

# CHAPTER 4

## ENVIRONMENT

The environment in King County includes a rich and valuable array of natural resources ranging from marine and freshwater environments, to highly urbanized areas, to nearly pristine landscapes in the foothills of the Cascades. The policies in this chapter protect that environment, ensure its effective management, support its restoration where needed, and support the Strategic Plan's goal of environmental sustainability. King County residents depend on sound policies not only to protect public health and safety, but also to preserve quality of life for future generations. King County is committed to pursuing partnerships, cost-effective strategies, and best management practices to optimize the long-term protection and restoration of the environment within available resources. These policies guide King County's environmental development regulations as well as incentives, education, and stewardship programs in unincorporated King County.

One of the central tenets of the Growth Management Act (GMA), the Countywide Planning Policies, and King County's Comprehensive Plan is that new growth be focused within designated urban areas with the aim of protecting resource lands (forestry, agriculture, and mining) and reducing development pressure on the Rural Area. At the same time, GMA requires that critical areas be designated and protected. Critical areas include wetlands, areas with a critical recharging effect on aquifers used for potable water, fish and wildlife habitat conservation areas, frequently flooded areas and geologic hazard areas. Achieving development goals must be integrated with protecting critical area functions and values. Individual solutions can be tailored by following the guidance of comprehensive plan policies that recognize both critical area protection and the need to reduce urban sprawl.

All parts of the county—from densely developed urban areas, to farm and forest land, to the Rural Area—have a role to play and a common interest in environmental protection. Responsibility for environmental protection cannot fall on one geographic area or category of citizens alone. Tools for environmental protection, for all residents whether in the Urban or Rural Area, include buying locally grown produce at a farmers market, taking care to avoid polluted discharges to storm drains, riding the bus, investing in natural resource programs like those offered by the King Conservation District, complying with stormwater standards, controlling invasive plants, and protecting forest cover. For urban residents, environmental protection occurs through different means, including investing in wastewater treatment and stormwater improvements, protecting greenbelts and other remnants of native habitats, and living in densely developed areas. For rural residents, it means protecting aquifers used for drinking water, using development practices that slowly infiltrate stormwater, and using best management practices to protect

water quality. On farm lands, forest lands, and lands in the Rural Area, stewardship and technical assistance provides opportunities for supporting long-term resource use while protecting the environment.

One of the most significant environmental issues facing King County during the past decade was the listing of Chinook salmon and bull trout as threatened under the Endangered Species Act (ESA). Since 2000, the region has seen unprecedented cooperation between local governments, citizens, tribes, conservation districts, non-profit groups, and federal and state fisheries managers to develop watershed-based Water Resource Inventory Area (WRIA) plans for salmon conservation. These plans, known as the Shared Strategy for Puget Sound, form the basis for the federal recovery plan for Chinook salmon. Watershed partners are continuing to work together to implement and monitor these plans through WRIA Forums. King County has taken significant steps to increase protections for Chinook and other salmon species through changes in daily operations (like maintenance of county roads and parks), increased open space protection, tax incentives, and updated development regulations. The lessons learned and relationships developed through cooperative planning in response to the Chinook salmon and bull trout listings should help to inform King County's response to new listings, and bolster efforts to prevent future species listings.

Individual species protections under the ESA continue to play an important role. At the same time, both nationally and internationally, many governments are initiating multi-species approaches aimed at conserving biodiversity. Biodiversity refers not only to plants and animals but also to their habitats and the interactions among species and habitats.

Protection of biodiversity in all its forms and across all landscapes is critical to continued prosperity and quality of life in King County. In fisheries, forestry, and agriculture, the value of biodiversity to sustaining long-term productivity has been demonstrated in region after region. With the impending effects of climate change, maintaining biodiversity will be critical to the resilience of resource-based activities and to many social and ecological systems. The continued increase in King County's population and the projected effects of climate change make conservation a difficult but urgent task. The protection and restoration of biodiversity and of a full range of supporting habitats is important to King County. King County will incorporate these considerations in its operations and practices, ranging from its utility functions (such as wastewater, solid waste and stormwater management) to its regulatory and general government practices.

State and federal agencies are undertaking biodiversity initiatives. The Washington Biodiversity Council was created by the Governor in 2004, in part, with the aim of refocusing state conservation efforts from the species level to the ecosystem level. In 2009, the Washington State Department of Fish and Wildlife (WDFW) released Landscape Planning for Washington's Wildlife: Managing for Biodiversity in Developing

Areas. The goal of this document is to provide information to planners and others that can be used to minimize the impacts of development on fish and wildlife and to conserve biodiversity. The United States Forest Service also integrates biodiversity principles into its land management practices. Internationally, Local Governments for Sustainability's Local Action for Biodiversity Project (LAB) convenes local governments from around the world, including King County, to establish strategies for the conservation of urban biodiversity.

Climate change has the potential for severe and wide-ranging impacts on public health, safety, and welfare; the economy; and the environment. Climate change in the Pacific Northwest is projected to bring more severe weather events including heat events, winter storms and summer droughts, decreased water supplies for people and fish, and changes in habitat and species distribution. King County is a leader in taking steps to reduce greenhouse gas emissions and to adapt to climate change.

New approaches for stormwater management that mimic the natural functions of soil and forest cover in slowing and filtering stormwater runoff, known as Low Impact Development (LID) techniques, are providing additional options for stormwater management. In conjunction with a comprehensive stormwater management program of structural controls and best management practices, LID techniques can result in reduced impacts from stormwater runoff and protection of the ecological functions of the landscape and surface waters. LID techniques work in tandem with structural controls and other best management practices to meet other objectives such as retention of canopy cover, riparian habitat and native soils that help protect biodiversity, improve air quality, and create a better and more sustainable environment and quality of life for King County citizens.

Environmental initiatives during the past decade have underscored the need for monitoring changes in our environment and the effectiveness of our efforts to protect it. Monitoring and performance measurement help local governments to target limited resources on existing and emerging environmental problems, determine whether actions are having their intended effect, promote accountability, and adapt approaches to environmental management. The Department of Natural Resources and Parks assesses environmental conditions with a variety of monitoring programs. The results are presented in the environmental indicator section of KingStat and are used to develop appropriate county responses and provide an opportunity to collaborate and partner with other organizations in making improvements.

The Environment Chapter reflects the overarching goal of the Countywide Planning Policies to protect, restore and enhance the quality of the natural environment in King County for future generations. The Environment Chapter has been updated to integrate county strategies for protection of land, air, and water; to emphasize implementation of salmon recovery plans; to reflect increased emphasis on climate change and biodiversity; and to support monitoring and adaptive management. These policies guide King

County's environmental regulations and incentives, education and stewardship programs in unincorporated King County.

# **I. Natural Environment and Regulatory Context**

## **A. Integrated Approach**

Environmental protection efforts need to be integrated across species, habitats, ecosystems, and landscapes. Efforts to reduce flooding or protect water quality and habitat cannot work successfully in isolation from management of land use across the larger contributing landscape. Efforts to protect one particular species or resource type could be detrimental to another if such efforts are not considered in an ecosystem context.

Likewise, the tools King County uses to protect the environment—incentives, regulations, changes in county operations, planning, capital projects, land acquisition, education, stewardship, and monitoring—also need to be integrated. For example, the regulatory buffers placed around wetlands need to consider changing conditions in the watershed around the wetland. These conditions are influenced by land use, stormwater management, clearing and grading requirements, and protection of forest cover and open space. Incentives, education, and technical assistance programs also must work hand-in-hand so that land owners can access a seamless set of programs that work together to accomplish environmental protection.

As part of the Comprehensive Plan Update in 2004, King County updated its critical areas, stormwater management, and clearing and grading regulations consistent with GMA requirements to include best available science. These regulations are functionally interrelated, with the standards for protection of wetlands, aquatic areas, and wildlife areas also working in tandem with landscape-level standards for stormwater management, water quality, and clearing and grading.

Habitat conditions vary throughout unincorporated King County, with higher quality habitat generally found in less developed areas of the county. However, both urban and rural habitats play a critical role for various species and during different life stages. The environmental protections we use should consider development patterns, habitat conditions, and the roles played by different geographic and ecologic areas. A geographic and watershed-based approach to planning, stewardship, and environmental protection acknowledges that different areas of King County may have different environmental and resource values and face different levels of development pressure. Therefore, methods of protecting critical areas that respect those distinctions must continue to evolve to balance the protection of the environment with the need to reduce urban sprawl and preserve our quality of life.

In 2004, the county strengthened incentives available to land owners through its Public Benefit Rating System, a tax incentive program through which landowners can receive reduced property taxes in

exchange for commitments to protect open space and natural resources. However, incentives are not just limited to tax incentives, but can include regulatory flexibility (e.g., alternatives to fixed-width buffers), streamlined permit processing, reduced permit fees, and free or low-cost technical assistance. Additionally, the King County Strategic Plan, released in 2010, has an environmental sustainability goal to “safeguard and enhance King County’s natural resources and environment.” The first two objectives of this goal, “Protect and restore water quality, biodiversity, open space, and ecosystems” and “Encourage sustainable agricultural and forestry,” both rely heavily on incentives as integral strategies.

**E-101                    In addition to its regulatory authority, King County should use incentives to protect and restore the natural environment whenever practicable. Incentives should be monitored to determine their effectiveness in terms of protecting natural resources.**

**E-102                    King County should take a regional role in promoting and supporting environmental stewardship through direct education, coordinating of educational efforts and establishing partnerships with other entities that share similar environmental concerns and stewardship opportunities.**

King County coordinates many programs with other agencies and governments. The cooperative development of watershed-based salmon recovery plans over the last decade has brought together local governments, federal and state agencies, citizens, and interest groups. Continued collaboration at the watershed level will be necessary to make these habitat-focused plans a reality. Tribes with treaty reserved fishing rights and the WDFW co-manage harvest and hatchery actions. Working closely with these co-managers will be essential to ensure that watershed-based salmon recovery strategies effectively integrate habitat, harvest and hatchery actions.

The Puget Sound Partnership was created by the Washington State Legislature and Governor in July 2007 to achieve the recovery of the Puget Sound ecosystem by the year 2020. The Partnership’s goal is to consolidate and significantly strengthen the federal, state, local, and private efforts undertaken to date to protect and restore the health of Puget Sound and its watersheds. Additional discussion of King County’s participation in the Puget Sound Partnership is found later in this chapter.

King County also works closely with federal and state agencies, cities, and other counties to try to integrate and streamline compliance with federal mandates like the Clean Water Act, Clean Air Act, and Endangered Species Act. In doing so, multiple benefits can be achieved. For example, in some cases mandated monitoring for Clean Water Act compliance can provide useful information to support salmon conservation efforts.

**E-103** King County should coordinate with local jurisdictions, universities, federal and state agencies, tribes, citizen interest groups, special districts, businesses, and citizens to implement, monitor, and update Water Resource Inventory Area plans for all areas of King County.

**E-104** Development of environmental regulations, restoration and mitigation projects, and incentive and stewardship programs should be coordinated with local jurisdictions, federal and state agencies, tribes, special interest groups and citizens when conserving and restoring the natural environment consistent with Urban Growth Area, Rural Area and designated Resource Land goals.

King County will use existing and updated subarea and functional plans and Salmon Recovery Plans to provide guidance to programs, regulations and incentives to protect and restore environmental quality.

**E-105** Environmental quality and important ecological functions shall be protected and hazards to health and property shall be minimized through development reviews and implementation of land use plans, Water Resource Inventory Area plans, surface water management plans and programs, flood hazard management plans, environmental monitoring programs, and park master plans. These plans shall also encourage stewardship and restoration of critical areas as defined in the Growth Management Act, and include an adaptive management approach.

**E-106** The protection of lands where development would pose hazards to health, property, important ecological functions or environmental quality shall be achieved through acquisition, enhancement, incentive programs and appropriate regulations. The following critical areas are particularly susceptible and shall be protected:

- a. Floodways of 100-year floodplains;
- b. Slopes with a grade of 40 percent or more or landslide hazards that cannot be mitigated;
- c. Wetlands and their protective buffers;
- d. Aquatic areas, including streams, lakes, marine shorelines and their protective buffers;
- e. Channel migration hazard areas;
- f. Critical Aquifer Recharge Areas;

- g. Fish and Wildlife Habitat Conservation Areas; and**
- h. Volcanic hazard areas.**

The State Environmental Policy Act (SEPA) requires King County to consider the environmental impacts of proposed actions that may have a significant adverse environmental impact. Over the years, King County has adopted development regulations that address many of the impacts that are likely to occur as a result of development. In many cases, King County's regulations adequately address environmental impacts and development proposals do not require additional mitigation under SEPA. However, there may be certain development proposals or unusual circumstances not contemplated by the development regulations that require further mitigation under SEPA. This principle is articulated in King County's SEPA regulations codified in K.C.C. Chapter 20.44. The presence of a species listed as endangered or threatened by the federal government is such an unusual circumstance.

- E-107 Regulations to prevent unmitigated significant adverse environmental impacts should be based on the importance and sensitivity of the resource.**
  
- E-108 King County may exercise its substantive authority under the State Environmental Policy Act to condition or deny proposed actions in order to mitigate associated individual or cumulative impacts such as significant habitat modification or degradation that may actually kill, injure or harm listed threatened or endangered species by significantly impairing essential behavioral patterns, including breeding, feeding, spawning, rearing, migrating or sheltering.**
  
- E-109 King County should promote efficient provision of utilities and public services by exempting minor activities from its critical areas regulations, if the agency has an approved best management practice plan approved by King County, and the plan ensures that proposed projects that may affect habitat of listed species be carried out in a manner that protects the resource or mitigates adverse impacts.**



## **B. Policy and Regulatory Context**

### **1. Endangered Species Act**

In March 1998, The National Marine Fisheries Service (NMFS) proposed to list the Puget Sound Chinook salmon as "threatened" under the ESA. This Chinook population was officially listed in March 1999. The listing of Chinook as threatened triggered a requirement for consultations with NMFS on any activity requiring a federal permit, relying on federal funds, or being sponsored by a federal agency.

Since that listing, several other aquatic species present in King County have been listed as threatened, including two additional salmonids: bull trout in November 1999, and steelhead in May 2007. Coho salmon are considered a Species of Concern. Puget Sound's resident Orca, which rely almost solely on salmon as a food source, were also listed under the ESA as endangered in November 2005.

NMFS and the United States Fish and Wildlife Service have issued rules describing regulations deemed necessary to conserve Puget Sound Chinook and other West Coast salmonids. These rules, commonly referred to as "4(d) rules," legally establish the protective measures that are necessary to provide for conservation of a listed species. These rules also make it a violation of the ESA for any person, government, or other entity to "take" a threatened species. Prohibited "take" under the ESA includes harm through significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, spawning, rearing, migrating or sheltering.

The 4(d) rule for Chinook and steelhead also establishes conditions or limits under which certain categories of activities that may result in "take" may be conducted. King County takes actions under the conditions established for two categories of activity: routine road maintenance and habitat restoration projects funded by the State Salmon Recovery Funding Board.

Final ESA Recovery Plans have been developed for Chinook (2007) and bull trout (2004). A final Recovery Plan for Orca whales was published in 2008. These plans describe recovery goals for the species, specific measures to address the factors that are limiting the health of the species, and timeframes and cost estimates for recovery measures. Conservation actions identified in Water Resource Inventory Area plans for King County watersheds are now being implemented subject to available funding and are anticipated to contribute significantly to the achievement of recovery goals for these species and their eventual removal from the Endangered Species list.

## **2. Clean Water Act**

Protecting the quality and beneficial uses of surface waters is a requirement of the federal Clean Water Act (CWA). Two of the major programs to achieve state and local compliance with the CWA are: the National Pollutant Discharge Elimination System (NPDES) permits for municipal discharges (including wastewater and municipal stormwater), and broader pollutant limits known as Total Maximum Daily Loads (TMDLs).

Additionally, in 2008 the US Environmental Protection Agency (EPA) and the US Army Corps of Engineers issued joint guidance on off-site compensatory mitigation for impacts to aquatic resources under the Clean Water Act. These new federal rules change how mitigation shall occur for unavoidable permitted impacts to aquatic resources.

### **a. National Pollutant Discharge Elimination System**

Authority for administering the NPDES Program has been delegated by the EPA to the Washington State Department of Ecology (Ecology). King County must comply with NPDES permit conditions for individually permitted activities, such as construction site activities, classed industrial sites or wastewater discharges, and for discharges from its municipal stormwater system that are regulated under a general municipal stormwater permit. The current Phase I Municipal Stormwater Permit, set to expire August 2012, contains prescriptive requirements for controlling and monitoring pollutants in municipal stormwater. It is anticipated that the next permit will continue to contain prescriptive requirements for controlling municipal stormwater, including new requirements for retrofitting, implementing Low Impact Development techniques, and additional requirements to meet TMDL actions. It is also anticipated that the monitoring requirements will be substantially modified in the next permit to require participation in a regional stormwater monitoring program rather than requiring jurisdiction-run programs.

### **b. Water Quality Standards and Total Maximum Daily Loads**

The Federal Clean Water Act (CWA) and Washington State law require the state to develop standards for surface and groundwater and for sediments collectively known as "Water Quality Standards" (WQS). These standards are intended to ensure that our waters can be beneficially used for purposes we all value, like fishing, swimming, boating, and drinking, as well as industrial and agricultural purposes and fish habitat.

Additionally, the state must prepare a list of surface water bodies that do not meet WQS. This list, known as the Water Quality Assessment (WQA), is prepared for Washington State by Ecology, and must be submitted to the EPA every two years. The water bodies in Category 5 of this list consist of "water quality

limited” or “impaired” estuaries, lakes, rivers and streams, estuaries, and marine waters that fall short of state surface water quality standards.

For water quality impaired waters on the Category 5 list, EPA requires that states establish a Total Maximum Daily Load (TMDL). A TMDL, also called a Water Quality Improvement Project, analyzes how much of a pollutant can be discharged to a water body and still meet state water quality standards. The Water Quality Improvement Project also includes a strategy for controlling pollution and monitoring requirements to test the Project’s effectiveness. TMDLs potentially affecting unincorporated King County have been approved by EPA for the Snoqualmie River, Little Bear Creek, Bear-Evans Creek Basin, Issaquah Creek, Cottage Lake, Lake Fenwick, Lake Sawyer, the Duwamish River and Lower Green River. TMDLs under development or pending US EPA approval include Green River and Newaukum Creek, White and Puyallup Rivers, and Soos Creek.

King County may be called upon by Ecology to participate in some TMDLs within incorporated cities within King County (e.g., monitoring in Fauntleroy Cove for the Fauntleroy Creek TMDL).

A complete listing of TMDLs and the Water Quality Assessment list can be found on Ecology’s web site at [http://www.ecy.wa.gov/programs/wq/links/wq\\_assessments.html](http://www.ecy.wa.gov/programs/wq/links/wq_assessments.html).

Washington State Department of Ecology’s recent TMDL analysis of temperature for the Snoqualmie and Green Rivers indicated that in some areas, summer water temperatures exceed water quality standards and can interfere with salmon survival. Maintaining and increasing the shallow groundwater and hyporheic zones associated with rivers contribute to maintaining water temperatures that can support local ecosystems.

**E-110                    Surface waters designated by the state as Water Quality Impaired under the Clean Water Act (water bodies included in Category 5 of the Water Quality Assessment) shall be improved through monitoring, source controls, best management practices, enforcement of existing codes, and, where applicable, implementation of Total Maximum Daily Load plans. The water quality of other water bodies shall be protected or improved through these same measures.**

**E-111                    King County shall evaluate development proposals subject to drainage review to assess whether the proposed actions are likely to cause, contribute to, or lead to violations of Washington State water quality standards in receiving waters for individual pollutants of concern and identify mitigation or requirements to avoid the impacts when appropriate.**

There are certain actions that can be used to help moderate water quality. Such actions may include maintaining and increasing connections between surface waters and shallow groundwater or hyporheic flow, promoting riparian vegetation and low impact development techniques, and increasing the physical complexity of river channels.

