considered in evaluating the alternative growth distribution scenarios.

Air quality proponents, such as Diesel Solutions, address many of the concerns of concentrating populations in urban centers. Therefore, coordination and collaboration among agencies will be valuable.

Implications for Regional Planning

The following is a list of general observations arising from this project's research. Several of these observations are then translated into recommendations for Next Steps.

1. There is a wide range of environmental research and management efforts under way in the Puget Sound region.

The over twenty research and management entities contacted for this study represent only a sampling of the environmental organizations and efforts addressing a broad spectrum of environmental quality issues. Some of these efforts are issue- and area-specific, while others, such as in the Department of Ecology and the U.S. Environmental Protection Agency, address a variety of region-wide concerns. Many efforts are under way locally, regionally, and statewide to identify key indicators on which to focus management and monitoring activities.

2. There is not a single organized entity or forum to coordinate the diverse efforts.

While a number of coalitions, partnerships, and "shared strategies" are emerging, this interaction has occurred from the bottom up, in that it has generally resulted from individual organizations finding a common cause and collaborating with one or more other organizations. For example, The Nature Conservancy and the Washington State Department of Fish and Wildlife have developed an ecoregional assessment, and Watershed Resource Inventory Areas 7, 8, 9, and 10 are working on a shared strategy to coordinate the individual watershed conservation programs.

However, there is no comprehensive or coordinating entity working at the regional level. Such an entity might, for example:

- Serve as a clearinghouse or repository for environmental information.
- Identify gaps and needs in regional-scale environmental planning information, scientific research, and management activities.
- Coordinate environmental management activities with regional land use, transportation, and economic development planning.
- Communicate between different organizations, alerting individual entities to the work being done by others.
- Communicate a coordinated message to the public and local governments.
- Provide assistance in securing funds for research and management projects.
- Provide a unifying regional planning framework supporting more issues and geographic-specific efforts.

3. New scientific information is being developed at a rapid pace.

At the time of the preparation of this document, several studies were being completed. For example, years of watershed inventory work is currently being translated into a coordinated management strategy, and the Department of Ecology has prepared a paper promoting new techniques in landscape-scale characterization that is being peer-reviewed. At the same time, new concerns and issues, such as a greater emphasis on the health implications of air toxics and the potential effects of climate change, are emerging.

4. New research is identifying problems and trends that are not being adequately addressed.

In some cases, new issues differ from the problems that the agency currently monitors because the laws establishing management programs, environmental standards, and monitoring protocols were developed before the current state of scientific knowledge. Any regional environmental planning program will need to respond to new information and address emerging issues as they arise.

5. There are differences in environmental data and scientific information resources across organizations.

Much of the inventory information regarding environmental conditions is at varying levels of accuracy and scale, and much of the information does not extend to the whole region. For example, the King County Benchmarks Program has been tracking several environmental indicators for over eight years and has developed useful data sets. However, the information does not extend beyond King County. The Benchmarks Program, however, does serve as a useful model for a potential regional monitoring program, and its experience in such an effort would prove useful.

Likewise, there are some significant gaps in our understanding of key issues. For example, the problems associated with impervious land coverage are becoming increasingly recognized, but the extent to which current surface water management regulations are effective and the desirability of other efforts is less clear. Similarly, the causes of the substantial population drop in some aquatic species are not clearly understood. This again points to the fact that any regional environmental planning program must be sufficiently flexible to address the uncertainty inherent in environmental management efforts and to respond to new conditions and information.