**E-112                      When environmental monitoring indicates impaired water quality, such as increased water temperature, fecal contamination, low oxygen, excess nutrients, metals, or other contaminants, King County shall take actions which will help moderate those impairments.**

### **3.        Growth Management Act and Critical Areas Protection**

The GMA requires that critical areas be designated and protected. Critical areas include wetlands, areas with a critical recharging effect on aquifers used for potable water, fish and wildlife habitat conservation areas, frequently flooded areas and geologically hazardous areas. This chapter establishes policies for designating and protecting critical areas. King County Code Title 21A provides the regulatory framework for these policies.

The GMA also requires local governments to include the best available science (BAS) in developing policies and development regulations to protect the functions and values of critical areas, and to give special consideration to the conservation or protection measures necessary to preserve or enhance anadromous (fish that spawn in freshwater and spend part of their lifecycle in salt water) fisheries.

### **4.        Shoreline Management Act**

The Shoreline Management Act (SMA) requires each city and county with Shorelines of the State to adopt a Shoreline Master Program that complies with state guidelines but that is tailored to the specific needs of the community. The SMA applies to all marine waters, streams with a mean annual flow of 20 cubic feet or more per second, and lakes that are 20 acres or more in size. The SMA also applies to upland areas called “shorelands” within 200 feet of these waters, as well as associated wetlands and floodplains. The program’s goals are set by state law and include protecting natural resources, increasing public access to shorelines and encouraging businesses such as marinas along the waterfront.

Under the SMA, the Shoreline Master Program includes both a Shoreline Master Plan and implementing shoreline land use and development regulations. The GMA requires that a local government’s Comprehensive Plan, Shoreline Master Plan, and development regulations, including both shoreline

regulations and critical area regulations, must be consistent with each other. The Shoreline Master Program is included in its entirety in Chapter 5.

## **5. Puget Sound Partnership**

The Puget Sound Partnership was created by the Washington State Legislature and Governor in July, 2007 to achieve the recovery of the Puget Sound ecosystem by the year 2020. Its goal is to consolidate and significantly strengthen the federal, state, local, and private efforts undertaken to date to protect and restore the health of Puget Sound and its watersheds. The Puget Sound Partnership is the umbrella for salmon recovery efforts in Puget Sound, including implementation of salmon recovery plans prepared for Chinook salmon. King County, through its land use decisions, management of stormwater and wastewater discharges, development of reclaimed water supplies, cooperative habitat protection and restoration projects, and ongoing monitoring is actively involved in the conservation and recovery of Puget Sound. King County has the opportunity, and responsibility, to make significant contributions to protecting and restoring Puget Sound.

**E-113 King County should actively participate in updating and implementing the Puget Sound Partnership's 2020 Action Agenda.**

**E-114 King County should collaborate with other watershed forum partners to ensure that recommendations of watershed-based salmon recovery plans for King County are integrated with the Puget Sound Partnership recommendations.**

The Puget Sound Partnership maintains a Strategic Science Plan and Biennial Science Work Plan which provide an overall framework for development and coordination of specific science activities necessary to support Puget Sound ecosystem protection and restoration under the Partnership's Action Agenda.

**E-115 The county should identify opportunities for coordinating its existing monitoring programs with monitoring and assessment work conducted through the Puget Sound Partnership's Strategic Science Plan and Biennial Science Work Plan.**

## II. Climate Change

Arguably the single most pervasive environmental challenge that King County faces now and into the future is global climate change. Impacts from climate change have the potential to dramatically impact ecosystems, agriculture, economy, biodiversity, and public health and safety in myriad and interrelated ways. The effects of climate change will not be felt equally across King County, with some communities facing particular vulnerabilities. Sustaining quality of life and our environment requires a significant commitment on the part of King County to both reducing greenhouse gas emissions, the primary driver of human caused climate change, and adapting to climate change impacts in an ever-changing and increasingly dynamic landscape.

### Climate Change Science and Impacts

Human caused sources of greenhouse gas emissions, including carbon dioxide and methane, are causing unprecedented and severe changes in global and local climate systems. This is the consensus view of the world's leading scientists, including the Intergovernmental Panel on Climate Change (IPCC) and the US National Academy of Sciences (NAS).

In King County, decreasing mountain snowpack, increasing flooding, and rising sea levels are evidence that the climate system is changing. While many factors affect the climate system and natural environment, including land use changes, scientists have attributed many changes in significant part to recent increases in atmospheric greenhouse gas concentrations. The County faces significant environmental and economic challenges stemming from climate change, including stressed and rapidly changing ecosystems, costly impacts on public and private property, and new public health risks resulting from worsening air quality, additional heat related impacts, and increased exposure to infectious disease.

The IPCC, NAS, University of Washington Climate Impacts Group and the King County Water and Lands Resource Division have already observed important long term trends in global and local climate systems. Over the last century, changes include:

- An increase in average annual temperatures of about 1.5°F (0.7-0.8°C) in the Pacific Northwest between 1920 and 2003;
- A rise in sea levels, with a worldwide average estimated at about 6.7 in (0.17m) in the 20<sup>th</sup> century;
- A decrease in mountain snowpack, with April 1 declines of 30-60% at many individual stations in the Pacific Northwest from 1950-2000;
- Global observations that cold days and nights have become less frequent, hot days and nights have become more frequent, and heat waves have increased in number and duration;

- Some evidence that severe storms and floods are occurring more frequently locally, as observed at 8 weather stations and at 10 river gauging stations with minimal upstream flood controls in Snohomish, Pierce, and King County; and
- A significant trend of decreasing summertime water volume in local rivers, especially in the months of August and September, as observed at 10 river gauging stations with minimal upstream water diversions in Snohomish and King County.

According to the Washington State Climate Change Impacts Assessment and the University of Washington Climate Impacts Group, among other leading scientists, predicted impacts to the Pacific Northwest and King County include:

- Increased average annual temperatures, increased temperatures across all seasons, significantly increased summer temperatures, and increased urban “heat island” effects, in which urban air and surface temperatures are higher than in the Rural Area due to storage of heat in pavement and buildings;
- Sea level rise of approximately 1 foot or more by 2100 leading to increased coastal flooding, inundation, saltwater intrusion of coastal aquifers, nearshore habitat loss, and erosion;
- Increased ocean temperatures, decreased ocean pH, and altered hydrology, which will affect the marine ecosystem in numerous ways;
- Changes to the timing and magnitude of streamflows due to snowpack and glacier reduction, increased winter rainfall, decreased winter snowfall, and earlier spring melt;
- Increased stress to regional water supplies due to increased frequency of drought events and increased demand;
- Negative effects on public health including thermal stress, respiratory problems due to increased smog, and increased exposure to certain infectious diseases;
- Increased stress to forests in the foothills, and potentially increased growth in forests at higher elevations that were snow-dominated;
- Increased stress to plant and animal species due to vegetation changes, food web disruption, streamflow changes, and increased freshwater and marine water temperatures;
- Decreased summer hydropower production and increased summer cooling power demands;
- Altered regional distributions of many species, including salmon and orca whales as well as marine and freshwater phytoplankton (and zooplankton, which are the base of aquatic food webs);
- Potentially more extreme weather events, including precipitation, heat, and coastal storms; and
- Potential migration of people to King County from other regions that may be more severely impacted by climate change impacts such as sea level rise and water shortages.

## **King County Greenhouse Gas Emissions**

Human-caused climate change results primarily from greenhouse gas (GHG) emissions such as methane, carbon dioxide and nitrous oxide, which are measured in metric tons of carbon dioxide equivalent (MTCO<sub>2e</sub>). King County has recognized that it must reduce the GHG emissions of its operations and support broader efforts to reduce countywide emissions.

### **Government Operations**

King County government operations create greenhouse gas emissions. Major government sources are associated with combustion of diesel and gasoline for transit buses and fleet vehicles, methane from landfills, electricity usage in buildings and for wastewater treatment, and emissions from the production, use and disposal of government purchased goods and services.

King County is making progress in reducing greenhouse gas emissions from county operations, with emissions from energy-related non-transit sources decreasing 13.1 percent between 2000 and 2010. During this time emissions directly associated with transit service increased by 10.3 percent as the transit system grew to meet rider demand.

### **Countywide**

Within King County's geography, greenhouse gas emissions are primarily caused by fossil fuel use (gasoline and diesel) for transportation and to a lesser but significant extent to heat buildings (natural gas and heating oil). Additional significant emissions are associated with consumption in King County, but these sources do not necessarily occur within its geographic borders. These emissions are created through the production, transport, sale, use, and disposal of imported goods and services such as food and electronics. Between 2003 and 2008, emissions produced in geographic King County increased 5.5 percent, which reflects a stabilization of per capita greenhouse gas emission. However, sustained focus on reducing emissions will be needed to achieve countywide emissions reduction goals.

King County elected officials, management and staff are taking leadership roles in broader countywide emissions reduction efforts. These roles include spearheading action by convening and partnering with King County cities, businesses, non-profits and community groups to:

- Develop regional emissions targets and track progress toward these goals;
- Share local success stories and challenges;
- Pursue and share grants, resources and group funding sources;
- Provide coordinated outreach and messaging on climate change solutions;
- Raise the profile of climate efforts of King County cities and the county itself; and
- Coordinate efforts through workshops, presentations and conferences.



In addition to leading by example in reducing operational sources of emissions and organizing action at the countywide scale, King County is also playing important roles in reducing greenhouse gas emissions through sustainable land use policies, transportation investments, recycling infrastructure and policy, and through the advocacy and provision of critical services such as waste prevention, recycling and transit.

### **Preparing for Climate Change Impacts**

Even if all greenhouse gas emissions ceased today, global and regional temperatures would continue to increase. Therefore, King County must be proactive in adapting to local climate change impacts. For King County, adaptation includes preparing for more frequent and severe flooding and droughts, developing capacity for reclaimed water, working with farm and forest owners to address climate change impacts, planning for effects of climate change on human health, taking steps to improve the resiliency of our natural and built environments, and ensuring that the County can continue to provide services such as transit, wastewater treatment, and flood protection.

**E-201                    King County should participate in and support appropriate local, regional and national efforts and organizations focused on reducing greenhouse gas emissions and preparing for climate change impacts.**

### **Status of King County Climate Change Efforts**

As articulated in King County's Strategic Plan, the 2010 King County Energy Plan, King County Climate Motion 12362, the 2012 King County Strategic Climate Action Plan and policies in this section of the King County Comprehensive Plan, a high bar has been set for county efforts to respond to climate change. Significant progress has been made. For example direct non-transit greenhouse gas emissions from government operations were reduced approximately 13.1 percent between 2000 and 2010, and countywide emissions have stabilized on a per capita basis between 2003 and 2008. Additionally, important steps have been taken to plan for and reduce operational and countywide vulnerabilities to climate change-related impacts such as flooding and sea level rise.

Despite this progress, the magnitude of the challenge is daunting. For example, achieving King County's long-term emissions reduction target of at least 80 percent below 2007 levels by 2050—the amount scientists tell us is necessary to avoid some of the most catastrophic impacts of climate change – will require significant changes to government operations and the broader fossil fuel-based economy.

King County's climate change related efforts are led and coordinated by the Department of Natural Resources and Parks. The broad scope of climate change issues means that staff from all departments – from the Department of Public Health and the Department of Transportation to the Department of Executive Services and the Department of Development and Environmental Services – share

responsibilities and resources to implement the county's climate change policies. This model of collaboration works in implementing many related projects and programs, from green building and sustainable development, to energy efficiency and renewable energy projects, to climate change impacts preparedness and planning efforts. This model also works as a way to leverage limited available resources to accomplish as much as possible.

In 2012, the county will initiate its Strategic Climate Action Plan (SCAP). The SCAP will provide the mechanism by which the county will refine specific strategies and program activities to achieve the twin objectives of reducing greenhouse gas emissions and adapting to climate change impacts. Additionally, the SCAP will identify clear performance targets (how much change is the county attempting to achieve) for those strategies and priority activities. It will allow for the reporting of all strategies, program activities, and performance measures related to climate change in one location. By 2015, the county intends to combine the SCAP and Energy Plan into one plan to allow for a more efficient and cohesive use of county resources dedicated to these interrelated issues and provide a platform for unified reporting on the county's efforts to reduce energy use and the effects of climate change.

## **A. Assessment**

King County has completed regular inventories and assessments of greenhouse gas emissions associated with government operations as well as emissions associated with all citizen, resident and business activity in the county since 2000. These assessments have provided valuable data to inform actions that will reduce greenhouse gas emissions as well as to monitor progress toward meeting emissions reduction targets.

In 2006, King County joined the Chicago Climate Exchange (CCX) and tracked and reported emissions from government operations via this program through 2010. New protocols for monitoring and verifying emissions from local government operations have emerged, including through The Climate Registry, and King County continues to annually assess operational greenhouse gas emissions.

In addition to tracking emissions from government operations, King County also frequently assesses greenhouse gas emissions associated with all resident, business, and other local government activities in King County. Accounting for countywide emissions can be challenging, as it requires diverse sources of data and information, and there are currently no county-scale accounting protocols that are widely accepted. In partnership with the Puget Sound Clean Air Agency, the City of Seattle, and the US Department of Energy, King County conducted a comprehensive assessment of 2008 calendar year greenhouse gas emissions in King County. These inventories quantified all sources within the county's geographic borders and also for the first time estimated emissions associated with local consumption of

food, goods and services, regardless of where these commodities were produced. This work shows that through a consumption perspective, sources of emissions associated with personal transportation, home energy usage, food, goods such as furniture and electronics, and services such as health care and banking, are all nearly equal.

- E-202**            **Through reporting on its major environmental sustainability programs, King County shall assess and publicly report on:**
- a.    Its normalized and total energy usage and total greenhouse gas emissions associated with county operations;**
  - b.    Countywide greenhouse gas emissions associated with resident, business, and other local government activities; and**
  - c.    countywide greenhouse gas inventories that quantify all direct local sources of greenhouse gas emissions as well as emissions associated with local consumption.**
- E-203**            **King County should collaborate with other local governments regionally, nationally and internationally to set transparent standards to account for the net energy and greenhouse gas emissions impacts of government actions such as constructing transportation infrastructure and providing services such as recycling and transit and should assess and publically report these impacts as practicable.**
- E-204**            **King County should collaborate with experts in the field of climate change, including scientists at the University of Washington’s Climate Impacts Group, to monitor and assess the impacts of climate change in King County.**

## **B.    Reducing Greenhouse Gas Emissions**

King County is leading by example in reducing operational sources of greenhouse gas emissions through efforts such as:

- Green building and sustainable development practices that reduce emissions of capital facilities projects;
- Purchasing and maintenance practices that reduce emissions associated with the production, use and disposal of goods and services;
- Modifying operations of county buildings and facilities that reduce emissions and resource demand;

- Purchasing and efficiently using alternative vehicles such as electric powered vanpools and hybrid cars and buses;
- Improving energy efficiency and producing renewable energy sources at King County's wastewater treatment and solid waste disposal facilities; and
- Protecting forested areas, encouraging and supporting active stewardship, and undertaking reforestation projects that enhance biological carbon sequestration.

King County is also supporting emissions reductions at the broader countywide scale through sustainable land use policies, transportation infrastructure, and through the provision of important services such as recycling and transit, including actions and policies such as:

- Land use designations and zoning that influence the pattern and density of development and the level of reliance on single occupancy vehicles;
- Use of voluntary tools like Transfer of Development Rights to reduce development density on Rural and Resource Lands;
- Building codes and facilities standards that can influence the types of building materials and future energy demands; and
- Promoting the use of transit and non-motorized travel modes to decrease vehicle miles traveled.

Many actions that reduce greenhouse gas emissions result in additional benefits, such as saving energy and fuel costs, improving health, and minimizing other types of air and water pollution. For example, healthy communities, as described in Chapter 2, have been shown to have significantly below average per capita greenhouse gas emissions while at the same time saving residents money, supporting healthier lifestyles and creating stronger communities.

In some cases, county actions are direct sources of greenhouse gas emissions, but when considered at a broader scale have a net emissions reduction benefit. For example, providing public transportation results in significant direct greenhouse gas emissions, primarily from combusting diesel, but the availability of public transportation also reduces emissions from single occupancy vehicle trips that are avoided. Public transit also helps reduce traffic congestion and facilitates the development of denser, more efficient communities. As this example shows, there are broad and complex considerations that need to be taken into account in making decisions about greenhouse gas emissions reduction strategies.

Policies related to King County efforts to reduce operational and countywide greenhouse gas emissions are presented below. Policies related to green building and sustainable development can be found in Chapter 8, Services, Facilities and Utilities, relating to public development and Chapter 9, Economic Development, relating to private development. Policies related to reducing greenhouse gas emissions and adaptation strategies for agriculture and forestry can be found in Chapter 3, Rural Area and Natural

Resource Lands. Policies related to reduction of GHG emissions from transit and fleet vehicles can be found in Chapter 7, Transportation. Policies related to water supply, use of reclaimed water, and energy can be found in Chapter 8, Services, Facilities and Utilities.

### **Government Operations**

- E-205**            **King County should seek to reduce greenhouse gas emissions from all facets of its operations and actions associated with construction and management of county-owned facilities, infrastructure development, transportation, and environmental protection programs.**
  
- E-206**            **King County shall reduce total greenhouse gas emissions from government operations, compared to a 2007 baseline by at least 80% by 2050.**
  
- F-207**            **King County shall develop near-term reduction targets of greenhouse gas emissions emanating from its government operations to help achieve the 2050 goal.**
  
- E-208**            **King County shall maximize the creation of resources from waste products from county operations such as gases produced by wastewater treatment and solid waste disposal in a manner that reduces greenhouse gas emissions and produces renewable energy.**
  
- E-209**            **King County will continue to evaluate its own maintenance and operations practices, including procurement, for opportunities to reduce its own emissions or emissions produced in the manufacturing of products.**

### **Countywide**

Many King County cities, businesses, non-profits and citizens are taking steps to reduce greenhouse gas emissions. For example, at least 17 of the 39 King County cities have signed the US Conference of Mayors' Climate Protection Agreement, committing to emissions reduction targets for their communities and to take actions to reduce greenhouse gas emissions. In addition to individual commitments such as these, state and regional requirements and policies are providing a regional focus on reducing emissions.

The Washington State legislature established statewide greenhouse gas emission reduction requirements (RCW 70.235.020) and vehicle miles traveled reduction goals (RCW 47.01.440). The greenhouse gas emissions requirements are to limit emissions to 1990 levels by 2020, to twenty-five percent below 1990

levels by 2035, and to fifty percent below 1990 levels by 2050. The vehicle miles traveled goals are to decrease annual per capita vehicle miles traveled by eighteen percent by 2020, thirty percent by 2045, and fifty percent by 2050. The Puget Sound Regional Council incorporated these provisions into VISION 2040.

- E-210**            **King County shall collaborate with its cities, and other partners, to meet or exceed the statewide greenhouse gas emissions reduction requirement of 50 percent below 1990 levels by 2050.**
  
- E-211**            **King County shall collaborate with its cities and other partners to develop near term targets to achieve greenhouse gas emission reductions throughout the region to 80 percent below 2007 levels by 2050.**
  
- E-212**            **King County will work with its cities and other partners to establish a greenhouse gas emissions inventory and measurement framework for use by all King County jurisdictions to efficiently and effectively measure progress toward countywide targets.**

Renewable energy technology, such as solar power, has the potential for replacing a significant share of King County's energy portfolio. Renewable energy technologies that have the benefit of zero or very low levels of greenhouse gas emissions should be encouraged. The renewable technology industry is evolving and no single technology is guaranteed to fit all the county's alternative energy needs. King County should provide flexibility in its policies and regulations to adapt to the changing circumstances.

- E-213**            **King County should ensure that its land use policies, development and building regulations, technical assistance programs, and incentive programs support and encourage the use of viable renewable energy technologies that have zero or minimal greenhouse gas emissions.**
  
- E-214**            **King County, through its comprehensive plan policies and development regulations, should promote healthy community designs that enable walking, bicycling, and public transit use, thereby reducing greenhouse gas emissions and regional air pollution.**

### **New Development**

Nearly every new development results in new sources of greenhouse house gas emissions. These include emissions from construction and land development, emissions created from producing and

transporting building materials, energy used in operating buildings and structures, and transportation associated with the development. Although the emissions associated with construction occur today, the emissions associated with energy and transportation will occur over the life of the development, which may extend for fifty years or more. This means that decisions we make today about development will have an effect on climate change far into the future.

Building and energy codes can assist in ensuring that new structures are energy efficient to the maximum extent practical. Land use policies that encourage or require compact urban development can also ensure that developments are located in ways that will result in the best use of transportation alternatives. However, these regulatory systems may not be adequate to address the impacts of all kinds of developments or may not have been updated to incorporate climate change impacts. The State Environmental Policy Act (SEPA) provides a tool that can be used to fill in the gaps of this regulatory scheme until a more robust regulatory system is available.

SEPA was enacted by the Washington State legislature in the 1970s and requires King County to look at a variety of environmental impacts from development proposals that may have a significant adverse impact on the environment, including impacts to the air. With the United States Supreme Court decision in *Massachusetts v. EPA* in 2007, and the Environmental Protection Agency's subsequent Endangerment Finding in 2009, greenhouse gas emissions have been recognized as coming within the scope of the federal Clean Air Act and the National Environmental Protection Act (NEPA) and, as a result, also within the scope of SEPA.

Executive Order PUT 7-10-1 requires King County departments to consider greenhouse gas emissions in their SEPA review. In implementing this direction, the Departments of Development and Environmental Services and Natural Resources and Parks developed a worksheet to assist project proponents in estimating their greenhouse gas emissions. Applicants have been required to include these estimates with the SEPA checklists since October 2007. More recently, the Washington State Department of Ecology has developed guidance to assist local governments throughout the state in including greenhouse gas emissions in their SEPA reviews. See <http://www.ecy.wa.gov/climatechange/sepa.htm>.

**E-215                    King County shall evaluate proposed actions subject to the State Environmental Policy Act (SEPA) for their greenhouse gas emissions. King County may exercise its substantive authority under SEPA to condition or deny proposed actions in order to mitigate associated individual or cumulative impacts to global warming. In exercising its authority under this policy, King County should consider project types that are presumed to be not significant in generating greenhouse gas emissions and do not require review for their**

**greenhouse gas emissions. Any standards related to consideration of greenhouse gas emissions through the SEPA process shall be subject to council review and adoption by ordinance.**



## **C. Adaptation**

Anticipation of environmental change has enabled institutions and societies to adjust and adapt in the past. Based on the potentially severe impacts of climate change to public health and safety, the environment, and economic prosperity in the King County region, the county needs to take action now to increase resiliency of our natural and built systems to climate change impacts using the best information available.

King County can increase resiliency and adapt to climate change through actions such as:

- Coordinated public health and disaster planning;
- Climate-sensitive land use planning;
- Investments in flood hazard management projects;
- Collaborative planning with water suppliers and development of reclaimed water sources;
- Comprehensive approaches to conserving biodiversity that may make habitats more resilient to climate change impacts;
- Information sharing and collaboration with other local governments developing strategies for climate change adaptation;
- Cooperation with farm and forest land owners to identify and address impacts of climate change; and
- Siting facilities and using sustainable building practices to reduce vulnerability to the impacts of climate change.

King County, in partnership with scientists from the University of Washington Climate Impacts Group and other agencies, has begun to implement and learn from practical preparedness steps. Examples include analyzing and planning for sea level rise impacts on Vashon Island and wastewater and road infrastructure, assessing and reducing flood impacts in partnership with the King County Flood Control District, and developing reclaimed water systems and markets. Effective climate change adaptation actions will require a high degree of coordination among state, regional and local governments, academic institutions, business leaders, and King County residents.

Recent research on local climate change impacts is helping to support planning and preparedness efforts. However, additional specific local information is still needed to understand how climate change will affect extreme weather, flooding, human health, and other important issues. Additionally, we know that some communities and populations may shoulder a greater burden from the impacts of both air pollution and climate change as a result of their location or abilities to adapt to changes, and the county may need to take proactive steps to address these inequalities.

## **Collaboration**

- E-216** King County should take steps to raise awareness about climate change impacts, including impacts on human health, and should collaborate with climate science experts, federal and state agencies, and other local governments to develop strategies to adapt to climate change.
- E-217** King County will work with its cities and other partners to formulate and implement climate change adaptation strategies that address the impacts of climate change to public health and safety, the economy, public and private infrastructure, water resources, and habitat.

## **Built Environment**

- E-218** King County should collaborate with climate scientists, federal and state agencies, and other local governments to evaluate and plan for the potential impacts associated with sea level rise.
- E-219** King County shall consider projected impacts of climate change, including more severe winter flooding and heat events, when updating disaster preparedness, levee investment, and land use plans; siting King County infrastructure; and updating development regulations.
- E-220** The county should inventory essential county facilities and infrastructure, including roads and wastewater treatment and conveyance facilities, that are subject to impacts that may be exacerbated by climate change, such as flooding and inundation from sea level rise, and develop strategies for reducing risks and mitigating future damages.

## **Natural Environment**

- E-221** King County should periodically review and evaluate climate change impacts on natural resources that its resource programs are designed to protect, such as open space, forests, fisheries, productive farmland, and water quality and treatment, in order to assess and improve the efficacy of existing strategies and commitments.

- E-222** King County should collaborate with climate scientists in order to increase knowledge of current and projected climate change impacts to biodiversity.
- E-223** King County shall consider projected impacts of climate change on habitat for salmon and other wildlife when developing long-range conservation plans and prioritizing habitat protection and restoration actions.
- E-224** To foster resilience to climate change in ecosystems and species, the county should prioritize efforts such as the restoration of riparian vegetation to reduce warming in cold water systems, restore wetlands to reduce drought and flooding, improve connections between different habitats, facilitate migration opportunities for species whose ranges shift in latitude and altitude and protect and restore areas most likely to be resistant to climate change.

#### **Public Health**

Vulnerable populations are often defined as groups whose unique needs may not be fully integrated into planning for disaster response. These populations include, but are not limited to, those who are physically or mentally disabled, blind, deaf, hard-of-hearing, cognitively impaired, or mobility challenged. Also included in this group are those who are non-English (or not fluent) speakers, geographically or culturally isolated, medically or chemically dependent, homeless, frail elderly and children. Public Health – Seattle - King County has established a Vulnerable Population Action Team to address the needs of this population.

See [www.kingcounty.gov/healthservices/health/preparedness/VPAT.aspx](http://www.kingcounty.gov/healthservices/health/preparedness/VPAT.aspx)

- E-225** Through land use and transportation actions, King County should work to reduce air quality and climate change related health inequities and the exposure of vulnerable populations to poor air quality and extreme weather events.
- E-226** King County shall develop and incorporate into outreach efforts public health messages related to the health implications of climate change, particularly in urban communities, and the benefits of actions, such as using alternative transportation options that simultaneously reduce greenhouse gas emissions, improve air quality, and improve public health.

#### **D. Collaboration with Others**

King County recognizes that the climate change challenge is worldwide in its scope, and that far reaching consequences to the environment and to humankind's quality of life may result if this issue is not

addressed effectively. King County's actions are important contributors to addressing this issue; however, its global nature will require cooperation across local, regional, state and international boundaries. King County can play important roles in collaborating with others on solutions, especially through community outreach, education, advocacy and information sharing with other local governments and universities.

**E-227                    King County should support appropriate comprehensive approaches to reducing greenhouse gas emissions, such as market-based emissions reduction programs and products, renewable energy standards for electricity production, and vehicle efficiency performance standards.**

**E-228                    King County should advocate for federal and state initiatives and grant and loan programs that support local investments in projects and programs such as community solar and energy efficiency retrofits to reduce greenhouse gas emissions and prepare for climate change impacts.**

**E-229                    King County shall work with the business community to support efforts that reduce energy use and greenhouse gas emissions, and to promote King County and the Puget Sound region as a center for green manufacturing. The county shall also work with community groups, consumers, and the retail sector to promote the consumption of green-manufactured products.**

# III. Air Quality

## A. Overview

Clean air, free of pollutants, is essential for the day-to-day quality of life and long-term health of county residents. King County has shown critical leadership in forging solutions to air pollution and will continue to do so well into the future.

King County works for clean air in partnership with the Puget Sound Clean Air Agency (PSCAA), which has the lead regulatory and monitoring responsibilities for the region in accordance with the Clean Air Act. Underlying drivers of the Clean Air Act include protecting public health, reducing property damage, and generally protecting the environment. Because air quality impacts water quality, a better understanding is needed regarding the input of pollutants via air transport from both local and distant sources.

PSCAA is responsible for monitoring and regulating six “criteria air pollutants” using standards set by the EPA. The six “criteria” air pollutants are:

- Fine particulate matter (dust, soot, smoke);
- Ground-level ozone (smog);
- Carbon monoxide (gas primarily from vehicle exhaust);
- Sulfur dioxide (gas primarily from industrial processes like smelters, paper mills, and power plants);
- Oxides of nitrogen; and
- Lead.

PSCAA also focuses on reducing harmful air toxics that come primarily from wood smoke and diesel burning, as well as greenhouse gases such as carbon dioxide and methane from landfills.

Efforts to address climate change and improve air quality are strongly linked. For example, conversion from conventional to hybrid buses and fleet vehicles not only helps to reduce greenhouse gas emissions, but also reduces emissions of particulates. Additionally, a likely impact of climate change on air quality is an increase in ground-level ozone because higher temperatures enhance the conversion of precursors into ground-level ozone. Ozone can exacerbate asthma and reduce respiratory system functioning. Because of these linkages, there is significant overlap with this section and the climate change section of this chapter. Section II, subpart B of this chapter relates to reducing greenhouse gas emissions. These strategies usually concurrently reduce other types of air pollution. Section II, subpart C of this chapter describes the linkages between climate change and health impacts, including policies related to minimizing health inequities among vulnerable populations more negatively impacted by climate change and air pollution.

## **B. Ozone, Fine Particulate, Toxics**

Reducing criteria pollutants will continue to be a primary focus for King County. The ozone strategy identified by PSCAA for our region focuses on reducing volatile organic compounds (VOCs), which are precursors to ozone formation. Emission of VOCs results mostly from vehicles, as well as to a significant degree from household chemicals and paint evaporation.

In addition to ozone, fine particulates also represent a serious health threat. Health studies have shown a significant association between exposure to fine particles and premature death from heart or lung disease. Fine particles can aggravate heart and lung diseases and have been linked to effects such as: cardiovascular symptoms; cardiac arrhythmias; heart attacks; respiratory symptoms; asthma attacks; and bronchitis. These effects can result in increased hospital admissions, emergency room visits, absences from school or work, and restricted activity days. Individuals that may be particularly sensitive to fine particle exposure include people with heart or lung disease, older adults, and children. Diesel emissions are one of the county's largest sources of fine particulate emissions. King County's participation in the ultra-low sulfur diesel (ULSD) program, known as "Diesel Solutions," has made tremendous strides in cleaning up King County Metro's fine particulate emissions. Indoor burning and outdoor burning are a major source of fine particulates.

Lastly, as a large county with a mix of urban and rural land uses, King County will continue to face risks from air toxics. Examples of air toxics include benzene, formaldehyde, mercury, and dioxins. The air quality impact of toxics cannot be evaluated in isolation. Their greatest health risk comes from their combined effect. National air toxics assessment data indicate that air toxics risks in the Puget Sound region are in the top five percent in the nation. EPA and its regulatory partners at the State and local level identify steps to reduce toxic air pollutants and provide important health protections: reducing toxic emissions from industrial sources; reducing emissions from vehicles and engines through stringent emission standards and cleaner burning gasoline; and addressing indoor air pollution through voluntary programs.

Local air monitoring data done by the Washington State Department of Ecology indicates that diesel exhaust and wood smoke are key contributors to toxics.

In 2002, King County Metro became the first transit agency in the United States to test articulated hybrid-diesel electric buses. King County Metro currently owns 214 articulated hybrid buses, the largest such fleet in the nation. A National Renewable Energy Laboratory study found articulated hybrids provide a 30 percent reduction in greenhouse gases and are 40 percent more reliable than diesel fueled articulated buses.

Wood smoke is a leading contributor to air toxics. King County will examine proposals to curtail the impacts of woodstove burning and land-clearing practices in rural parts of the county.

The focus of King County air quality improvement efforts is to engage in projects and changed practices to reduce county emissions and promote policies that incorporate consideration of air quality impacts. Motorized vehicle and other fuel burning engine-related emissions are the primary source of ozone, fine particulate, toxics and greenhouse gas emissions in King County and therefore should be a primary focus for emissions reduction.

**E-301                    King County should support initiatives that reduce emissions due to indoor and outdoor wood burning consistent with the actions of Puget Sound Clean Air Agency to control this source of public health threat.**

**E-302                    King County will continue to actively develop partnerships with the Puget Sound Clean Air Agency, local jurisdictions, the state, and public, private, and not-for-profit groups to promote programs and policies that reduce emissions of ozone, fine particulates, toxics, and greenhouse gases, particularly for those populations already experiencing health disparities linked to air quality.**

More detailed policies related to reducing greenhouse gas emissions and improving air quality can be found in Section II of this chapter, Chapter 7, Transportation, and Chapter 8, Services, Facilities and Utilities.

## **IV. Land and Water Resources**

### **A. Conserving King County's Biodiversity**

It is King County's goal to conserve fish and wildlife resources in the county and to maintain countywide biodiversity. This goal may be achieved through implementation of several broad policy directions that form an integrated vision for the future. Each of the pieces is necessary for the whole to be successful. The policy objectives are to: (1) initiate multi-species, biodiversity management approaches, (2) integrate biodiversity conservation goals and climate change planning into new and existing developments and habitat restoration programs, (3) identify and protect fish and wildlife habitat conservation areas (FWHCAs), (4) connect the FWHCAs and other important conservation areas and protected lands through a habitat network system, and (5) provide education and incentive opportunities to engage citizens. Incentives can include, but are not limited to, tax incentives, regulatory flexibility (e.g., alternatives to fixed-width buffers), streamlined permit processing, reduced permit fees, and free or low-cost technical assistance. Conservation of biodiversity is necessary if benefits including important ecosystem services such as clean water, natural flood control, timber production, climate regulation, and pollination currently enjoyed and relied upon by residents of the county are to be available for future generations.

#### **1. Biodiversity**

Because of its size, topography, and geology, the diversity of landscapes and habitats in King County is dramatic. From the Cascade Mountains to Puget Sound, alpine areas to lowland bogs, King County possesses an astonishing array of habitats and species. Approximately 220 species of breeding and non-breeding birds are usually seen on an annual basis in King County. Based on an analysis by the State of Washington, 69 species of mammals, 12 species of amphibians, and 8 species of reptiles are thought to be breeding in the county. About 50 species of native fish (and 20 species of introduced fish) are found in the freshwater streams, rivers, ponds, and lakes of King County. In the county's marine environment, over 200 species of fish, some 500 species of invertebrate animals, and 8 species of marine mammals can be found. 1,249 (383 introduced) species of vascular plants have been identified in the county. The diversity of geography combined with King County's history of land use has shaped the biodiversity of the past and present and will continue affecting it into the future.

King County defines biodiversity as the variety of living organisms considered at all levels, from genetic diversity through species, to higher taxonomic levels, including the variety of habitats, ecosystems, and landscapes in which the species are found. The Washington Biodiversity Conservation Strategy provides another working definition: Biodiversity is the full range of life in all its forms, including the habitats in



which they live, the ways species interact with each other and their environment, and the natural processes (like flooding) that support those interactions.

The biggest threats to biodiversity in King County visible today are habitat loss and fragmentation from development, invasive plant and animal species, and climate change.

**E-401                    The county shall strive to conserve the native diversity of species and habitats in the county.**

**E-402                    In the Urban Growth Area, King County shall strive to maintain a quality environment that includes fish and wildlife habitats that support the greatest diversity of native species consistent with GMA-mandated population density objectives. In areas outside the Urban Growth Area, the county should strive to maintain and recover ecological processes, native landscapes, ecosystems, and habitats that can support viable populations of native species. This should be accomplished through coordinated conservation planning and collaborative implementation.**

**E-403                    King County should develop a biodiversity conservation framework and conservation strategy to achieve the goals of maintaining and recovering native biodiversity. This framework should be coordinated with the Washington Biodiversity Conservation Strategy where applicable.**

**E-404                    King County should collaborate with other governments and private and non-profit organizations to establish a bioinventory, an assessment and monitoring program, and a database of species currently using King County to provide baseline and continuing information on wildlife population trends in the county.**

## **2.        Climate Change and Biodiversity**

The effects of climate change on native biodiversity in the Pacific Northwest are likely to be serious, but as yet are largely unpredictable. In King County, some effects already are apparent as average temperatures over the last decade have increased slowly but steadily, especially in winter. For many of our native species, climate change will present added stresses to ecosystems and populations, including changes in distribution and availability of food, cover, and breeding habitat. Changes in temperature can alter productivity and growth rates or cause direct mortality, particularly for salmon, and trigger invasions of non-native species. The range and seasonal presence of some species will shift, and it is likely that the

timing of when some species are in certain habitats won't match with the availability of their food sources. Finally, changing lake and ocean temperatures may have devastating impacts on the base of food web.

The effects of climate change are only beginning to be observed and understood in the county and are presumed to increase over time. In the face of climate change, biodiversity conservation may be of critical importance for buffering the effects of rising temperatures on regional ecosystems, damping the rates of ecological change, and reducing the potential for sudden, extreme changes in the environment.

**E-405                      King County should evaluate a range of projected future climate scenarios based on best available science to help ensure that conservation efforts are able to meet their objectives in a changing climate.**

### **3.            Biodiversity Conservation Approaches**

This section provides guidance for biodiversity management of the county's natural resources. The following concepts and principles are based on current approaches to conservation biology, restoration ecology, and climate science combined with input from the new Washington State Climate Change Response Strategy.

#### **a.            Landscape Context**

Natural resource protection occurs within an ecological context. Environmental management should consider not only the immediate site but also the spatial and temporal context that surrounds it. In terms of spatial context, different activities will require consideration of different scales—from small sub-basins of a few square miles to watersheds and ecosystems that contain many hundreds or thousands of square miles. For example, watershed boundaries are useful ways to define ecological planning units for resource protection of aquatic systems whereas large-scale vegetation communities may be more useful for terrestrial systems.

In terms of temporal contexts, habitat conditions and populations can fluctuate over long time periods. It may take decades to see the results of habitat restoration projects and other environmental management actions on populations, and in the interim climate change and possibly major events such as flooding will also impact the trajectory of restoration actions.

There is no single scale appropriate for all planning and management of conservation activities. Management within the context of a landscape helps to ensure the actions in one area will not be undone or rendered unsustainable by conditions in the surrounding watershed or ecoregion. Conservation efforts designed to protect only one species could have an unintended, detrimental effect on others. Ecological communities consist of multiple species often that interact in the same geographical area.

- E-406**            **King County’s conservation efforts should be integrated across multiple landscape scales, species, and ecological communities.**
- E-407**            **Distribution, spatial structure, and diversity of native wildlife and plant populations should be taken into account when planning restoration activities, acquiring land, and designing and managing parks.**
- E-408**            **King County should carry out conservation planning efforts in close collaboration with other local governments, tribes, state and federal governments, land owners, and other conservation planning stakeholders.**

“Ecoregions” are land areas that contain a geographically unique set of species, communities, and environmental conditions. Washington is a highly diverse state, with portions of nine ecoregions located within its boundaries. Three ecoregions cover parts of King County: the Puget Lowland Ecoregion in the western half of the county, the North Cascades Ecoregion in the northeastern and east central portion, and the Cascades Ecoregion in the southeastern portion of the county.