6. A broad picture of landscape-scale ecological processes is emerging.

Despite the lack of comprehensive understanding of Puget Sound ecosystems, researchers have begun to establish the importance of landscape-scale ecological processes to maintaining these ecosystems. This has allowed initial development of a broad picture of the relationship of landscape processes to aquatic ecosystems. These processes include the delivery and movement of water, sediment, large woody debris, nutrients, and pollutants. Since these processes are controlled by physical and biological characteristics of the landscape, including geology, soils, topography and land cover, improperly sited and designed development can significantly alter these processes and, in turn, impact aquatic resources relatively

distant from a development envelope. For example, paving recharge areas in the upper portion of a watershed may increase the risk of reducing groundwater discharge to streams and wetlands located lower down in the watershed. This may, in turn, affect water temperature and low flows that are critical to fish and invertebrate populations. In this way, the landscape-scale processes affect almost all of the other environmental issues noted in this paper. Finally, because these processes occur at the large scale, they are especially relevant to regional planning.

For these reasons, the VISION 2020+20 process should coordinate closely with those entities addressing landscape-scale processes—most notably the Department of Ecology, King County, Watershed Resource Inventory Area teams, the Puget Sound Action Team, and the University of Washington—during the ongoing analysis to identify if this new information can be useful in shaping the alternatives. If sufficient information can be developed, the importance of these landscape-scale processes appears to be a key “story line” in the baseline report.

7. There are several cooperative Environmental Management Initiatives that should be considered and potentially incorporated into the VISION 2020+20 plan.

The Cascade Land Conservancy’s “Cascade Dialogues,” the Watershed Resource Inventory Areas 7, 8, 9, and 10 “Shared Strategy” conservation planning, and The Nature Conservancy/Washington Department of Fish and Wildlife ecoregional assessment have completed substantive analysis and are undertaking ground-breaking regional environmental management efforts that directly relate to land use, development, and growth management practices being considered in VISION 2020+20. These programs might provide insights regarding areas where new development should be avoided, potential mitigation measures, priority restoration actions, and other environmental management issues. Therefore, PSRC should look for opportunities to coordinate with these entities in the development and analysis of growth alternatives.

A further observation is that it appears that the most useful environmental information identified during this study is analyzed data that agencies are using for specific environmental management purposes. This suggests that the most effective strategy for regional environmental planning may be to incorporate substantive work by environmental management entities rather than to undertake new analysis.

8. Environmental planning and management is important in urban and rural areas, as well as within resource lands.

Aquatic systems and species, for example, span the urban/rural/resource lands continuum, and measures to reduce habitat fragmentation are particularly important in urbanizing areas. Urban environmental management questions and issues deserve significantly more attention. New techniques, such as low-impact development, smart buffers, mitigation banking, green building practices and green street programs, may be applicable in a variety of settings, while specific measures to improve environmental quality in dense urban settings are also needed. Urban estuaries, in particular, merit special consideration for joint cleanup/ restoration/ redevelopment efforts. The majority of issues identified in this report emphasize preventing urban development from encroaching into rural and resource lands. Since most planning and regulatory activities address urban development, it is essential that urban issues be taken fully into account.

9. Because regional environmental planning actions must be made on the basis of incomplete information, any such program should incorporate “adaptive management” principles.

Given the current gaps in scientific information, the rapid pace of emerging knowledge, and the need to incorporate environmental planning considerations into the VISION 2020+20 process, it will be necessary to base planning recommendations without the benefit of undisputed scientific knowledge. In this situation, environmental planning actions (for example, recommending a set of policies directed toward management of aquatic systems in urban environments) should be seen as experiments in

which the effect of these actions is clearly monitored and management measures modified if the desired objectives are not met. In this way, actions can be taken without complete certainty and scientific knowledge advanced in the process.

Policy Implications

In its initial review of the environmental provisions in the 1995 VISION 2020 document, the Growth Management Policy Board concluded that the updated VISION should be developed within an "environmental framework." The guidance provided by the Policy Board was that, rather than have a stand-alone chapter on environmental issues, "the *environment* – natural and built – should be an organizing principle" for the VISION 2020+20 Update. (See discussion from the September and October 2003 meetings of the Growth Management Policy Board.)