Ecoregions are the largest units of biodiversity in King County, and this scale is appropriate for broader natural resources planning and management. More localized habitats and species can be identified within these ecoregions, and can inform actions at the watershed and even property-specific level. Funding for landscape evaluations of this nature is extremely limited and will typically require grant funds. The County should take advantage of opportunities that may arise to collaborate with other ecoregional planning efforts.

- E-409**            **King County should develop a countywide landscape characterization system based on ecoregions as a key tool for assessing, protecting, and recovering biodiversity.**

**b.    Habitat connectivity**

Protecting and enhancing habitat connectivity is a critical action for maintaining ecosystem integrity and resilience, particularly in the face of climate change. However, funding for such evaluations is extremely limited. Protection of isolated blocks of habitat is critical but not enough to adequately protect wildlife in King County. Critical wildlife habitats and refuges also need to be connected across the landscape through a system of habitat corridors, or networks.

How wide the corridors within the network should be is related to requirements of target wildlife species, length of network segment and other important characteristics within the network. Wider corridors will be required for larger species if the distance between refuges is great or if multiple uses, such as public access and trails, are desired. Because it may not be possible to protect wide corridors in the Urban Growth Area, it may not be possible to accommodate larger wildlife species in all areas. Networks will address some of the problems of habitat fragmentation for smaller species within the Urban Growth Area.

Open spaces set aside during subdivision of land should be located to make connections with larger offsite systems. This approach will also benefit other open space goals.

**E-410                   Habitat networks for threatened, endangered and Species of Local Importance, as listed in this chapter, shall be designated and mapped. Habitat networks for other priority species in the Rural Area should be identified, designated and mapped using ecoregion information about the county and its resources and should be coordinated with state and federal ecosystem mapping efforts as appropriate.**

As mentioned above, protecting and enhancing habitat connectivity is critical for maintaining ecosystem integrity and resilience. Functional habitat connectivity is the degree to which a given species can easily move between habitat areas. Because individual species respond to the landscape, functional connectivity depends on both the features in the landscape and how particular species respond to that landscape. Focal species are used to identify important linkages between habitat areas that will be suitable for a variety of species.

**E-411                   King County should conduct an analysis to identify areas critical for functional habitat connectivity. This assessment should be coordinated with state and federal mapping efforts as appropriate. Areas identified by this analysis as being critical for functional habitat connectivity should be prioritized by King County for land conservation actions and programs.**

In planning for climate change, it will be increasingly important to provide for habitat connectivity not only across jurisdictional boundaries, but also across a range of environmental gradients. As the "Washington State Integrated Climate Change Response Strategy" explains:

Habitat connectivity is expected to allow species and ecosystems to better withstand climate change by allowing them to follow changes in climate across the landscape and maintain critical ecological processes such as dispersal and gene flow. In general, it is

much costlier and more difficult to restore connectivity than to maintain existing connectivity, yet ongoing development rapidly removes this opportunity. Planning for habitat connectivity in the near term will be far more economical the sooner it is implemented.

**E-412 King County should work with adjacent jurisdictions, state and federal governments, tribes, and landowners during development of land use plans, Water Resource Inventory Area plans, and site development reviews to identify and protect habitat networks at jurisdictional and property boundaries.**

Additional medium- and long-term strategies identified in the “Washington State Integrated Climate Change Response Strategy” that are appropriate for the County to consider when planning for connectivity include:

- Identifying and designating areas most suitable for core habitat and connectivity in view of a changing climate.
- Protecting and restoring areas most suitable for current core habitat, likely future core habitat, and connections between them.
- Protecting and re-establishing connectivity of rivers and their floodplains.
- Adjusting the size and boundaries of conservation areas (parks and natural areas) to accommodate anticipated shifts in habitat and species’ ranges.
- Adjusting land use designations in important connectivity areas (for example, allowable density).
- Facilitating inland migration of marine shoreline habitats.

Connectivity is addressed further below, as the Wildlife Habitat Network is a designated Fish and Wildlife Habitat Conservation Area.

**c. Ecosystem Resilience and Natural Processes**

Ecosystems and habitats suitable for particular species communities are the result of various geologic, hydrologic, and biologic processes. Where habitat forming processes are intact, ecosystems and their inhabitants are more likely to persist in the face of environmental variation.

Further, reducing vulnerability of systems to large-scale disturbances including disease, invasive species, catastrophic fire, flooding, and drought is best accomplished by supporting resilience, which is the ability of a system to return to its former state after a disturbance. When an ecosystem is resilient, that system with its species communities is better able to bounce back following disturbance or change with ecological functions and processes still intact. In addition, current efforts such as the Washington State

Department of Ecology's Watershed Characterization analysis can be used to inform decisions and direct resources for regarding land protection and restoration efforts with maximum ecological benefit.

**E-413                    King County's efforts to restore and maintain biodiversity should place priority on protecting and restoring ecological processes that create and sustain habitats and species diversity.**

**E-414                    When acquiring land for habitat protection, efforts should be made to protect and restore areas of each habitat type most likely to be resistant to and enhance resilience to climate change.**

"Structural diversity" is an accepted scientific term whose meaning varies depending on the ecosystem. For example in a forest, structural diversity means the combination of tree species, tree height classes, and legacy components (snags, logs); the more of each of these there are, the greater the forest structural diversity. Structural diversity of a river or stream means the degree of sinuosity (meaning curviness of the river and more is better) combined with both native riparian habitat and natural in-stream structure, which includes downed wood, various-sized substrate, and a combination of pools, riffles, and glides. "Landscape diversity" means the size, shape, and connectivity of different ecosystems across a large area; a mosaic of heterogeneous land cover types and vegetation types; assemblages of different ecosystems.

**E-415                    King County should conserve areas where conditions support dynamic ecological processes that sustain important ecosystem and habitat functions and values, and promote structural and landscape diversity.**

**d.     Decisions in the Face of Uncertainty**

Both current and historical information on habitat conditions and species distribution can inform ecologists and decision-makers about environmental management decisions. However, decision-makers do not always have access to complete information, and uncertainty is often the only thing that is certain.

**E-416                    King County should use a mixture of information on historic, current, and projected future conditions to provide context for managing public hazards and protecting habitat.**

**E-417                    King County should take precautionary action informed by best available science where there is a significant risk of damage to the environment.**

**Precautionary action should be coupled with monitoring and adaptive management.**

**e. Rare Ecosystems, Habitats, and Species**

Rare or sensitive habitats and species are at a greater risk of extinction than those that are widespread and abundant and therefore should be a high priority for conservation. An important secondary benefit of protecting habitat for rare, endemic (native to a particular area), or keystone (a species that is central to the survival of a multitude of other species) species is that habitat for many other species is protected as well. For example, the most effective way to protect and enhance native salmonid populations is through protection of those river and stream channels, riparian corridors, lakes, wetlands, groundwater, headwaters, and watersheds that provide or impact spawning and rearing habitat, food resources, and fish passage. Protecting these resources also enhances protection of habitat for other species.

**E-418 King County should assess the relative scarcity of different land types and resources, the role of these lands in supporting sensitive species, and the level of threat to these lands in terms of habitat modifications that would likely reduce populations of sensitive species.**

**E-419 King County should give special consideration to protection of rare, endemic, and keystone species when identifying and prioritizing land areas for protection through acquisition, conservation easements, and incentive programs.**

**E-420 King County should incorporate climate change projections into new species protection plans and shall revise older species protection plans when feasible or when conducting regular plan updates to incorporate projected impacts from climate change.**

Rare ecosystems, habitats, and species are also addressed in the Fish and Wildlife Habitat Conservation Areas section below.

**f. Integrated Land and Water Management and Planning**

In the past, aquatic and terrestrial habitats and species have often been managed independently of each other. Effective conservation and resource management of aquatic and terrestrial systems requires coordinated planning among departments with authority over development regulations and guidelines, wastewater treatment, stormwater management, flood hazard management, groundwater protection, transportation planning and road building, water quality, natural resource management, agriculture, and

fish and wildlife conservation. Effective conservation planning must include the interests of private landowners as well.

Coordinated planning and management can improve understanding of cumulative effects on terrestrial and aquatic systems, and can allow for a systems-based approach to avoiding or mitigating for adverse effects and improving habitat functions and value over time.

**E-421                    Terrestrial and aquatic habitats should be conserved and enhanced to protect and improve conditions for fish and wildlife.**

**E-422                    King County’s land use planning, regulatory, and operational functions related to environmental protection, public safety, and equity should be closely coordinated across departments and with other applicable agencies and organizations to achieve an ecosystem-based approach.**

**g.     Habitat and Development**

A key element in local wildlife conservation is the integration of wildlife and habitats into developments of all types. Wildlife protection does not have to be at odds with many types of development. Urban multifamily projects, industrial developments, new school facilities and rural open space projects all provide opportunities to enhance wildlife amenities. Residential developers and businesses have been able to use wildlife in marketing strategies to attract more potential homeowners, renters and quality employees.

Techniques such as minimizing clearing during site preparation, using native plant species in required buffers, landscaping, using bridges and wildlife-specific crossings rather than culverts to cross streams and innovative site design can be used to promote wildlife presence and connectivity and minimize problems with nuisance wildlife. Other plan elements, such as open space, road system design and housing density, also have related impacts on the remaining wildlife values that must be considered.

Benefits to wildlife are enhanced if screening and landscaping is composed of native vegetation. Retention of natural vegetation can provide wildlife and aesthetic benefits often at a lower cost than non-native or constructed options.

**E-423                    New development should, where possible, incorporate native plant communities into the site plan, both through preservation of existing native plants and addition of new native plants.**



**E-424                    The county should steward public lands well and should integrate fish and wildlife habitat considerations into capital improvement projects whenever feasible. Fish and Wildlife Habitat Conservation Areas should be protected and, where possible, enhanced as part of capital improvement projects.**

Standard buffers for streams and wetlands will not always adequately protect wildlife resources that utilize those sensitive areas. Areas with critical wildlife resources may need larger buffers to protect the resource.

**E-425                    Stream and wetland buffer requirements may be increased to protect King County species of Local Importance and their habitats, as appropriate. Whenever possible, density transfers, clustering and buffer averaging should be allowed.**

#### **h.     Non-Native Species**

Non-native species are often invasive because they did not evolve as part of the ecosystem and therefore do not have natural controls or competition. These species may be terrestrial, freshwater, or marine. Invasive species can create costly maintenance problems for both public and private landowners. Noxious and invasive weeds and animal species pose threats to the environmental health of all landscapes in King County, including natural, agricultural, wildlife, wetland, stream, and recreational areas. Weeds spread in a variety of ways, including the transport of seeds or plant parts by vehicles boats, shoes, clothing and animals (including pets, livestock, wildlife, birds and insects), in soil, gravel and other landscaping and building materials, down watercourses and in floods, by wind, and occasionally through deliberate introduction by people. They alter ecosystems through disrupting food chains, out-competing native species, and reducing habitat for native wildlife. Invasive species, including weeds, are widely recognized as having a significant negative impact on wildlife biodiversity.

King County offers technical assistance with identification and removal of non-native plants through programs like Forest Stewardship and Naturescaping. The county also partners with volunteer groups to remove invasive plants from open space and natural areas. Some non-native species are classified as “noxious” weeds. The King County Noxious Weed Control Program provides many services to county residents, including: educational materials and workshops, current information on control and eradication of noxious weeds, support to volunteer and land owner groups, and annual road-side surveys. In addition, the Noxious Weed Control Program implements the State Weed Law (RCW chapter 17.10) in

the county which requires all landowners to eradicate Class A noxious weeds and control designated class B and county-selected Class C noxious weeds on their properties.

The State Weed Law applies to both private and public lands. King County manages approximately 4,250 parcels of public land totaling 33,300 acres. King County also owns or manages over 1,500 linear miles of roads and right of way. These lands are managed by multiple county agencies, including the King County Departments of Natural Resources, Transportation, and Executive Services. Since weed infestations can spread from property to property, on both public and private lands, it is critical that the county have a coordinated strategy for controlling noxious and invasive weeds on county-owned and managed lands.

- E-426                    Introductions of non-native, invasive plant, vertebrate, and invertebrate species should be avoided in terrestrial, freshwater, and marine environs.**
  
- E-427                    King County should promote and restore native plant communities where sustainable, feasible, and appropriate to the site and surrounding ecological context and should incorporate climate change considerations into planting design.**
  
- E-428                    On county-owned lands, King County should use locally adapted native species for natural area landscaping, restoration, rehabilitation, and erosion control. Habitat restoration projects should include provisions for adequate maintenance of plantings to prevent invasion of weeds and ensure survival of native plantings.**
  
- E-429                    King County should provide incentives for private landowners who are seeking to remove invasive plants and noxious weeds and replace them with native plants.**
  
- E-430                    King County shall implement its strategy to minimize impacts of noxious weeds to the environment, recreation, public health and the economy on all lands in the County. This includes preventing, monitoring and controlling infestations of state-listed noxious weeds and other non-native invasive weeds of concern on county-owned and managed lands.**

## **i. Adaptive Management**

Adaptive management refers to modifying management actions based on ongoing monitoring and data analysis. To sustain native biodiversity and improve the county's efforts at conservation, it must always be advancing the understanding of the systems under its care and change its efforts accordingly.

**E-431 Management activities should, when feasible and practicable, be designed in a manner that can test them against management objectives and adjust as appropriate.**

Additional text and policies related to monitoring and adaptive management can be found at the end of this chapter.

## **4. Fish and Wildlife Habitat Conservation Areas**

Fish and wildlife habitat conservation, according to the state's definition, means land management for maintaining populations of species in suitable habitats within their natural geographic distribution so that the habitat available is sufficient to support viable populations over the long term and isolated subpopulations are not created. This definition does not mean that all individuals of all species at all times must be maintained, but it does mean not degrading or reducing populations or habitats so that they are no longer viable over the long term. Additionally, it should be recognized that geographic distributions will shift with climate change,

King County's fish and wildlife policies and regulations have been informed by current state fish and wildlife guidance, recommendations, and requirements. The GMA directs local jurisdictions to designate and protect critical areas, including Fish and Wildlife Habitat Conservation Areas. Fish and Wildlife Habitat Conservation Areas are designated with the intent to ensure the conservation of individual species recognized as declining or imperiled as well as protect and connect specific areas of habitat deemed important. This approach of protecting individual species and their habitat comprises one of the five major objectives described above for protecting the county's biodiversity. Because biodiversity encompasses a variety of levels, from genes to ecosystems, and occurs at multiple spatial scales, a wider approach beyond single-species management is necessary to conserve biodiversity in King County. Additionally, most fish and wildlife species are not confined to small portions of the landscape; rather, they move about for feeding, breeding, rearing young, and interacting with other members of their species to insure adequate genetic exchange and population viability.

Federal laws have been enacted over the past century to protect a wide range of species. In addition to the Endangered Species Act (ESA), other federal laws include the Marine Mammal Protection Act, and the Migratory Bird Treaty Act. Individuals of ESA-listed species, marine mammals, and migratory birds in King County are protected under the provisions of these laws.

In order to build a robust approach to biodiversity conservation, especially in view of a changing climate, individual species and habitat protections must be integrated with a landscape-scale approach to fostering and protecting resilient and diverse ecosystems. Fish and Wildlife Habitat Conservation Areas occur on both publicly and privately owned lands. Designating these areas is an important part of land use planning for appropriate development densities, urban growth area boundaries, open space corridors, incentive-based land conservation and stewardship programs, and acquisition planning. The policies in this section are intended to fulfill federal and state requirements for protection of specific species and habitats while implementing landscape-based approaches to conserve native biodiversity in the long term. Protection measures designed to help maintain populations of certain species may necessarily include protecting the habitat where those species have a primary association with the protected area such as spawning or breeding, and also for rearing young, resting, roosting, feeding, foraging, and migrating.

**E-432                    King County shall designate the following areas as Fish and Wildlife Habitat Conservation Areas:**

- a.        Areas with which federal or state listed endangered, threatened or sensitive species have a primary association;**
- b.        Habitats of Local Importance and Habitats for Species of Local Importance;**
- c.        Wildlife habitat networks designated by the county;**
- d.        Commercial and recreational shellfish areas;**
- e.        Kelp and eelgrass beds;**
- f.        Herring, smelt, and sand lance spawning areas;**
- g.        Riparian corridors; and**
- h.        State aquatic reserves.**

**E-433                    King County should map Fish and Wildlife Habitat Conservation Areas. King County shall protect Fish and Wildlife Habitat Conservation Areas through measures such as regulations, incentives, capital projects or purchase, as appropriate.**

The WAC guidelines suggest considering waters of the state, wetlands, salmonid habitat (which includes marine nearshore areas), and riparian ecosystems when designating fish and wildlife habitat conservation areas. All of these areas and their associated buffers are highly valuable wildlife habitat, and they serve many other functions as well. Protections for these areas are addressed more broadly in other provisions of this chapter.

**a. Federal and State Listed Endangered, Threatened, Sensitive Species**

The importance of designating seasonal ranges and habitat elements where federal and state listed endangered, threatened and sensitive species have a primary association is that these areas, if altered, may reduce the likelihood that the species will survive over the long term. The state recommends that King County and other local jurisdictions identify and classify these areas.

**E-434 Habitats for species that have been identified as endangered, threatened, or sensitive by the state or federal government shall not be reduced and should be conserved.**

**b. Species and Habitats of Local Importance**

Federal and state listings of species as endangered or threatened often encompass relatively large geographic areas. More localized declines of species within King County may not be captured by state and federal listings. For example, local monitoring data indicate the extinction of the Early Lake Sammamish Kokanee run and significant declines in the Middle and Late Lake Sammamish Kokanee salmon runs. In 2000, a petition to list just the Early run was filed with the US Fish and Wildlife Service (USFWS), but by 2003 the run went extinct without any federal action to prevent that result. In 2007, a second petition was filed to list all remaining Lake Sammamish kokanee. This petition led to an official review of the population's status by USFWS. On September 30, 2011, USFWS concluded that kokanee and sockeye should be considered together in their listing determination and therefore declined to list this kokanee population. However, King County believes the conservation of local native kokanee to be important, and the County maintains strong collaborative relationships with the watershed cities, the USFWS, Washington Department of Fish and Wildlife (WDFW), non-governmental organizations, and watershed residents to improve habitat, conduct research, and support captive brood stock program.

King County defines Species of Local Importance as those species that are of local concern primarily because of their population status or their sensitivity to habitat manipulation. The county takes into consideration native species named as priority species by WDFW; anadromous salmonids aquatic species whose populations are particularly vulnerable to changes in water quality and quantity; species

whose habitat or mobility is limited (local populations of species that are immobile or have very limited habitat); and species that can be directly impacted by King County (for example, where road projects or other infrastructure development can impact habitat; where the county may acquire, protect, or restore certain habitat types). King County Species of Local Importance are identified so that they and their habitats may be considered during land use planning and protected during project implementation and development. Habitats for Species of Local Importance are designated as a type of Fish and Wildlife Habitat Conservation Area and are covered by policies and regulations designed to protect those areas. However, individual animals or plants may also be at risk of injury from development or during construction or other changes to the landscape and may require additional measures to protect them from injury. For example, freshwater mussels may be protected from an instream project by relocating individual animals so they are not injured or killed during construction. Or, a rare individual plant may require the protection of an area of land because the plant cannot be relocated.

**E-435**

**King County designates the following to be Species of Local Importance:**

- a. Salmonids and other anadromous fish – Kokanee salmon, Sockeye/red salmon, Chum salmon, Coho/silver salmon, Pink salmon, Coastal resident/searun cutthroat trout, Rainbow trout, Dolly Varden, and Pacific lamprey;**
- b. Native Freshwater Mussels – Western pearlshell mussel, Oregon and western floater, and western ridge mussel;**
- c. Shellfish – Dungeness crab, Pandalid shrimp, Geoduck clam, and Pacific oyster;**
- d. Marine Fish – White sturgeon, Pacific herring, Longfin smelt, Surfsmelt, Lingcod, Pacific sand lance, English sole, and Rock sole;**
- e. Birds – Western grebe, American bittern, Great blue heron, Brant, Harlequin duck, Wood duck, Hooded merganser, Barrow’s goldeneye, Common goldeneye, Cinnamon teal, Tundra swan, Trumpeter swan, Surf scoter, White-winged scoter, Black scoter, Osprey, Western screech-owl, Sooty grouse, Band-tailed pigeon, Belted kingfisher, Hairy woodpecker, Olive-sided flycatcher, Western meadowlark, Cassin’s finch, and Purple finch;**
- f. Mammals – American marten, mink, Columbian black-tailed deer, Elk in their historic range, mountain goat, Pika, roosting concentrations of Big-brown bat and Myotis bats;**
- g. Amphibians – Red-legged frog;**
- h. Reptiles – Western fence lizard;**

- i. **Rare Plants – bristly sedge; Canadian St. John's-wort; clubmoss cassiope; Oregon goldenaster; toothed wood fern; Vancouver ground-cone; and white-top aster; and**
- j. **High-quality ecological communities - Douglas-fir - Pacific Madrone / Salal; Douglas-fir - Western Hemlock / Swordfern; Forested Sphagnum Bog PTN, Low Elevation Freshwater Wetland PTN, North Pacific Herbaceous Bald and Bluff, Red Alder Forest; Western Hemlock - (Western Redcedar) / Bog Labrador-tea / Sphagnum Spp.; Western Hemlock - (Western Redcedar) / Devil's-club / Swordfern; Western Hemlock - (Western Redcedar) / Sphagnum Spp.; Western Hemlock / Swordfern – Foamflower; Western Redcedar - Western Hemlock / Skunkcabbage; and Willow Spp. Shrubland [Provisional]).**

**E-436 King County shall protect Species of Local Importance through measures such as regulations, incentives, capital projects, or purchase, as appropriate.**

Caves, cliffs, and talus (a sloping mass of rocky fragments at the base of a cliff) occupy a very small percent of the total land area, yet they are disproportionately important as wildlife habitats. The same is true for sphagnum-dominated peat bogs, old-growth forest, and snag-rich areas, which have all declined as a result of development. Each of these habitats concentrates and supports a unique animal community. Plant associations adjacent to caves, cliff, and talus are important because they help stabilize light and wind patterns, and as with snag-rich areas, they provide perches for raptors. Caves, cliffs, talus, and sphagnum-dominated peat bogs are fragile environments that can be easily destroyed, but cannot be easily restored

**E-437 King County shall designate the following to be Habitats of Local Importance:**

- a. **Caves;**
- b. **Cliffs;**
- c. **Talus;**
- d. **Old-growth forest;**
- e. **Sphagnum-dominated peat bogs; and**
- f. **Snag-rich areas.**

The federal and state governments also designate “candidate” species. In the context of the ESA, candidate means any species being considered for listing as an endangered or a threatened species but not yet the subject of a proposed rule. Lists of federal candidate species are updated annually. Review of these lists and the supporting assessments can provide valuable information about threats to species found within King County and can help the county to be proactive in preparing for potential future listings.

- E-438** King County should review federal and state candidate listings for information about candidate species that are under consideration for listing as an endangered or threatened species and found in King County. King County shall protect habitat for candidate species, as listed by the Washington Department of Fish and Wildlife or a federal agency. Information regarding candidate species should be used to inform King County's long-term wildlife conservation and planning efforts.
- E-439** King County should review fish and wildlife surveys and assessments with local application to King County and consider additional habitat protections where warranted. Habitat protection should be accomplished through incentives, cooperative planning, education, habitat acquisition, habitat restoration, or other appropriate actions based on best available science.
- E-440** King County should regularly review the Washington Department of Fish and Wildlife's list of Priority Species and other scientific information on species of local importance, and evaluate whether any species should be added to or deleted from the lists in E-435 and E-437. Any additions or deletions should be made through the annual amendment process for the comprehensive plan.
- E-441** Development proposals shall be assessed for the presence of King County Species of Local Importance. A comprehensive assessment should follow a standard procedure or guidelines and shall occur one time during the development review process.

Salmon are particularly important because of their significance to local and regional character, tribes, salt and freshwater ecosystems, and recreational and commercial fisheries. A growing number of salmon stocks within King County and other areas of Puget Sound are in a serious state of decline. Three salmonid species present within King County have been listed under the ESA, several others have significant potential for listing, and the salmon-dependent Orca whale has been listed as endangered.

The protection and restoration of river and stream channels, riparian corridors, lakes, wetlands, headwaters and watersheds, and marine nearshore habitats that provide or impact spawning and rearing habitat, food resources and fish passage is essential to the conservation of native fish populations. Intermittent streams also can be critical to native fish populations.



Hatcheries and other artificial propagation facilities that are properly managed to protect the abundance, productivity, genetic diversity, and spatial distribution of native salmon may contribute in the near term to both maintaining sustainable salmon stocks and harvest opportunities while habitat protection and restoration measures for salmon are implemented.

**E-442                    King County should conserve and restore salmonid habitats by ensuring that land use and facility plans (transportation, water, sewer, electricity, gas) include riparian and stream habitat conservation measures developed by the county, cities, tribes, service providers, and state and federal agencies. Project review of development proposals within basins that contain hatcheries and other artificial propagation facilities that are managed to protect the abundance, productivity, genetic diversity, and spatial distribution of native salmon and provide harvest opportunities should consider significant adverse impacts to those facilities.**

**c.     Wildlife Habitat Network**

The King County Wildlife Habitat Network was designed to help reduce the effects of fragmentation by linking diverse habitats through the developed and developing landscape. The network is intended to facilitate animal dispersal by connecting isolated critical areas, segments, open space, and wooded areas on adjacent properties. The corridors tend to follow riparian and stream corridors across the lowlands and the upland plateau to the east and southeast of Lake Washington into the foothills. The Wildlife Habitat Network is mapped on the “Wildlife Network and Public Ownership Map.”

**5.     Conservation Incentives and Education**

King County offers landowner technical assistance for protection of fish and wildlife habitat through programs like Forest Stewardship, Noxious Weed Control, the GoNative website, and assistance for native plant restoration and landscaping. Other organizations, including King Conservation District, Natural Resource Conservation Service, WSU Extension, and Washington Department of Fish and Wildlife’s Backyard Wildlife Sanctuary Program offer support to landowners to enhance fish and wildlife habitat. Landowners can also receive property tax reductions through the King County Public Benefit Rating System in exchange for protecting and improving habitat.

**E-443                    The county should promote voluntary wildlife habitat enhancement projects by private individuals and businesses through educational, active stewardship, and incentive programs.**

**E-444**                    **King County should partner with community associations, realtors, community groups, and other agencies to conduct targeted outreach to potential and new property owners about fish and wildlife habitat education and forestry education and incentive programs, particularly in rural and resource lands areas of the county.**

## **B.     Stormwater Quality**

Rivers, streams, lakes, wetlands, and groundwater must be protected from the adverse impacts of urbanization and land use change to continue functioning in a beneficial manner. Because urbanization both increases runoff from storms and reduces streamflows in dry months by limiting infiltration, control of the quantity and quality of stormwater runoff is critical. Unmitigated stormwater runoff can cause erosion, sedimentation and flooding with resulting adverse impacts on water quality, fish and wildlife habitat, property and human safety. In addition, stormwater runoff can carry pollutants such as oil, heavy metals, fertilizers, herbicides, pesticides and animal wastes into waters. Sedimentation from soil disturbed by clearing, grading, farming and logging can reduce river or stream channel capacity, fill lakes and wetlands, and smother aquatic life and habitat.

King County stormwater management encompasses a wide range of programs that integrate proven, traditional approaches with new and innovative concepts, such as low impact development (LID) practices intended to minimize pollutants and mimic the natural flow of stormwater runoff. These programs and practices include such actions as changing land use and development practices; encouraging public behaviors through education and social marketing that maximize natural hydrologic processes; improving pollution source control by legislating product or material restrictions; changing business practices and educating the public about pollution generating activities; implementing programs that minimize land clearing and preserve or restore native vegetation; housing clustering and smart growth to reduce development impacts and the construction and maintenance of conveyance; and flow control (detention or infiltration) and water quality treatment facilities and their associated drainage systems. Together these programs and practices will reduce pollution and flow impacts in King County's surface and ground waters.

King County supports the implementation of new approaches such as low impact development (LID) best management practices (BMPs) techniques as part of a comprehensive stormwater management program. LID requires the public to maintain stormwater features on their properties, including but not limited to rain gardens, dispersion areas, permeable pavement driveways, and vegetated roofs. As with any new approach or technology, the effectiveness and limitations of LID practices must be determined. These

evolving technologies need to be studied further to determine operational effectiveness, long term maintenance needs, and appropriate placement.

Some stormwater practices require changes in how we live and work on the land. Successful implementation will include different product use, new land development approaches, and, in some areas, the setting aside of private land and its dedication to stormwater purposes. In addition, effective stormwater management will require a regional approach that includes landscape level analysis to identify areas of greatest need for additional management including retrofitting older developed areas and constructing facilities where no or minimal management exists now.

**E-445 Stormwater runoff shall be managed through a variety of methods, with the goal of protecting surface water quality, in-stream flows, and aquatic habitat; promoting groundwater recharge while protecting groundwater quality; reducing the risk of flooding; protecting public safety and properties; and enhancing the viability of agricultural lands.**

**E-446 King County should evaluate the need for product or material restrictions because of water quality impacts.**

## **C. Upland Areas**

### **1. Forest Cover**

King County recognizes the value of trees and forests in both rural and urban communities for benefits such as improving air and water quality and enhancing fish and wildlife habitat. Forests absorb and slowly release rainwater to streams and aquifers, filter runoff, and provide food, shade, and cover for wildlife. In doing so, they help to prevent flooding and erosion, protect drinking water, and support fish and wildlife and their habitat. Therefore, it is important that regulations protecting critical areas like wetlands take into consideration both regulations and incentive programs intended to protect forest cover in upland areas. Forests in rural King County are also relied upon for recreation and resource use, including harvest and firewood collection. Forest Stewardship Plans provide mechanisms for tailoring regulations and best management practices for forest management to individual properties. Completion of one of these plans can also qualify landowners for tax incentive programs and streamlined permitting. The retention or restoration of forest cover and native vegetation also reduces stormwater runoff and maximizes natural infiltration processes, thus reducing the need for additional stormwater management.

**E-447 King County recognizes that protecting and restoring headwater and upland forest cover is important for preventing flooding, improving water quality, and**

**protecting salmon and other wildlife habitat. The central role that forest cover plays in supporting hydrologic and other ecological processes should be reflected in policies and programs addressing stormwater management, flooding, wildlife, and open space.**

**E-448 King County’s critical areas and clearing and grading regulations should provide for activities compatible with long-term forest use, including use of recreational trails, firewood collection, forest fire prevention, forest management, and control of invasive plants.**

**E-449 The county shall promote retention of forest cover and significant trees using a mix of regulations, incentives, and technical assistance.**

## **2. Soils and Organics**

Soils play a critical role in the natural environment. The benefits of healthy soils include: (1) keeping disease-causing organisms in check, (2) moderating runoff, (3) filtering, binding, and biodegrading pollutants, (4) recycling and storing nutrients, and (5) serving as the basis for forest and agricultural fertility. More recently, the carbon storage properties of soils have been recognized as a major climate-moderating influence. The properties of a healthy soil are similar to those of a sponge, faucet and filter. They soak up and store water, naturally regulate the flow of water, and bind and degrade pollutants. The presence of millions of macro and microorganisms in soil creates a vibrant soil culture where organic material is consumed and air and water are retained. Nutrients are made available to plants to allow healthy root growth and oxygen generation.

It is common for healthy native soils to be removed during land development. Even when soils are not removed, development and other human activity often cause soil compaction, removal and erosion of healthy, native soils. Fewer organisms are present in disturbed soils. The resulting decrease in organic matter inhibits the soil’s ability to hold water, which increases surface water runoff. In addition, plants cannot thrive in disturbed soils because of the lack of nutrients. This, in turn, causes people to use more chemical fertilizers, pesticides, and water to induce plant growth. The combination of increased runoff and increased fertilizer and pesticide use results in greater water pollution downstream.

Increasing the organic content in disturbed soils can help restore their environmental function. Composted organic materials that might be used include yard debris, food and wood wastes, soiled paper, biosolids and/or livestock wastes, but not others, such as fly ash from industrial smokestacks. Benefits of incorporating composted organic materials in soils include: improving stream habitat,

supporting healthier plants, reducing runoff, and closing the recycling loop for organic materials. The transformation of degraded soils to enhance their ability to uptake and store carbon may be the one of the most effective actions that can be taken to mitigate the near-term effects of climate change.

It is preferable to leave native soil and vegetation in place as much as possible so that it can continue to function as a natural sponge and filter, minimizing erosion and surface water runoff. Where soil is disturbed or removed, soil function can be improved by providing soil with adequate depth and organic matter content.

**E-450                    Site development practices should minimize soil disturbance and maximize retention of native vegetation and soils. Where soil disturbance is unavoidable, native soils should be stockpiled on site and reused on site in accordance with best management practices to the maximum extent possible.**

**E-451                    King County shall require the use of organic matter to restore disturbed soils on site developments.**

Salmon play an important role in sustaining the productivity of soils in riparian and floodplain areas. Salmon mature in saltwater environments and then spawn and die in their original spawning streams. In doing so, salmon transport nutrients back to watersheds that eventually become available to vegetation.

**E-452                    The role of salmon in transferring nutrients and maintaining the productivity of riparian and floodplain soils should be incorporated in the development of salmon and soil conservation plans.**

Organics comprise a large portion of the waste generated by King County residences, businesses and farms. This organic waste stream requires significant solid waste, farm management, and wastewater treatment resources. Many of these “waste materials” (yard debris, food and wood waste, soiled paper, biosolids, and agricultural livestock wastes), can be recycled and reused to provide numerous uses that are beneficial to the environment and the economy.

King County has a long history of resource conservation and waste recycling. Programs have successfully captured organic materials for beneficial use such as yard debris and biosolids applications to farms, forests and composting. However, large volumes of organic waste continue to be disposed of in the landfill. Significant volumes of livestock waste generated in the suburbs and rural areas are inadequately managed, which can adversely impact water quality and fish habitat.

Although efforts are underway to increase the amount of organic materials that are recycled, the region still lacks the capacity to process all of these materials. Along with its efforts to promote beneficial use of these products, King County is working with organic material processors and others to try and increase the processing capacity in the region.

**E-453                    King County should implement programs to improve availability and markets for organic materials for soils that have been disturbed by new and existing developments.**

**E-454                    King County shall regard the region's organic waste materials as resources which should be reused as much as possible, and minimize the disposal of such materials.**

**E-455                    King County shall work with regional stakeholders to ensure a viable and safe organics recycling infrastructure that allows for yard, food, wood, biosolids, manure and other organic wastes to be turned into resources benefiting climate change, soil health, water quality, and maximizing landfill diversion.**

King County seeks to divert as much material as possible from disposal to reduce overall costs of solid waste management, conserve resources, protect the environment, and strengthen the county's economy (see Chapter 8, Services, Facilities and Utilities, Policy F-266). In many cases, organic materials can be recycled into a beneficial, highly valued resource helping to meet these diversion goals. Beneficial uses of organic materials include, but are not limited to, the following: soil amendment, mulch, erosion control, and even energy production.

King County recognizes that in most cases, the best management method for yard debris and livestock wastes is to compost it on the property where it is generated. Examples of residential onsite yard debris management techniques include grasscycling (leaving the grass on the lawn when it is cut) and backyard composting.

**E-456                    King County shall promote, encourage, and require, where appropriate, the beneficial use of organic materials, including but not limited to their use in the following activities: agriculture and silviculture; road, park and other public project development; site development and new construction; restoration and remediation of disturbed soils; nursery and sod production; and landscaping. For these purposes, organic materials do not include fly ash.**

**E-457                    King County agencies shall use recycled organic products, such as compost, whenever feasible and promote the application of organic material to compensate for historic losses of organic content in soil caused by development, agricultural practices, and resource extraction.**

**E-458                    King County will seek to enhance soil quality, and protect water quality and biodiversity across the landscape by developing policies, programs, and incentives that support the goal of no net loss of organic material.**

Biosolids are the nutrient rich organic product from the wastewater treatment process which can be recycled as a soil amendment. At King County's wastewater treatment plant, solids are removed from the wastewater and treated in large digesters where the organic solids are stabilized, reducing the volume by half. After digestion, a portion of water is removed, leaving the semisolid material ready for recycling.

The Biosolids Management Program's mission is to safely and sustainably return carbon and nutrients to the land through the use of biosolids. The Biosolids Management Program pursues environmental stewardship through diverse public-private partnerships. One hundred percent of county biosolids are beneficially used through the forestry and agriculture programs. A portion of the County's biosolids are composted as a Class A product.

**E-459                    King County supports and should explore ways to beneficially use biosolids locally, whenever feasible.**

On-farm composting as a method of managing livestock waste and other organic waste materials is becoming an important waste management strategy for farmers. Benefits of on-farm composting include:

- Additional revenue from the sale of compost;
- Reduced costs for water, fertilizers and pesticides, due to reduced water usage and reduced reliance on fertilizers and pesticides;
- Reduced impacts to surface waters; and
- Increased crop yields.

King County's Livestock Management Ordinance (LMO), adopted in December 1993, sets manure management standards in order to minimize impacts to water quality by preventing farm wastes from contaminating the region's watersheds. The LMO encourages farmers to implement farm plans in collaboration with the King Conservation District (KCD) to protect and enhance natural resources, including water quality. The KCD provides technical assistance and education to agricultural landowners on how to implement best management practices, which include manure storage facilities and pasture

renovation, as well as stream and wetland buffer fencing and clean water diversion. The resulting farm plans can include provisions for onsite and offsite management of livestock wastes and strategies to integrate processing livestock wastes with other organic waste materials. These strategies should be consistent with the King County Comprehensive Solid Waste Management Plan, including but not limited to on-farm composting and land application of processed yard debris. Farm plans that address livestock waste management further compliance with the provisions of the Clean Water Act and other federal and state mandates regarding water quality.

**E-460                      King County shall promote livestock waste management that keeps waste out of stormwater runoff and from infiltration to groundwater, and enhances soil health by methods such as combining livestock waste with other plant and animal waste material for incorporation into crop soils.**

## **D.     Aquatic Resources**

King County's aquatic resources include rivers, streams, lakes, wetlands, groundwater, and the marine waters of Puget Sound. These resources provide many beneficial functions, including fish and wildlife habitat; food supplies; flood risk reduction; water supply for agricultural, commercial, domestic and industrial use; energy production; transportation; recreational opportunities; and scenic beauty.

In order to preserve and enhance aquatic resources in King County, they must be managed as an integrated system together with terrestrial resources, and not as distinct and separate elements. The hydrologic cycle (the occurrence, distribution and circulation of water in the environment) is the common link among aquatic resources and describes their interdependence.

Use and modification of water resources and the surrounding terrestrial environment affects how the hydrologic cycle functions and can cause unintended detrimental impacts such as flooding, low stream and river flows, reduced groundwater availability, erosion, degradation of water quality, loss of fish and wildlife habitat, and loss of archeological and traditional cultural resources that depend upon but do not damage natural resources. In order to minimize adverse impacts on the water resources of King County and ensure the continued ability to receive the beneficial uses they provide, the county will need to promote responsible land and water resource planning and use. These beneficial uses include fish and wildlife habitat, flood risk reduction, water quality control, sediment transport, energy production, transportation; recreational opportunities, scenic beauty, and water supply for agricultural, municipal, and industrial purpose.