The regional environmental priorities discussed in the previous chapter – (1) air quality, (2) terrestrial habitats and species, (3) water quality and aquatic habitats, and (4) landscape-scale ecological processes – should continue to be advanced in the VISION 2020+20 process and would provide a meaningful organizing structure for addressing the range of environmental planning issues in the updated regional plan. Multicounty planning policies should be developed for each of these specific priority areas to begin to provide a common regional policy framework for addressing development opportunities and preservation goals in our common bioregion.

Suggestions for Next Steps

The following section suggests actions for PSRC to consider in developing a regional environmental planning effort during three different timeframes.

- When evaluating land use alternatives as part of the planning and State Environmental Protection Act analysis supporting the VISION 2020+20 process. *(Within the next six months)*
- During subsequent steps in the VISION 2020+20 process. *(2006 and 2007)*
- As part of a long-term effort to incorporate environmental planning into PSRC's efforts. *(Beginning with this VISION 2020+20 analysis and continuing over time, as appropriate)*

Alternative Analysis and State Environmental Protection Act Evaluation Process

During the alternative analysis and State Environmental Protection Act evaluation process, the following steps should be taken:

1. Coordinate with those entities addressing landscape-scale processes—most notably the Department of Ecology, the Washington Department of Fish and Wildlife, King County, Watershed Resource Inventory Area teams, the University of Washington, and Shared Strategy for Puget Sound—during the ongoing analysis to identify if this new information can be useful in analyzing the alternatives. Because these processes occur at the landscape or regional scale, there may be opportunities to further both efforts, at least in the area of public awareness and coordination of land use planning and environmental management.

2. Consider telling the story of the importance and interconnectedness of the landscape-scale ecological processes in the baseline report.

A. First generally describe (for example):

- Why these processes are also necessary to the productivity of our resource lands, the viability of our economy, and the quality of our living conditions.
- Processes within the landscape, including movement of water (surface and groundwater), sediment, wood, nutrients, toxins, and pathogens.
- How controls within the landscape, such as geology, soils, topography, and land cover, determine how these processes operate.
- How these processes interact with and help sustain aquatic resources such as those listed at the right.

B. Next describe how human development affects these processes and can threaten the sustainability of the region's fundamental ecological systems.

C. Then describe the current management efforts underway to protect and restore the landscape-scale processes and the current challenges they face.

3. Consider the following environmental management efforts when developing the land use alternatives.

- **The Cascade Land Conservancy's Cascade Dialogues.** The *Cascade Agenda* arising from this effort contains an ambitious and quantified strategy for protecting resource lands and restoring ecological systems. This strategy might be incorporated into one of the alternatives.
- **The Nature Conservancy/Washington Department of Fish and Wildlife.** Ecoregional Assessments prioritize places for the conservation of biodiversity. Their analysis may prove very useful in identifying impacts to key areas and in establishing a regionally based strategy for their conservation.

Ecological Processes

Following are some examples of ecological processes and their role in sustaining the resources we value

- **Depressional/slope wetland resources.** Use examples of the role of certain depressional wetlands in "controlling" the size, velocity, timing, and duration of downstream surface flows in streams and rivers.
- **Riverine resources.** Use examples of movement of large woody debris and its role in forming in-stream habitat for invertebrate and fish species and the role of salmon in the movement of nutrients.
- **Estuarine resources.** How the up-stream processes ultimately determine the health of estuaries and nearshore habitats.

- Coordinated Watershed Resource Inventory Area Habitat Conservation Planning and the Shared Strategy for Puget Sound.** The Watershed Resource Inventory Areas have largely completed their inventory and analysis work and are combining efforts toward a shared salmon recovery/habitat conservation strategy. Their work has identified priority “tiers,” or sub-basins, for habitat protection and identifies a number of specific protection and restoration actions within the watersheds. This information may be useful in generating alternatives and in evaluating the relative impacts of the different alternatives. The Shared Strategy for Puget Sound is compiling individual Watershed Resource Inventory Area plans into a single comprehensive plan and would be a good contact point.