**E-461                      King County shall use incentives, regulations, capital projects, open space acquisitions, public education and stewardship, and other programs like**



reclaimed water to manage its aquatic resources (Puget Sound, rivers, streams, lakes, freshwater and marine wetlands and groundwater) and to protect and enhance their multiple beneficial uses. Use of water resources for one purpose should, to the fullest extent practicable, preserve opportunities for other uses.

**E-462** Development shall occur in a manner that supports continued ecological and hydrologic functioning of water resources and should not have a significant adverse impact on water quality or water quantity, or sediment transport, and should maintain base flows, natural water level fluctuations, unpolluted groundwater recharge in Critical Aquifer Recharge Areas and fish and wildlife habitat.

## **1. Watersheds**

A watershed is an area that drains to a common outlet or identifiable water body such as Puget Sound, a river, stream, lake or wetland. There are six major watersheds in King County (Cedar/Lake Washington, Green/Duwamish, Puget Sound, South Fork Skykomish, Snoqualmie and White) that, in turn, contain numerous smaller catchments and water bodies. Surface and ground waters are managed most effectively by understanding and considering potential problems and solutions for an entire watershed. Because watersheds frequently extend into several jurisdictions, effective planning and implementation must be coordinated.

**E-463** King County shall integrate watershed plans with marine and freshwater surface water, flood hazard management, stormwater, groundwater, drinking water, wastewater, and reclaimed water planning, as well as federal and state Clean Water Act compliance and monitoring and assessment programs to provide efficient water resource management.

**E-464** King County shall protect and should enhance surface waters, including streams, lakes, wetlands and the marine waters and nearshore areas of Puget Sound, on a watershed basis by analyzing water quantity and quality problems and their impacts to beneficial uses, including fish and wildlife habitat, flood risk reduction, and erosion control. Conditions of and impacts to the downstream receiving marine beaches and waters of Puget Sound shall be included in watershed management efforts.

Over the past several years King County has been working cooperatively with many of the water utilities, local governments, state agencies, tribes, and other interested parties in the region to gather data and information to support a regional water supply planning process. (For more information and specific policies related to regional water supply planning, please see Chapter 8, Services, Facilities and Utilities). This cooperative work includes assessments of current and future water demands and supplies, potential climate change impacts on water, opportunities for use of reclaimed water, and potential improvements to stream flows. These cooperative efforts will provide valuable information to inform not only water supply planning but also salmon recovery planning and projects.

**E-465                    King County should use the information from local and regional water supply planning processes to enhance the county’s water resource protection and planning efforts, including salmon recovery planning and projects.**

**E-466                    As watershed plans are developed and implemented, zoning, regulations and incentive programs may be developed, applied and monitored so that critical habitat in King County watersheds is capable of supporting sustainable and fishable salmonid populations. Watershed-based plans should define how the natural functions and values of watersheds critical to salmonids are protected so that the quantity and quality of water and sediment entering the streams, lakes, wetlands and rivers can support salmonid spawning, rearing, resting, and migration.**

**E-467                    Responsibility for the costs of watershed planning and project implementation, including water quality, groundwater protection, and fisheries habitat protection, should be shared between King County and other jurisdictions within a watershed.**

King County contains a number of wetlands, lakes and river and stream reaches that are important to the viability of fish and wildlife populations and are therefore considered biological, social and economic resources. Some resource areas, including Regionally Significant Resource Areas and Locally Significant Resource Areas, were previously identified through basin plans and other resource inventory efforts. Additional high-priority habitat areas have been identified through Water Resource Inventory Area-based salmon conservation plans, “Waterways 2000,” Cedar River Legacy Program, acquisition plans, and through basin conditions maps used to establish protective buffers along wetlands and streams under the Critical Areas Ordinance.

These areas contribute to the resource base of the entire Puget Sound region by virtue of exceptional species and habitat diversity and abundance when compared to basins of similar size and structure elsewhere in the region. These areas may also support rare, endangered or sensitive species, including ESA-listed salmonids. They also provide wetland, lake, and stream habitat that is important for wildlife and salmonid diversity and abundance within the basin.

**E-468                    King County’s Shoreline Master Program, watershed management plans, Water Resource Inventory Area plans, flood hazard management plans, master drainage plans, open space acquisition plans, and critical areas regulations should apply a tiered system of protection that affords a higher standard of protection for more significant resources.**

**E-469                    A tiered system for protection of aquatic resources should be developed based on an assessment of basin conditions using Regionally Significant Resource Area and Locally Significant Resource Area designations, Water Resource Inventory Area Plans, habitat assessments completed for acquisitions plans, the Water Quality Assessment, Total Maximum Daily Loads, ongoing monitoring programs, and best available science.**

## **2. Wetlands**

Wetlands are valuable natural resources in King County. They include deep ponds, shallow marshes and swamps, wet meadows, and bogs. Wetlands comprise forested and scrub-shrub communities, emergent vegetation, and other lands supporting a prevalence of plants adapted to saturated soils and varying flooding regimes. Wetlands, with their highly diverse forms and diffuse distribution, can be particularly challenging to categorize and manage.

The federal and state governments also have roles in identifying and regulating certain types of wetlands and development activity. In order to streamline and synchronize regulatory standards for wetlands, the county relies on guidance from the Washington State Department of Ecology, US Army Corps of Engineers Seattle District and Environmental Protection Agency for wetland identification, delineation, categorization, and, where appropriate, mitigation.

**E-470                    King County shall use current manuals and guidance from state and federal governmental agencies and departments to identify, delineate, and categorize wetlands and to establish mitigation requirements for wetlands.**

**E-471                    King County will apply the current scientifically accepted methodology for wetland mitigation based on technical criteria and field indicators. Where appropriate, King County should rely on publications and recommendations from state and federal agencies to ensure King County-approved mitigation will be accepted by state and federal agencies with jurisdiction.**

Some wetlands are large and their physical boundaries as well as their functions and values extend beyond individual jurisdictional boundaries.

**E-472                    King County shall communicate and coordinate with other jurisdictions and tribes to establish uniform countywide wetlands policies that provide protection of both regionally and locally highly-rated wetlands.**

Wetlands are productive biological systems, providing habitat for fish and wildlife. Wetlands also store flood waters and control runoff, thereby reducing flooding, downstream erosion and other damage. Further, wetlands protect water quality by trapping sediments and absorbing pollutants. They allow rain and snowmelt to infiltrate into aquifers, recharging them and potentially making that water available for human use. They discharge groundwater, making it available to plants and animals. Wetlands store peak flows and discharge to streams in dry periods, thus enabling fish and riparian animal populations to survive. They may serve as outdoor classrooms for scientific study. Some are used for hiking, hunting, and fishing. These wetland functions and values need consideration from a watershed perspective. Measures to protect wetland functions and values need to be taken at both the site-specific and watershed scale. In the urban growth area, land use authority is often shared by multiple jurisdictions at the scale of a drainage basin. Similarly, efforts to protect and restore wetlands may be sponsored by multiple parties, including local governments.

**E-473                    King County’s overall goal for the protection of wetlands is no net loss of wetland functions and values within each drainage basin. Acquisition, enhancement, regulations, and incentive programs shall be used independently or in combination with one another to protect and enhance wetlands functions and values. Watershed management plans, including Water Resource Inventory Area plans, should be used to coordinate and inform priorities for acquisition, enhancement, regulations, and incentive programs within unincorporated King County to achieve the goal of no net loss of wetland functions and values within each drainage basin.**

Buffers are necessary but often insufficient to adequately protect wetland values and functions especially when wetlands are small and the adjacent watershed large. Consequently, the location of development in addition to its size is important in determining its impact on wetland functions and values.

The functions and values of a wetland will change as the surrounding land is altered by development and other human activities, and as local conditions are influenced by climate change. Silviculture, agriculture, and development-related changes in forest cover and impervious surface affect stormwater runoff patterns, flooding, water quality, and wetland hydrology.

**E-474                      Development adjacent to wetlands shall be sited such that wetland functions and values are protected, an adequate buffer around the wetlands is provided, and significant adverse impacts to wetlands are prevented.**

The diversity of plants and animals found in wetlands generally far exceeds that found in terrestrial habitats in the Pacific Northwest. Habitat loss and fragmentation are considered the greatest threats to this native biodiversity. Wetlands in the Urban Growth Area will experience the largest reduction in the distribution and number of native animals and plants due to habitat loss and fragmentation. It is anticipated that climate change will exacerbate the adverse effects of habitat loss and fragmentation by further reducing existing wetland habitat and altering wetland hydroperiods thereby increasing the inter-habitat distances and potentially restricting the dispersal and movement of plants and wildlife between favorable wetlands and habitats.

Protecting wetland biodiversity depends upon supporting the natural processes (like hydrology, nutrient cycling, and natural disturbances) that shape wetland habitat, protecting wetlands functions and values from the impacts of adjacent land uses, maintaining biological linkages, and preventing fragmentation of wetland habitats. Small wetlands strategically located between other wetlands may provide important biological links or “stepping stones” between other, higher quality wetlands. Wetlands adjacent to habitat networks also are especially critical to wildlife because they allow individual animals to escape danger and populations to inter-disperse and breed. Wetlands adjacent to habitat networks should receive special consideration in planning land use.

**E-475                      Areas of native vegetation that connect wetland complexes should be protected. Whenever effective, incentive programs such as buffer averaging, density credit transfers, or appropriate non-regulatory mechanisms shall be used for this purpose.**

Many wildlife species require access to both wetlands and adjacent terrestrial lands to support them at different stages of their lives. For example, many amphibians breed in the water and need access to terrestrial habitat for feeding and for shelter during the winter. Fixed-width buffers alone are unlikely to adequately address these needs or entirely protect wetlands from surrounding human activity. Adjacent and accessible terrestrial habitat may be too small or fragmented to provide core feeding, overwintering, and other habitat needs.

- E-476**                    **King County should identify upland areas of native vegetation that connect wetlands to upland habitats and that connect upland habitats to each other. The county should seek protection of these areas through acquisition, stewardship plans, and incentive programs such as the Public Benefit Rating System and the Transfer of Development Rights Program.**
- E-477**                    **The unique hydrologic cycles, soil and water chemistries, and vegetation communities of bogs and fens shall be protected through the use of incentives, acquisition, best management practices, and implementation of the King County Surface Water Design Manual to control and/or treat stormwater within the wetland watershed.**
- E-478**                    **Public access to wetlands for scientific, recreational, and traditional cultural use is desirable, providing that public access trails are carefully sited, sensitive habitats and species are protected, and hydrologic continuity is maintained.**
- E-479**                    **Regulatory approaches for protecting wetland functions and values, including the application of wetland buffers and the siting of off-site compensatory mitigation, should consider intensity of surrounding land uses and basin conditions. King County should continue to review and evaluate wetland research and implement changes in its wetland protection programs based on such information.**
- E-480**                    **Enhancement or restoration of degraded wetlands may be allowed to maintain or improve wetland functions and values, provided that all wetland functions are evaluated in a wetland management plan, and adequate monitoring, code enforcement and evaluation is provided and assured by responsible parties. Restoration or enhancement must result in a net improvement to the functions and values of the wetland system. Within available resources, King County**

should provide technical assistance to small property owners as an incentive to encourage the restoration or enhancement of degraded wetlands.

- E-481** Alterations to wetlands may be allowed to:
- a. Accomplish a public agency or utility development;**
  - b. Provide necessary crossings for utilities, stormwater tightlines and roads; or**
  - c. Allow constitutionally mandated “reasonable use” of the property, provided all wetland functions are evaluated, the least harmful and reasonable alternatives are pursued, affected significant functions are appropriately mitigated, and mitigation sites are adequately monitored.**

When adverse impacts cannot be avoided, compensatory mitigation may be allowed. This means wetland enhancement, restoration, or creation to replace project-induced losses of wetland functions and values. The county recognizes that, especially in the Urban Growth Area, allowing alteration of low-function wetlands in exchange for compensatory mitigation that contributes to wetlands of higher functions and values within a connected wetland system may achieve greater resource protection than simply preserving the low functioning wetland.

- E-482** A small Category IV wetland that is less than 2,500 square feet and that is not part of a wetland complex may be altered to move functions to another wetland as part of an approved mitigation plan that is consistent with E-483 and E-484.

- E-483** Wetland impacts should be avoided if possible, and minimized in all cases. Where impacts cannot be avoided, they should be mitigated on site if possible and if ecologically appropriate. Where on-site mitigation is not possible or appropriate, King County may approve off-site mitigation.

- E-484** Mitigation projects should contribute to an existing wetland system or restore an area that was historically a wetland. Mitigation should only create new wetlands after site monitoring indicates that hydrologic conditions exist to support a new wetland. Mitigation sites should be strategically located to reduce habitat fragmentation or to restore and enhance area-specific functions within a watershed.

- E-485** Land used for wetland mitigation should be preserved in perpetuity. Monitoring and maintenance in conformance with King County standards should be

**provided or paid for by the project proponent until the success of the site is established. Long-term stewardship should occur at mitigation sites to ensure sites continue to provide desired functions and values.**

Mitigation banks and in-lieu fee programs are forms of watershed-based compensatory mitigation, with the goal of providing greater resource protection and benefit to the public. Both approaches can allow for the consolidation of multiple, small mitigation projects into a large-scale wetland or wetland complex, resulting in economies of scale in planning, implementation and maintenance. Depending on their location and functions, mitigation banks and projects constructed using in-lieu fee programs can result in wetlands of greater hydrologic, chemical, and biological value because of their size and ecological context and the commitment to long-term management. These mitigation approaches also provide applicants with a range of options for meeting their off-site mitigation obligations.

Mitigation banking allows compensatory mitigation to occur prior to the loss of existing wetlands and their functions and values, thereby reducing “temporal” losses. Mitigation banking allows a project proponent to mitigate for their impacts by contributing fees to a bank sponsor for the creation or restoration of the bank site. In-lieu fee programs, such as King County’s Mitigation Reserves Program (MRP), allow an applicant to meet its off-site wetland mitigation requirements through payment of a fee to King County or another authorized agent with the capacity to design and construct, maintain, and monitor a successful mitigation project. Both types of programs enable fees to be pooled so that larger projects can be constructed to offset many small, incremental, and cumulative impacts throughout a watershed. Moreover, King County’s MRP enables such projects to be constructed on lands with degraded wetlands or aquatic areas or lands with the potential to reestablish wetlands or aquatic areas that could be restored or enhanced to benefit overall watershed functions. These Mitigation Reserve lands are managed for long term ecological protection, so that the landscape and stream basin context support a successful enhancement project. Such projects should be planned in a watershed context and may achieve multiple ecological objectives, including meeting salmon conservation and other habitat protection objectives as well as wetland enhancement needs.

**E-486            The county in partnership with other governmental entities and interested parties should encourage the development and use of wetland mitigation banks through which functioning wetlands are enhanced, restored, or created prior to the impacting of existing wetlands. The county shall encourage establishment of such banks by established government entities as well as by private, entrepreneurial enterprises.**



In 2008 the US Army Corps of Engineers and the US Environmental Protection Agency jointly issued new federal rules (40 CFR Part 230 and 33 CFR Part 332) regarding compensatory mitigation for losses to functions and values of aquatic resources associated with unavoidable permitted impacts. These rules require implementation of mitigation in a watershed context and consideration of functional losses to resources from permitted impacts and functional gains at mitigation sites.

King County revised its compensatory mitigation program in 2011 to comply with these new federal rules and is well positioned to become a regional service provider for compensatory in-lieu fee mitigation – both to permittees in unincorporated King County and within cities when appropriate agreements are in place. The revised program offers private and public project proponents the opportunity to pay a fee to King County in lieu of completing their own mitigation. These fees in turn will be used to implement mitigation projects that address watershed needs as determined through analysis of best available science.

In approving mitigation proposals, King County should consider the ecological context of the impacted wetland, as well as the wetland impact acreage, functions, and values. Mitigation sites should be located in areas in which the project will enhance ecological conditions of the watershed and should first replace or augment the functions and values that are most important to the optimum functioning of the wetland being created, restored, or enhanced. These functions and values may differ from those lost as a result of the impacting development project. Wetland mitigation proposals should result in no net loss, and if possible, in an increase in overall wetland functions and values within the watershed in which the impacted site is located.

**E-487                    The county should continue to implement and encourage use of its Mitigation Reserves Program to provide a fee-based option for permit applicants to mitigate for unavoidable impacts of permitted development on wetland and aquatic area functions and values. The fee structure shall be based on the full costs of land acquisition, construction and long-term maintenance and monitoring. Mitigation projects implemented through the Mitigation Reserves Program should occur within a watershed context.**

**E-488                    King County should be a regional service provider of compensatory mitigation through the Mitigation Reserves Program by working with local cities, other counties, and state agencies to establish partnerships for implementation of inter-jurisdictional in-lieu fee mitigation.**

A large portion of western Washington farming occurs in lands that were once wetlands. Region-wide, agricultural lands have been targeted as mitigation sites because the relative cost of land is low and the

likelihood of success in returning wetland functions is high. King County's Agricultural Production Districts (APDs) that are located in floodplains and the poorly drained Osceola soils of the Enumclaw Plateau are no exception. Unless carefully sited and engineered, wetland mitigation projects can inadvertently raise water tables on adjacent agricultural properties. King County has joined other counties in discouraging the use of productive farmland for wetland mitigation, while working with farmers on wetland enhancement and restoration at a scale appropriate to sustaining their farms.

Through the King County Mitigation Reserves Program (MRP), restoration sites are selected and pre-purchased in advance of development related impacts. Selected sites, with wetland or aquatic area enhancement, restoration or creation potential, will be purchased and actively managed as mitigation sites and will be protected in perpetuity as open space. Mitigation projects implemented through the MRP will enhance, restore, and/or create ecological functions at the site to compensate for wetland, stream, river, and/or buffer functions and values lost during unavoidable impacts associated with permitted construction of projects at other locations. Sites and projects through the MRP will occur where the projects will have sustainable long-term benefits to aquatic resources in the watershed, ensuring projects at protected sites occur in places with importance to ecological integrity of the watershed. King County's MRP has received approval from the US Army Corps of Engineers, the Environmental Protection Agency and the Washington Department of Ecology to serve as an in-lieu fee program to mitigate for the impacts to wetlands and other aquatic resources subject to state and federal regulations.

**E-489                      Wetland mitigation projects should avoid impacts to and prevent loss of farmable land within Agricultural Production Districts (APDs). Creation of wetland mitigation banks are not allowed in the APDs when the purpose is to compensate for wetland impacts from development outside the APDs.**

### **3.     Lakes**

There are approximately 700 lakes in King County ranging in size from less than one acre to Lake Washington's roughly 21,500 acres. These lakes provide habitat that is essential for various life stages of many species of fish and wildlife, including salmonids, as well as recreational opportunities and scenic beauty. Development and runoff into lakes can alter their functioning and lead to eutrophication (increases in nutrients), loss of shoreline habitat, and threats to human health. Although sewage treatment has greatly reduced pollution in urban lakes like Lake Washington, runoff polluted by oil, metals, sediments, pet waste, lawn fertilizers, and pesticides can threaten human health, aquatic life, and habitat. Construction of bulkheads and docks also has the potential to impact habitat by altering shoreline vegetation and natural erosion patterns.

King County conducts water quality monitoring assessment on lakes throughout King County, in some cases supported by interlocal agreements with cities. Some of the earliest evidence of climate change includes temperature changes in our regional lakes. Changes in annual temperature cycles in King County's regional lakes, particularly Lake Sammamish, Lake Union, and Lake Washington, provide some of the most accurate measures of climate change available locally.

During the summer months, the county conducts regular monitoring at public swimming beaches. When monitoring indicates a public health hazard, the information is provided to Public Health -- Seattle & King County, which can issue a temporary closure order.

**E-490                    Lakes should be protected through management of lake watersheds and shorelines. Lakes sensitive to nutrients shall be protected through the management of nutrients that stimulate potentially harmful algae blooms and aquatic plant growth. Where sufficient information is available, measurable standards for lake quality should be set and management plans established to meet the standards. Formation of lake management districts or other financing mechanisms should be considered to provide the financial resources necessary to support actions for protection of sensitive lakes.**

**E-491                    The county, in partnership with other governments and community groups, should monitor and assess lake water and sediment quality, physical habitat, and biotic resources. Assessment should identify trends and describe impacts on human health, aquatic life, and wildlife habitat.**

**E-492                    Swimming beaches on lakes should be monitored for bacterial contamination and algal toxins. When data shows public health to be at risk, Public Health -- Seattle & King County should take appropriate action to address public health risks.**

#### **4.            Groundwater Resources**

Protecting groundwater is an important regional issue because groundwater provides approximately 30 percent of the water used in King County and is the primary source of water in rural areas. On Vashon Island and in other sole-source aquifer areas, it is the only source of drinking water.

The natural hydrologic system can be altered by development practices and overuse of the aquifer. The result may be depletion of aquifers. Groundwater is also subject to contamination from human activity.

Once a source of groundwater is contaminated it may be lost forever. The cost of protection is considerably less than the cost of remediation and replacement. Having accurate, up-to-date information on groundwater quality and quantity is essential for managing this resource. Mapping risk could be achieved for a variety of pollutants or pollutant classes by integrating groundwater protection level, distance to groundwater, soil type, pollutant mobility, and land use information into a new map layer for each pollutant. Finally, public education (particularly for individual well owners) and coordinated groundwater management efforts will help to protect this resource over the long-run.

**E-493                    King County shall identify and map areas in unincorporated King County that are considered Critical Aquifer Recharge Areas and sole-source aquifers. The county shall periodically update this map with new information from adopted groundwater and wellhead protection studies and other relevant sources. King County should develop and maintain map layers of groundwater risk level when funding is available.**

**E-494                    King County should protect the quality and quantity of groundwater countywide by:**

- a.        Implementing adopted Groundwater Management Plans;**
- b.        Reviewing and implementing approved Wellhead Protection Programs in conjunction with cities, state agencies and groundwater purveyors;**
- c.        Developing, with affected jurisdictions, best management practices for development and for forestry, agriculture, and mining operations based on adopted Groundwater Management Plans and Wellhead Protection Programs. The goals of these practices should be to promote aquifer recharge quality and to strive for no net reduction of recharge to groundwater quantity;**
- d.        Refining regulations to protect Critical Aquifer Recharge Areas and well-head protection areas;**
- e.        Educating the public about Best Management Practices to protect groundwater;**
- f.        Encouraging forest retention and active forest stewardship;**
- g.        Incorporating into its land use and water service decisions consideration of potential impacts on groundwater quality and quantity, and the need for long-term aquifer protection;**
- h.        Coordinating groundwater management efforts with cities, water districts, groundwater committees, and state and federal agencies;**

- i. **Requiring the proper decommissioning of any well abandoned in the process of connecting an existing water system to a Group A water system; and**
- j. **When funding is available, monitoring groundwater status and trends, especially for the groundwater protection planning areas established by King County, and evaluating the groundwater monitoring results, along with groundwater monitoring performed by public water systems, plus their annual quantities of groundwater pumped over the five year period. Findings as an indicator of environmental quality should be reported for each groundwater management area.**

**E-495 King County should protect groundwater recharge quantity by promoting low impact development and other methods that infiltrate runoff where site conditions permit and where pollution source controls and stormwater treatment can prevent potential groundwater contamination.**

**E-496 In making future zoning and land use decisions that are subject to environmental review, King County shall evaluate and monitor groundwater policies, their implementation costs, and the impacts upon the quantity and quality of groundwater. The depletion or degradation of aquifers needed for potable water supplies should be avoided or mitigated, and the need to plan and develop feasible and equivalent replacement sources to compensate for the potential loss of water supplies should be considered.**

**E-497 King County should protect groundwater in the Rural Area by:**

- a. **Preferring land uses that retain a high ratio of permeable to impermeable surface area, and that maintain and/or augment the natural soil's infiltration capacity and treatment capability for groundwater; and**
- b. **Requiring standards for maximum vegetation clearing limits, impervious surface limits, and, where appropriate, infiltration of surface water.**

Climate change has the potential to impact future groundwater availability. Warmer temperatures in the Pacific Northwest are projected to lead to greater demand for water in the summer and fall, while reduced snow pack and associated stream flows could reduce seasonal groundwater recharge. Further analysis of the potential impacts of climate change on groundwater supplies is needed to understand and mitigate for potential impacts.

**E-498**                    **The county should, in partnership with water utilities, evaluate the likely effects of climate change on aquifer recharge and groundwater supplies and develop a strategy to mitigate potential impacts in coordination with other climate change initiatives.**

## **5. Rivers and Streams**

There are approximately 3,100 miles of rivers and streams in King County. The river and stream channels, the surrounding riparian (streamside) areas and upland areas all contribute to the functioning and integrity of rivers and streams. Many rivers and streams provide habitat that is essential for various life stages of many species of wildlife and fish, including salmonids.

Rivers and streams are dynamic systems. Winter floods can dramatically alter river and stream courses, creating new channels, eroding banks, and depositing sediment and gravel. Flooding and erosion can also dislodge trees creating log jams. These changes help to support dynamic and complex habitat for fish and wildlife. At the same time, they can create public safety issues for people living along and recreating in rivers. In addition, public access to rivers and streams is a requirement of the Shoreline Management Act and a goal for King County to support the regional economy and provide recreational opportunities for the community. People enjoy rivers and streams for the scenic and recreation values, including boating, swimming, and fishing. Management of these systems needs to consider not only habitat protection, but also public health and safety and opportunities for education and stewardship.

**E-499**                    **Rivers and streams are inherently dangerous. King County should coordinate across county departments and with other agencies and organizations to promote public awareness of the dynamics and dangers of river and stream systems and the need for personal responsibility when living near or recreating in or on rivers and streams.**

**E-499a**                    **When King County places large wood in rivers and streams for habitat restoration or enhancement, it should do so in a manner that minimizes danger to the public.**

In urban areas, rivers and streams in some cases also serve as stormwater drainage systems. During the winter months, runoff during storms can bring pollutants to these water bodies. During the summer months, lawn irrigation and other water uses can also carry pollutants to rivers and streams.

- E-499b** River and stream channels, stream outlets, headwater areas, riparian corridors, and areas where dynamic ecological processes are present should be preserved, protected and enhanced for their hydraulic, hydrologic, ecologic and aesthetic functions, including their functions in providing large wood to salmonid-bearing streams. Management of river and stream channels should consider other beneficial uses of these water bodies, including recreation.
- E-499c** The designation of buffers for aquatic areas, including rivers and streams, should take into account watershed-scale actions to mitigate the impacts of upland development on flooding, erosion, and habitat.
- E-499d** The county should continue to monitor and assess river and stream flows, water and sediment quality, physical habitats, and biotic resources in rivers and streams. Assessment should identify trends and describe impacts on human health and safety, aquatic life, and wildlife habitat.
- E-499e** To maintain and restore stream health, sources of uncontrolled stormwater flows contributing to peak flows in small streams should be managed using on-site structural or non-structural flow control techniques.

Specific policies addressing management of large wood are found in the King County Flood Hazard Management Plan.

Most streams in King County originate in either mountainous terrain or on rolling glacial uplands. These streams often descend through steep, narrow ravines before reaching the floodplain. At the point where these streams leave their ravines and flow onto the floodplain, the channel gradient (slope) and confinement decrease quickly, dramatically reducing the streams' ability to carry sediment. These are areas of natural sediment deposition and channel migration. The combination of sediment deposition and repeated channel migration creates fan-shaped depositional features known as alluvial "fans."

During periods of heavy rainfall, streams often carry large sediment loads from upstream that deposit on downstream alluvial fans. Landslides, beaver dam failures and other natural disturbances can create episodes of particularly high rates of sediment production and delivery. In many stream systems, instances of heavy sediment deposition may occur episodically with years or decades of apparent stability in the intervening periods. In many instances, sediment production and tributary or stream flow rates are exacerbated by upland land use conditions and associated stormwater effects.

Alluvial fans share many of the ecological attributes and land use risks associated with channel migration hazard areas and landslide hazards, though they are unique in many respects. In a natural environment, alluvial fans often provide some of the best available spawning habitat in a tributary stream, while also providing a source of gravel for areas downstream. In some heavily altered streams, the alluvial fan may represent the only remaining areas that are suitable for spawning. Alluvial fans can also form the highest ground available in the floodplain, and have historically been used for construction of buildings (including farm buildings), roads and other structures. Unfortunately, they are inherently unstable environments in which to build. During high flows coupled with sediment deposition, a stream may jump its bank in the area of the alluvial fan, in some cases damaging private property, disrupting agricultural activities, destroying culverts and road crossings, stranding fish, and creating risks to public safety. Protecting buildings, roads, and crops on and along alluvial fans often requires extensive, ongoing maintenance activities. Maintenance activities can have adverse effects on habitat.

The Rural and Natural Resource Lands chapter calls for alluvial fan pilot projects to test best management practices and innovative solutions for reducing hazards to agricultural landowners and protecting and restoring habitat.

**E-499f                      King County should improve the management of alluvial fans by developing and clarifying definitions of alluvial fans, mapping the locations of existing alluvial fans, and developing appropriate management strategies. Strategies should protect intact habitat and restore degraded habitat, reduce threats to public safety, and accommodate existing land use. Findings from Alluvial Fan Management Pilot Projects should inform management strategies for alluvial fans.**

## **6.        Puget Sound**

There are approximately 110 miles of marine shoreline in King County, including 51 miles in unincorporated areas. Shorelines provide important functions for maintaining a healthy ecosystem and also provide essential habitat for a variety of important and listed species, including mammals, birds, fish, and invertebrates. In addition to recreational opportunities, the marine nearshore environment provides essential habitat for a variety of species including juvenile salmonids, forage fish, and several commercially important shellfish species. Kelp and eelgrass populations are particularly important for providing food and habitat, especially for juvenile life stages for a variety of key fish and invertebrate species. Marine resources and shoreline development are susceptible to impacts from water pollution, changes in upland vegetation, alteration of natural bluff and beach erosion patterns, and alteration of nearshore substrates and aquatic vegetation.



The majority of marine waters within King County are subtidal waters, which provide important ecosystem functions and essential habitat for a variety of important species, including marine mammals, birds, fish and invertebrates. Subtidal waters support geoduck, shrimp, and bottomfish commercial fisheries as well as provide migratory pathways for marine mammals and salmonids. Resident killer whales are often observed in King County subtidal waters feeding on salmonids. Adult life stages of many species, such as rockfish and Dungeness crab, use subtidal waters extensively. In addition, subtidal waters provide an important connection to Pacific Ocean waters as well as waters within other parts of Puget Sound. Subtidal habitat is susceptible to impacts from water pollution, over-utilizing of biological resources, and climate change.

King County conducts water quality monitoring in marine offshore and nearshore areas throughout King County as part of the Marine Monitoring Program. Nutrients and dissolved oxygen are measured along with other physical and chemical parameters. Biological parameters, such as chlorophyll and phytoplankton community structure are also assessed. Offshore sediment quality is assessed in various areas and nearshore sediments are assessed throughout King County.

King County's freshwater and saltwater environments are integrally linked. Water, sediments, and nutrients move from upland areas to Puget Sound. Many species, including salmon, spend critical periods of their lives in both fresh and salt water. Salmon migrating from saltwater to their spawning areas bring nutrients back to the upland areas. Given the functional linkages between freshwater and saltwater environments, it is critical that planning and management be integrated.

**E-499g                    King County should collaborate with the federal and state agencies, cities, tribes, counties, and universities to monitor and assess marine waters and nearshore areas of Puget Sound. Monitoring and assessment should address water and sediment quality, bioaccumulation of chemicals, physical habitat, and biotic resources. Assessment should identify trends and describe impacts on human health and safety, aquatic life, and wildlife habitat.**

**E-499h                    King County should protect and enhance the natural environment in those areas recommended or adopted as Aquatic Reserves by Washington State Department of Natural Resources. This should include participation in management planning for the aquatic reserves and working with willing landowners adjacent to the reserve on restoration and acquisition projects that enhance the natural environment.**

Human waste contains high levels of nutrients and pathogens. These pollutants can enter Puget Sound marine waters from a variety of pathways including combined sewer overflow outfalls, septic systems, stormwater runoff, and rivers and streams. Nutrients are also present in treated wastewater effluent. A number of properties on Vashon-Maury Islands have on-site sewage systems that pre-date regulatory oversight and are undocumented. Washington State Department of Health surveys have indicated that failing systems are a significant problem in some areas of the Vashon-Maury Island shoreline. Public Health – Seattle & King County (PHSKC) is responsible for assuring that onsite sewage systems in King County meet state and local regulations. In addition, PHSKC is required to identify areas where marine water quality is threatened or impaired as a result of contamination from onsite sewage systems, to designate these areas as Marine Recovery Areas (MRAs), to develop a plan to identify failed septic systems within the MRAs, and to assure that these systems are repaired and maintained. The ability to install new systems is often severely constrained in the shoreline, due to small lot size, topography, and soils. In some cases, community treatment systems are needed to effectively treat waste. A four-year study to evaluate the role of nitrogen plays in causing low-level dissolved oxygen events in Quartermaster Harbor began in 2009. Sources of nitrogen will be identified and quantified for the study and nitrogen impacts on dissolved oxygen will be modeled.

**E-499i                      King County should work with landowners, the state Department of Health, sewer districts, and the Puget Sound Partnership to develop more effective strategies and additional resources for addressing failing septic systems in constrained shoreline environments.**

## **E.      Watershed-Based Salmon Recovery**

The protection and recovery of salmonid species that are listed under the ESA is and will continue to be a significant issue for King County. The listing of a species under the act is cause for great concern, because wild Pacific salmon have great environmental, cultural, economic, recreational and symbolic importance to the Puget Sound region

It is King County's goal to ensure the recovery and maintenance of our salmon populations to sustainable and harvestable levels, and to accrue the ecological, cultural and economic benefits that will be provided by healthy salmon stocks. King County will pursue salmon conservation strategies that sustain the region's vibrant economy. Successful restoration and maintenance of healthy salmon populations will require time, money and effort, and collaboration with federal, state, tribal and local governments, as well as businesses, environmental groups, and citizens.

The increasing number and diversity of ESA federally protected species in King County and around the Puget Sound calls for the development and implementation of species conservation actions that are embedded within a strategy that addresses natural resource management issues at the ecosystem scale. Although species are listed one at a time, managing them toward recovery and robust health that way increases the likelihood that conservation efforts will be incomplete, redundant, and more expensive.

As a means to address salmonid listings and to sustain this precious resource for generations to come, local governments in the Puget Sound region, in cooperation with state and tribal governments and other major stakeholders, have developed long-term salmon habitat conservation strategies at the Watershed Resource Inventory Area (WRIA) level. The boundaries of WRIsAs are defined under state regulations, and generally adhere to the watershed boundaries of major river or lake systems. King County participated as an affected jurisdiction in the development WRIA plans for WRIA 8 (Cedar/Sammamish Watershed), WRIA 9 (the Green/Duwamish Watershed), WRIA 7 (the Snohomish/Snoqualmie Watershed), about half of which is in King County, and WRIA 10 (the White/Puyallup Watershed), a small percentage of which is in King County. Additionally, King County has acted as a service provider at the direction of multi-jurisdictional forums for the development and implementation of the salmon recovery plans for WRIsAs 8 and 9, and for the King County portion of WRIA 7.

- E-499j**                    **King County shall continue to participate in the Water Resource Inventory Area-based salmonid recovery plan implementation efforts and in other regional efforts to recover salmon and the ecosystems they depend on, such as the Puget Sound Partnership. King County's participation in planning and implementation efforts shall be guided by the following principles:**
- a.        Focus on federally listed salmonid species first, take an ecosystem approach to habitat management and seek to address management needs for other species over time;**
  - b.        Concurrently work on early actions, long-term projects and programs that will lead to improvements to, and information on, habitat conditions in King County that can enable the recovery of endangered or threatened salmonids, while maintaining the economic vitality and strength of the region;**
  - c.        Address both King County's growth management needs and habitat conservation needs;**
  - d.        Use best available science as defined in WAC 365-195-905 through 365-195-925;**
  - e.        Improve water quality, water quantity and channel characteristics;**
  - f.        Coordinate with key decision-makers and stakeholders; and**

- g. Develop, implement and evaluate actions within a watershed-based program of data collection and analysis that documents the level of effectiveness of specific actions and provides information for adaptation of salmon conservation and recovery strategies.**

The WRIA plans recommend an array of actions including the restoration, acquisition and preservation of landscapes, municipal programmatic activities, and public outreach and education. The plans suggest that programmatic activities for salmon habitat conservation can generally be accomplished with the following three tools: regulation, incentives and education. Consequently, in addition to capital projects, local governments including King County will need to incorporate salmon recovery objectives and strategies into their normal operations, making best use of a wide range of their authorities and programs.

**E-499k King County should use the recommendations of approved Water Resource Inventory Area salmon habitat plans to inform the updates to development regulations as well as operations and capital planning for its surface water management, transportation, wastewater treatment, parks, and open space programs.**

**E-499I King County should seek to support Water Resource Inventory Area plan goals of maintaining intact natural landscapes through:**

- a. Retaining low density land use designations such as Agriculture, Forestry and Rural;**
- b. Promoting Current Use Taxation and other incentives;**
- c. Promoting stewardship programs including development and implementation of Forest Plans, Farm Plans, and Rural Stewardship Plans;**
- d. Promoting the use of Low Impact Development methods; and**
- e. Acquiring property or conservation easements in areas of high ecological importance with unique or otherwise significant habitat values.**

Many of the county's functional plans, programs and development regulations assist in the county's effort to conserve and recover ESA listed species. These include the code provisions governing zoning, critical areas, clearing and grading, landscaping, and the shoreline master program. County plans include the Surface Water Design Manual, the flood hazard management plan, and regional wastewater services plan. Finally the county's reliance on best management practices for vegetation management, use of

insecticides, herbicides and fungicides, and pest management, as well as for management of agricultural and forest lands also play a crucial role in protecting ESA listed species.

- E-499m**            **King County will monitor and evaluate programs and regulations to determine their effectiveness in contributing to ESA listed species conservation and recovery, and will update and enhance programs and plans as necessary. King County should amend regulations, plans and best management practices to enhance their effectiveness in protecting and restoring salmonid habitat, using a variety of resources, including best available science as defined in WAC 365-195-905 through 365-195-925.**
- E-499n**            **Through the Watershed Resource Inventory Area planning process, geographic areas vital to the conservation and recovery of listed salmonid species have been identified. King County will evaluate this information to determine appropriate short and long-term strategies, including, but not limited to: designation of Fish and Wildlife Habitat Conservation Areas, development regulations (special district overlays, zoning, etc.), acquisitions, facility maintenance programs, and capital improvement projects.**
- E-499o**            **King County may use its authority under the Growth Management Act, including its authority to designate and protect critical areas, such as fish and wildlife habitat conservation areas, to preserve and protect key habitat for listed salmonid species by developing and implementing development regulations and nonregulatory programs.**
- E-499p**            **King County shall, in cooperation with the cities, ensure a no net loss of housing capacity that preserves the ability to accommodate the 2022 growth targets, while pursuing compliance with Endangered Species Act requirements. To achieve this goal, densities shall be increased on buildable lands, consistent with U-319.**

Local governments primarily have authority and influence over land use actions affecting habitat. However, protecting and restoring habitat is just one piece of the salmon recovery puzzle. Management of fish harvest, hatchery, hydropower, and water storage actions is also critical, and actions need to be coordinated with entities having authority in these areas.