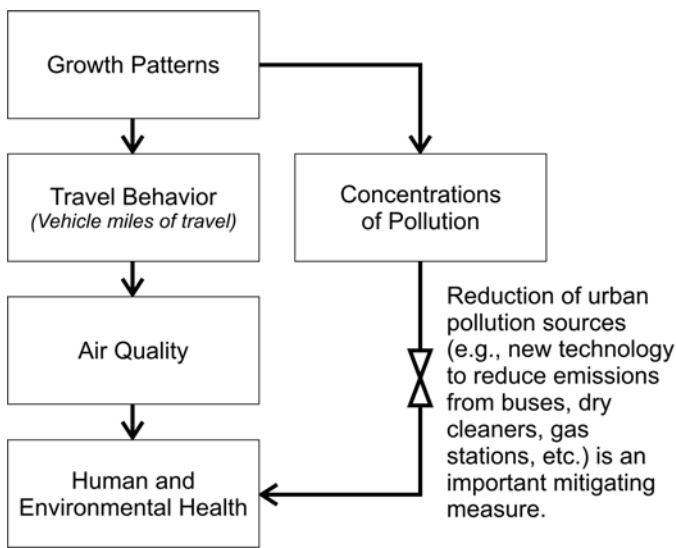


Figure 11. Environmental scientists are investigating the degree to which centralized growth reduces vehicle trip miles and polluting emissions. Medical scientists are continuing to learn more about the effects of air pollution on human health. At the same time, the effect of centralizing populations and pollution sources is a topic of research, and agencies are working to reduce emissions from diesel-powered vehicles and other typical urban sources. These studies should clarify the connection between growth patterns and human health and provide a more substantive basis for policy and implementing actions.

- Coordinate closely with the Puget Sound Clean Air Agency in its work linking land use planning to air quality and, ultimately, to human health. Documenting the causal links between growth patterns, vehicle emissions, air quality, and human health would be useful in supporting growth management efforts.
- In the State Environmental Protection Act analysis, identify where additional consistent baseline environmental information would be useful in regional environmental planning work and what questions should have the highest priority for future work—in other words, document information gaps where new data would facilitate more effective decisions. In instances where evaluations are made at the conceptual level, the team should also document the assumptions used and cite the research on which the assumptions were made.

Subsequent Steps in the VISION 2020+20 Process

When the preferred alternative land use/transportation plan and multicounty policies are developed during subsequent steps in the VISION 2020+20 process, take the following actions:

6. Continue to pursue the creation of a broader environmental planning framework that interacts with local environmental research and management efforts, establishes a more scientifically consistent methodological basis, and links planning activities more closely with current scientific understanding of environmental problems, issues, and trends. As a first step, incorporate tested information and management activities of existing efforts rather than undertaking new research or management efforts.
7. The VISION 2020+20 update should be organized around an environmental framework that provides a context for planning, development, and environmental management in our ecoregion. Ensure that the planning supporting the VISION 2020+20 process considers measures that encompass the full continuum of urban/rural/resource land areas. Also, consider how environmental planning and resource management measures can be coordinated at a range of scales, from the local to county, regional, and statewide jurisdictions.
8. In the updated multicounty planning policies, establish a procedure to incorporate "adaptive management" principles into regional planning and decision-making efforts. Such an adaptive management approach would seek to monitor conditions arising from current policies and practices and modify or "adapt" those policies as new conditions and scientific information arises.

9. The VISION 2020+20 Update should establish an appropriate role for the Puget Sound Regional Council to play in advancing environmental planning and management strategies. Such strategies should:
 - Address the full spectrum of the urban/rural/resource lands continuum.
 - Integrate efforts at a variety of scales, from regional to county, city, and site-specific activities.
 - Include a multi-disciplinary effort incorporating knowledge and recommendations from the full spectrum of environmental sciences.
 - Recognize emerging issues and trends that may not be currently addressed by resource agencies.
10. Describe how appropriate provisions in updated multicounty policies would likely be addressed in countywide policies and local plans. This relationship of policies will be very important for local-level planning, which would be responsible for some of the more detailed implementation of such provisions.

Considering PSRC's Long-Term Environmental Planning Role

In considering PSRC's long-term environmental planning activities and role within the field, it will be important to take the steps listed below: (Some of these steps may require resources beyond what is currently available.)

11. Evaluate the possibility of PSRC taking an active coordinating role at the regional level to:
 - Continue to facilitate a discussion among environmental scientists, planners, and resource managers regarding key issues, trends, and problems and coordinated measures to address them.
 - Serve as a clearinghouse or repository for environmental information. In this function, develop an inventory of best practices, including low-impact development, green building practices, and green street programs.
 - Identify gaps and needs in regional-scale environmental planning information, scientific research, and management activities.
 - Coordinate environmental management activities with regional land use, transportation, and economic development planning.

- Facilitate ongoing discussions between different organizations, alerting individual entities to the work being done by others.
- Communicate a coordinated message to the public and local governments.
- Provide assistance in securing funds for research and management projects.
- Provide a unifying regional planning framework supporting more issues and geography-specific efforts.

12. Periodically (perhaps every three years) produce a “State of the Environment” report that assesses local and agency past performance in meeting critical areas ordinance, Growth Management Act, Shoreline Management Act, and multicounty objectives and statutory requirements. This effort should be pursued with member jurisdictions, environmental agencies, and other interests to produce a truly regional assessment of key environmental issues and to not duplicate other benchmark reports done by local governments and agencies, but to perhaps coordinate their findings and fill in the gaps. The King County Benchmarks Program might provide a useful model.

The report should also anticipate or gaze into the future to see how the recent updates to these local plans and regulations are likely to impact the environment. Also, this might provide the basis for a stronger regional position on the need to improve the state statutes and rules to meet the collective vision. Finally, such a program should be ongoing as part of the monitoring that has been discussed.

13. Undertake a program to communicate a consistent, comprehensive message regarding environmental issues, current trends, current management activities, and where additional action is necessary to protect resources. Such a message might increase support for local governments in allocating more of their resources toward research, analysis, “best available science,” intergovernmental coordination, etc., and also in moving beyond the regulatory role into more creative and longer-term roles of environmental stewardship.

For example, this could be where PSRC could initiate a process for regional open space planning that would wed the environmental science side with the vision side to produce a design for corridors, networks, and ecosystems that serve to bring people into contact with the natural environment and leverage public investments in open space acquisition, parks and trail improvements, shoreline and wetlands enhancements, etc. Such a plan could become the matrix for seeking federal and state funding for local uses, justified on a much larger regional basis.

Bibliography

Bartnik, Dr. Vic, Don Bernard, Jodi Dong, Al Jamal, Bruce Kay, Linda Nichol, Scott Redman, Dr. Peter Ross, Michael Rylko, Heidi Siegelbaum, Dr. Risa Smith, Geoffrey Thornburn.

Georgia Basin-Puget Sound Ecosystem Indicators Report.

Prepared by the Transboundary Georgia Basin-Puget Sound Environmental Indicators Working Group, 2001.

Brace, S., et al. *State of the Sound 2004.* Prepared by the Puget Sound Action Team, Office of the Governor, State of Washington, 2005.

Climate Protection Advisory Committee. *Roadmap for Climate Protection: Reducing Greenhouse Gas Emissions in Puget Sound.* Prepared for the Puget Sound Clean Air Agency. December 29, 2004.

Department of Ecology. *Bulkheads Can Change the Beach.* Department of Ecology/Puget Sound Shorelines.

http://www.ecy.wa.gov/programs/sea/pugetsound/building/bulkhead_eff.html (February 21, 2005).