**E-499q** King County should continue to take actions that ensure its habitat restoration and protection actions are implemented as part of a watershed-based salmon conservation strategy that integrates habitat actions with actions taken by harvest and hatchery managers. Harvest and hatchery managers specifically include tribes, the Washington Department of Fish and Wildlife, the National Marine Fisheries Service, and the US Fish and Wildlife Service. Appropriate venues for this coordination include watershed plan implementation groups and other local or regional salmon management entities that rely on actions by habitat, harvest and hatchery managers to achieve specific goals and objectives.

Lastly, to ensure the long-term success of salmon recovery actions, King County will need to develop and implement a program that provides for the monitoring for effectiveness of recovery actions and provides valuable information to redirect and adapt salmonid recovery strategies and actions. Please see the Monitoring and Adaptive Management Section at the end of this chapter for policies related to this topic.

## **F. Flood Hazard Management**

Floodplains are lands adjacent to lakes, rivers and streams that are subject to periodic flooding. Floodplains naturally store flood water, contribute to groundwater recharge, protect water quality and are valuable for recreation, agriculture and fish and wildlife habitat. Floodplains also provide a deposition zone for sediments mobilized by rivers and streams. Wetlands are often an integral part of floodplains. Floodplains are designated based on the predicted frequency of flooding for a particular area. For example, a 100-year floodplain is a land area that has a one percent probability of experiencing flooding in any given year.

Development can reduce the floodplain's ability to store and convey floodwaters, thereby increasing the velocity and depth of floodwaters in other areas. In addition, floodplain development often occurs at the expense of important fish and wildlife habitat. King County has adopted the Flood Hazard Management Plan to provide guidance for decisions related to land use and floodplain management activities.

**E-499r** King County's floodplain land use and floodplain management activities shall be carried out in accordance with the King County Flood Hazard Management Plan.

The primary focus of King County's Flood Hazard Management efforts is protecting public health and safety. However, in many cases, flood hazard management projects can be designed in a manner that enhances or restores flood storage, conveyance, and ecological values of the floodplain and associated

wetlands and riparian corridors. Requirements for state and federal permits necessary for construction of capital projects typically require that projects be designed to protect and enhance habitat.

**E-499s                    The existing flood storage and conveyance functions and ecological values of floodplains, wetlands, and riparian corridors shall be protected, and should, where possible, be enhanced or restored.**

## **G.        Hazardous Waste**

Throughout King County, businesses use and generate hazardous materials as part of their normal operations. There are numerous rules and requirements for the proper management of these materials and requirements can vary slightly by jurisdiction. Often the businesses will learn of these requirements after they have found out that they are not in compliance. To help mitigate the potential harmful effects to human health and the environment and to minimize the economic impacts to businesses that may generate hazardous chemicals, King County provides education and technical assistance to businesses on requirements for proper management and disposal of hazardous chemicals, as well as information on less toxic alternatives.

Contacting businesses with information on proper hazardous waste disposal as early as possible in the business development phase can help to prevent improper disposal of hazardous waste and associated risks to public safety and the environment. Taking a preventative approach can also help to avoid costly code violations.

**E-499t                    King County should review new business permit and change of use applications for businesses that propose to use hazardous chemicals or generate hazardous waste as part of their operations. The county should offer to provide technical assistance related to hazardous waste disposal requirements, spill response, and non-toxic alternatives.**

## **V. Geologically Hazardous Areas**

King County is located on the active, tectonic Pacific "Ring of Fire," which is characterized by numerous, dynamic geologic processes that include frequent earthquakes and recurring volcanic eruptions. The relatively recent glacial history has left numerous steep and unstable hillsides throughout the county. Because of these steep and unstable hillsides, many areas of the county are prone to naturally occurring landslides and tree falls. Snow avalanches are also a common occurrence in the Cascade Mountains in Eastern King County. Often times the result of these naturally occurring events can be beneficial to the environment, by providing gravel and woody debris in streams and rivers, and continuing the process of natural regeneration. Salmon need gravel for spawning and in-stream debris for cover and to provide shade and regulate temperature. King County must balance the positive benefits of these natural occurrences with any adverse impacts that pose a threat to public health and safety. The county must also strike a balance between allowing naturally occurring landslides and erosion, and the need to prevent the unnatural acceleration of landslides and erosion due to development activities.

Coal mines have created additional areas of subsidence and instability in addition to those which occur naturally. When human activity occurs in areas subject to such active geologic processes, the potential consequences to life, property and environmental integrity can be enormous. If geologic processes are recognized and appropriately addressed in the course of development activities, adverse consequences can be substantially reduced if not completely eliminated.

### **A. Erosion Hazard Areas**

Virtually any area in King County can experience soil erosion if subjected to inappropriate grading and construction practices. The US Department of Agriculture Soil Conservation Service has identified certain soil types in King County as being especially subject to erosion, if disturbed. These Erosion Hazard Areas may not be well suited to high-density developments and intensive land uses because of the sensitivity of these soils to disturbance.

**E-501                      Grading and construction activities shall implement erosion control best management practices and other development controls as necessary to reduce sediment and pollution discharge from construction sites to minimal levels.**

**E-502                      Land uses permitted in Erosion Hazard Areas shall minimize soil disturbance and should maximize retention and replacement of native vegetative cover.**



**E-503**                    **Slopes with a grade of 40 percent or more shall not be developed unless the risks and adverse impacts associated with such development can be reduced to a nonsignificant level. No-disturbance zones shall be designated where basin plans identify the need to prevent erosion damages in areas that are extremely sensitive to erosion impacts. Properly designed stormwater tightlines may be allowed within designated no-disturbance zones.**

Vegetation is an important component of the natural environment. This general term refers to all plant life growing at, below or above the soil surface. It includes trees, shrubs, herbs, grasses and aquatic plants.

Vegetation, especially forests, provides many significant ecological functions. Vegetation absorbs, filters and slows surface water flow. This is particularly important over aquifer recharge areas. Native vegetation also provides wildlife habitat to which native species are well adapted. Forests are key components in atmospheric cycles; they absorb carbon dioxide, produce oxygen and filter particulate matter. Additionally, they absorb noise and are aesthetically pleasing.

Noxious weeds are nonnative invasive plants that pose a threat to health and safety, agriculture, wildlife, wetlands and recreational areas. They tend to spread in areas that have been disturbed by urban development and agriculture and are difficult to eradicate once they become established. Without natural predators, some noxious weeds can displace native plant communities, reducing plant diversity. Invasive plants also decrease the quality of wildlife habitats, reduce visual quality, and increase maintenance and production costs for natural resource managers and farmers.

**E-504**                    **King County should protect native plant communities by encouraging management and control of nonnative invasive plants, including aquatic plants. Environmentally sound methods of vegetation control should be used to control noxious weeds.**

**E-505**                    **Through training and other programs, King County should actively encourage the use of environmentally safe methods of vegetation control. Herbicide use should be minimized. King County should be a good steward of public lands and protect water quality, by reducing the use of insecticides, herbicides and fungicides through the use of integrated pest and vegetation management practices.**

**E-506**                    **The use of native plants should be encouraged in landscaping requirements and erosion control projects, and in the restoration of stream banks, lakes, shorelines, and wetlands.**

**E-507**                    **In response to watershed-based salmon conservation Water Resource Inventory Area plans and as part of King County’s continued basin planning and stewardship programs, King County may adopt vegetation retention goals for specific drainage basins. These goals should be consistent with R-334, as applicable. The county should adopt incentives and regulations to attain these goals, and the county should monitor their effectiveness.**

## **B.     Landslide and Avalanche Hazard Areas**

Certain hillsides in King County are either naturally unstable or susceptible to instability when disturbed. These hillsides contain slopes greater than 15 percent, are underlain by impermeable soils, and are subject to seepage. They also include areas that have experienced landslides in the past and have slopes that are being undermined by stream or beach erosion. Construction in these areas is expensive and difficult. Landslides on such slopes following development can result in enormous public and private costs and severe threats to human health and safety. Such landslides can also cause severe natural resource damage.

Many of the mountainsides in the Cascade Range in Eastern King County are subject to snow avalanches during the winter. Such avalanches are destructive and can be deadly. King County supports all efforts to monitor and share information regarding avalanche dangers and to alert the public of those dangers.

**E-508**                    **Avalanche or Landslide Hazard Areas should not be developed unless the risks and adverse impacts associated with such development can be reduced to a nonsignificant level. Development proposed in or adjacent to avalanche or landslide hazard areas shall be adequately reviewed and mitigated to ensure development does not increase landslide or erosion hazards that would adversely impact downstream properties or natural resources.**

## **C.     Seismic Hazard Areas**

King County is an earthquake-prone region subject to ground shaking, seismically induced landslide and liquefaction of soil. Areas with low-density soils are likely to experience greater damage from earthquakes.

**E-509**                    **In areas with severe seismic hazards, special building design and construction measures should be used to minimize the risk of structural damage, fire and injury to occupants and to prevent post-seismic collapse.**

## **D.     Volcanic Hazard Areas**

King County is located in a region characterized by active volcanism. The volcanic hazard that poses the greatest risk to safety and wellbeing of county residents would be from a lahar (volcanic mudflow) originating on Mt. Rainier and flowing down the White River valley (possibly overflowing into the lower Green River Valley). Ongoing investigations by the United States Geological Survey continue to clarify the nature of this hazard. Current information provides the basis for taking steps to mitigate that risk.

**E-510**                    **King County should work with the United States Geological Survey to identify lahar hazard areas and shall work with local governments to assess the risk to county residents from lahars and to implement appropriate emergency planning and implement appropriate development standards.**

## **E.     Coal Mine Hazard Areas**

King County has a long and varied history of underground and surface coal mining. Some coal mining was conducted by large, well-capitalized mining companies that used methods such as detailed underground and surface mapping and protection of surface improvements. Other mines were small operations or re-mining operations that sought to maximize coal extraction with less regard for surface impacts or mapping. Some intensively developed areas of King County are located over abandoned underground coal workings, including Talbot Hill and the north Benson Hill of Renton, the Spring Glen area around Cascade Vista, East Fairwood, Black Diamond, southwest Issaquah, and the Newcastle/Coal Creek area.

The greatest dangers to people, wildlife and surface facilities typically exist around mine portals, timber chutes, air shafts, and workings which have collapsed to the surface. Other areas were deep mined by “room and pillar” mining techniques in which “pillars” of coal were left to provide support for the mining of adjacent “rooms.” Once abandoned, pillars would collapse and rooms of mined-out coal would fill with collapsed roof material, coal debris and water. Regional downwarping of these areas was generally not observable and usually happened in the early years following mining of a section. Deep mined areas with a high ratio of overburden/cover-to-void usually present no hazards for surface development. However, areas with low overburden/cover-to-void ratio present higher risks and may require more advanced investigations and construction techniques for development. Mine portals, timber chutes, airshafts, and

workings which have collapsed to the surface require the greatest need for detailed engineering studies to ensure that these sites are safe for new, productive use.

- E-511**            **King County will encourage efforts by public and private property owners and the Office of Surface Mining, Reclamation, and Enforcement to return lands to their highest productive use by safely minimizing or eliminating coal mine hazards.**
  
- E-512**            **King County shall require all development proposals potentially subject to coal mine hazards to assess the mine-related hazards, including risks to structures, improvements, occupants and public health and safety.**
  
- E-513**            **King County shall allow development within coal mine hazard areas if the proposal includes appropriate mitigation for identified, mine-related hazards using best available engineering practices and if the development is in compliance with all other local, state and federal requirements.**
  
- E-514**            **King County shall require all landowners proposing new development in coal mine hazard areas to document the potential hazard on the title of the parcel or parcels being developed. This notice may include reference to any available technical studies or detailed hazard delineations.**

## **VI. Monitoring and Adaptive Management**

King County's environment is constantly changing in response to land and water management actions that are within our control, as well as climate cycles and geologic processes that are beyond our control. The county makes significant investments in projects, programs, and policy implementation to help ensure that our environment supports a range of ecological, cultural and economic values that are fundamental to the region's quality of life.

King County's policies, regulations, and actions to protect and restore the environment need to be assessed on an ongoing basis to ensure that they are having the intended effect, and that they are responding to changing conditions. Our efforts to protect the environment will also need to reflect improvements in our knowledge about the natural environment and how human activity impacts ecological systems, and uncertainties about ecological and biological processes.

Assessing the effectiveness of specific and cumulative actions requires data collected within rigorous monitoring programs. Monitoring provides essential information to track: (1) changes in the natural and built environment, (2) implementation of planned and required actions (like construction of wetland mitigation projects), and (3) effectiveness of our environmental protection actions. Monitoring information can support a formal Adaptive Management program to modify policies, goals, and management decisions as necessary, and inform regulatory change.

Adaptive management can be used to help insure that projects, programs and policies are moving the county toward its environmental goals over time. Adaptive Management is defined as the process of making hypotheses of management outcomes, collecting data relevant to those hypotheses, and then using monitoring data to inform changes to policies and actions to better achieve intended goals. Adaptive management concepts are often applied in programs intended to address complex natural resource management problems, for example in Water Resource Inventory Area plans for salmon recovery or in Habitat Conservation Plans to comply with the ESA. The Washington Administrative Code calls for local governments to use monitoring and adaptive management to address uncertainties in best available science for protecting critical areas like wetlands.

King County conducts a diverse array of monitoring activities, ranging from project-specific monitoring of Capital Improvement Projects and legally required monitoring of municipal wastewater and stormwater discharges in compliance with National Pollutant Discharge Elimination System permit requirements, to watershed-wide ambient monitoring of groundwater, rivers, streams, lakes, and marine waters of Puget Sound to the extent that funding allows. King County maintains a continuous water quality monitoring program for freshwater streams, rivers, lakes, and marine waters. This long-term monitoring program

informs our understanding of changes in water quality over time including those caused by climate change, and contributes to the identification of emerging pollution issues *and sources of water pollution*. The monitoring program also allows the quantification of water quality and aquatic habitat improvements. The data collected by these programs additionally provides the necessary baseline information for many scientific studies conducted in King County wetlands, lakes, streams, and marine waters by county scientists as well as scientists at universities and state and federal agencies.

Financial resources for environmental protection programs, including monitoring, are limited. Because baseline monitoring does not result in an actual project “on the ground,” and often is not mandated, it may not compete well with other priorities for limited funding. However, investments in monitoring will provide essential information for evaluating the effectiveness of current actions and guiding future policy decisions, priorities, and investments. To make the most efficient use of limited resources, it is critical that the county look for opportunities to coordinate its data collection and dissemination efforts so that they can meet as many information needs as possible. The county should also partner with entities conducting monitoring, including other governments and universities.

When data are collected, it is important that its usefulness is maximized. “Metadata” is background information on data, and is necessary to facilitate the understanding, use, storage, sharing, and management of data. For example, metadata can describe how a particular data set was collected, provide definitions for types of data, and describe the reliability of the data.

**E-601                    King County should conduct a comprehensive and coordinated program of environmental monitoring and assessment to track long-term changes in climate (e.g., precipitation, temperature), water quality and quantity, land use, land cover and aquatic and terrestrial habitat, natural resource conditions, and biological resources as well as the effectiveness of policies, programs, regulations, capital improvement projects, and stormwater treatment facility design. This monitoring program should be coordinated with other jurisdictions, state and federal agencies, tribes, and universities to ensure the most efficient and effective use of monitoring data.**

**E-602                    King County should seek to develop and maintain a publicly accessible, geo-spatial database on environmental conditions to inform policy decisions, support technical collaboration, and inform the public. All King County monitoring data should be supported by metadata.**

**E-603**                    **King County should establish a decision-support system suitable for adaptive management that uses data from its environmental monitoring programs.**

## **A.     Performance Measurement, Performance Management, and KingStat**

Like adaptive management in realm of science, performance management includes collecting data, analyzing data to inform decision-making, and making programmatic course corrections based on this analysis.

King County has already started to report to the public both community-level conditions and agency performance measures. Monitoring data referenced in this chapter serves as a core element of helping elected officials and the public stay informed about the state of the environment and the effectiveness of agency programs.

The executive's KingStat program is using environmental monitoring data to assess environmental conditions, develop appropriate county responses, and provide an opportunity to collaborate and partner with other organizations in making improvements. With respect to environmental conditions, data used in KingStat includes marine water, freshwater, terrestrial habitat, fish and wildlife, atmosphere, and resource consumption.

**E-604**                    **The county should continue to collect data on key natural resource management and environmental parameters for use in KingStat, King County's Strategic Plan implementation goals and objectives, and other environmental benchmarking programs. Findings should be reported to the public, partner agencies, and decision-makers. The information collected should be used to inform decisions about policies, work program priorities and resource allocation.**

## **B.     National Pollutant Discharge Elimination System Compliance**

A new National Pollutant Discharge Elimination System general municipal stormwater permit for discharges from the county's municipal stormwater system was issued in January of 2007 for a term of five years. The new permit contains prescriptive requirements for controlling and monitoring pollutants in municipal stormwater.

**E-605**                    **King County shall carry out monitoring in compliance with its National Pollutant Discharge Elimination System municipal permit. Data collected through these**

**monitoring efforts should be coordinated with King County's other monitoring efforts to the extent possible, and carried out in the most cost-effective and useful manner possible.**

## **C. Water Resource Inventory Areas Plan Implementation**

The Puget Sound region has responded commendably to the listing of Puget Sound Chinook. In King County, more than 40 jurisdictions have joined together to cooperatively lead salmon recovery in our watersheds. In the five years since the plans were adopted (2006-2010), King County has implemented 23 priority salmon restoration projects within its jurisdiction and has initiated work on an additional 55. In 2010, NMFS conducted a five-year assessment of progress to implement the Puget Sound Salmon Recovery Plan. Some of the conclusions and recommendations of the five-year assessment are:

- Habitat continues to decline, and the region needs to increase its scrutiny of the sources of habitat decline and the tools used to protect habitat sites and ecosystem process.
- Habitat protection needs improvement, and lead entities and regional groups should advocate for stronger regulatory programs to protect habitat.
- Habitat work is underway, but funding sources tend to favor capital projects over the funding of staff necessary to perform the work.
- Funding is unavailable to fully implement current three-year work programs.
- Adaptive Management Plans are not completed: A process should be established to recognize changes that are being made to Recovery Plan strategies as implementation proceeds.

Although Water Resource Inventory Area plans are Chinook salmon-focused, they are expected to also provide the basis for recovery planning for other listed aquatic species, including Orcas and other listed salmonids.

**E-606 King County should work with other Water Resource Inventory Area plan partners to establish a program (framework and methodology) for monitoring project specific and cumulative effectiveness of King County salmonid recovery actions. This program should include data collection and analysis and should provide information to guide an adaptive management approach to salmonid recovery.**

**E-607 The county should coordinate with other governments, agencies, tribes, non-governmental organizations and others to develop and implement regional and watershed-based Adaptive Management programs focused on achieving salmon recovery goals.**



## **D. Effectiveness of Critical Areas Regulations**

Under the GMA, all counties and cities are required to periodically review their comprehensive plans and development regulations, including critical area regulations, for consistency with the GMA. GMA also requires local governments to include best available science in the development of land use policies and regulations to protect the functions and values of critical areas. Washington State Department of Commerce procedural criteria for adoption of comprehensive plans and development regulations provide direction on how local governments should include best available science in their critical area regulations (WAC 365-195). The procedural criteria call for the use of a precautionary approach, in which development and land use activities are strictly limited until the uncertainty is sufficiently resolved, where the science is uncertain. Coupled with this precautionary approach should be an adaptive management program that allows for changes to regulations as new information comes in to address uncertainties. The adaptive management program is dependent upon a monitoring program that is designed to obtain the information needed to determine the effectiveness of regulations.

**E-608                      King County should develop and implement a framework for effectiveness monitoring of critical areas regulations, and use monitoring data to inform the future review and updates of its critical areas policies and regulations.**