De Place, Eric, Dan Bertolet. "Feeling the Heat." *Washington CEO*, from the November 2002 print edition. Retrieved March 04, 2005 from Northwest Environment Watch Press Room web site: http://www.northwestwatch.org/press/commentary_wash_ceo.asp

Durning, Alan Thein, Clark Williams-Derry, Eric de Place, Ellen W. Chu. *This Place on Earth 2002: Measuring What Matters.* Prepared by Northwest Environment Watch, 2002.

http://www.northwestwatch.org/press/recent_tpoe02.asp (March 4, 2005).

Floberg, J., M. Goering, G. Wilhere, C. MacDonald, C. Chappell, C. Rumsey, Z. Ferdana, A. Holt, P. Skidmore, T. Horsman, E. Alverson, C. Tanner, M. Bryer, P. Iachetti, A. Harcombe, B. McDonald, T. Cook, M. Summers, D. Rolph. *Willamette Valley–Puget Trough–Georgia Basin Ecoregional Assessment, Volume One: Report*. Prepared by The Nature Conservancy with support from the Nature Conservancy of Canada, Washington Department of Fish and Wildlife, Washington Department of Natural Resources (Natural Heritage and Nearshore Habitat programs), Oregon State Natural Heritage Information Center and the British Columbia Conservation Data Centre, 2004.

Institute for Fisheries Resources. *The Cost of Doing Nothing: The Economic Burden of Salmon Declines in the Columbia River Basin*. October 1996.
<http://www.amrivers.org/snakeriver/reports99.htm>.

Kitsap County. *Kitsap County Comprehensive Plan*. 1998.

Kitsap County. *Landscape Assessment and Conservation Prioritization of Freshwater and Nearshore Salmonid Habitat in Kitsap County*. 2003.

Kitsap County. *Shoreline Management Master Program*. 1999.

Knackstedt, Mary, et al. *State of the Sound 2004*. Prepared by the Puget Sound Action Team, 2004.

Lake Washington/Cedar/Sammamish Watershed (WRIA 8) Steering Committee. *Lake Washington/Cedar/Sammamish Watershed (WRIA 8) Chinook Salmon Conservation Plan: Public Review Draft*. 2004.

Mantua, Nathan. "How Will Salmon Fare in a Warmer World?" Presented at Expert Briefing: *Impacts of Climate Change on the Pacific Northwest*, JISOA/SMA, University of Washington, Seattle, November 8, 2001.

Mazza, Patrick. *In Hot Water - A Snapshot of the Northwest's Changing Climate*. Prepared by Climate Solutions, June 1999. <http://www.climatesolutions.org> (March 4, 2005).

Mote, Philip, et al. *Impacts of Climate Variability and Change, Variability, Pacific Northwest*. Prepared by the National Atmospheric and Oceanic Administration and JISOA/School of Marine Affairs (JISOA/SMA). Seattle: University of Washington, 1999.

Northwest Environmental Watch. *Cascadia Scorecard: Seven Key Trends Shaping the Northwest*. Seattle, 2004.

- O'Neal, Kirkman. *Effects of Global Warming on Trout and Salmon in U.S. Streams*. Prepared for the Natural Resources Defense Council and Defenders of Wildlife by Abt Associates, Inc., May 2002.
<http://www.defenders.org/releases/pr2002/pr052102.html>
(March 4, 2005).
- Puget Sound Action Team. *The Physical Sound*.
http://www.psat.wa.gov/About_Sound/Physical.htm (March 4, 2005).
- Puget Sound Action Team and Georgia Basin Action Plan. *2003 Georgia Basin/Puget Sound Research Conference Proceedings: Panel and Workshop Summaries*.
http://www.psat.wa.gov/Publications/03_proceedings/start.htm
(March 04, 2005).
- Puget Sound Clean Air Agency. *2003 Air Quality Data Summary*. <http://www.pscleanair.org/ds03/index.htm> (March 4, 2005).
- Stanley, Stephen, J. Brown, and S. Gigsly. *Protecting Aquatic Resources Using Landscape Characterization: A Guide for Puget Sound Planners* (Review Draft), May 2005.
- Starkes, Jim. *Reconnaissance Assessment of the State of the Nearshore Ecosystem: Eastern Shore of Central Puget Sound, including Vashon and Maury Islands (WRIAs 8 and 9)*. Prepared for King County Department of Natural Resources by Pentec Environmental, May 2001.
- Thom, R.M. and D.K. Shreffler. *Shoreline Armoring Effects on Coastal Ecology and Biological Resources in Puget Sound*. Preliminary report prepared for Washington Department of Ecology's Shorelands and Coastal Zone Management Program, 1994.
- The Trust for Public Land. *Greenprint for King County*. December 2004. <http://www.tpl.org> (February 22, 2005).
- Washington Department of Natural Resources. *State of Washington Natural Heritage Plan*. 2003.
- Washington Department of Natural Resources. *Strategic Plan for the Department of Natural Resources, 05-07 Biennium*. Office of Budget and Economics, 2005.
http://www.dnr.wa.gov/htdocs/obe/budgetstrategy/budgetstrategy05_07.pdf (February 22, 2005).

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- ¹ King County. *King County Benchmarks*, 4.
 - ² King County. *King County Benchmarks*, 7.
 - ³ Puget Sound Clean Air Agency. *Air Quality Data Summary, 2004*.
 - ⁴ King County. *King County Benchmarks, 2004, Environment*, 2.
<http://www.metrokc.gov/budget/benchmrk/bench03/environment.pdf#10> (April 13, 2005)
 - ⁵ "Cascadia Scorecard," page 59.
 - ⁶ Alan T. Durning et al., *This Place on Earth 2002* (NEW, 2002), 24.
 - ⁷ *Natural Heritage Plan* (DNR, 2003), 7.
 - ⁸ "Cascadia Scorecard," page 60.
 - ⁹ *Natural Heritage Plan* (DNR, 2003), 7.
 - ¹⁰ Bartnik et al., *GB-PS Ecosystem Indicators Report*, 15.
 - ¹¹ Bartnik et al., *GB-PS Ecosystem Indicators Report*, 13-14.
 - ¹² Bartnik et al., *GB-PS Ecosystem Indicators Report*, 13.
 - ¹³ Environmental Protection Agency. *Draft Report on the Environment 2003* (EPA, 2003), 3-7.
<http://www.epa.gov/indicators/roe/html/roePDF.htm> (April 13, 2005).
 - ¹⁴ Puget Sound Action Team.
 - ¹⁵ King County. *King County Benchmarks*, 2.
 - ¹⁶ R.M. Thom and D.K. Shreffler, *Shoreline Armoring Effects* (Washington Department of Ecology, 1994).
 - ¹⁷ Department of Ecology.
 - ¹⁸ *Bulkheads Can Change the Beach* (Dept. of Ecology).
 - ¹⁹ Puget Sound Action Team.
 - ²⁰ Puget Sound Action Team.
 - ²¹ King County. *King County Benchmarks*, 17.
 - ²² *How Washington Measures Up. Data Supplement for This Place on Earth 2002* (NEW).
 - ²³ King County. *King County Benchmarks*, 2.
 - ²⁴ *2003 Georgia Basin/Puget Sound Research Conference Proceedings* (PSAT and GBAP, 2003), 5.
 - ²⁵ Puget Sound Clean Air Agency. *Roadmap for Climate Protection*, 4.
 - ²⁶ Puget Sound Clean Air Agency. *Roadmap for Climate Protection*, 5.
 - ²⁷ Puget Sound Clean Air Agency. *Roadmap for Climate Protection*.

²⁸ The East Bay Children's Respiratory Health Study, *Traffic-Related Air Pollution Near Busy Roads*, found that very high levels of carbon monoxide (CO) occur next to freeways in Los Angeles, but that they drop to background levels within 150 meters of the freeways.²⁸ For example, in 2003, concentrations of CO in the University District were twice those recorded on Beacon Hill. While CO is not a pollutant of concern in this region, the findings may suggest that concentrations of pollutants may occur.