

Reducing Pressures on the Puget Sound Ecosystem from Runoff from the Built Environment

C2. Use a comprehensive approach to manage urban stormwater runoff at the site and landscape scales

The Challenge

Urban stormwater runoff poses a high risk to the health of Puget Sound by causing two major problems.

First, the runoff transports a mixture of pollutants such as petroleum products, heavy metals, bacteria, nutrients, and sediments from construction sites, roads, highways, parking lots, lawns and other developed lands, with the following results:

- Urban stormwater pollution has harmed virtually all urban creeks, streams and rivers in Washington State.
- Stormwater is the leading contributor to water quality pollution of urban waterways in the state.
- Two species of salmon and bull trout are threatened with extinction under the federal Endangered Species Act. Loss of habitat due to stormwater and development is one of the causes.
- Shellfish harvest at many beaches is restricted or prohibited due to pollution. Stormwater runoff is often one of the causes.
- Stormwater causes the death of high percentages of healthy Coho salmon in Seattle creeks within hours of the fish entering the creeks, before the fish are able to spawn.
- English sole are more likely to develop cancerous lesions on their livers in more urban areas. Stormwater pollutants likely play a role.

Second, during the wet, winter months, high stormwater flows, especially long-lasting high flows, can:

- Cause flooding.
- Damage property.
- Harm and render unusable fish and wildlife habitat by eroding stream banks, widening stream channels, depositing excessive sediment, and altering natural streams and wetlands.

In addition, more impervious surface area means less opportunity for water to soak into the ground. As a result, groundwater drinking water supplies may not be replenished and streams and wetlands may not

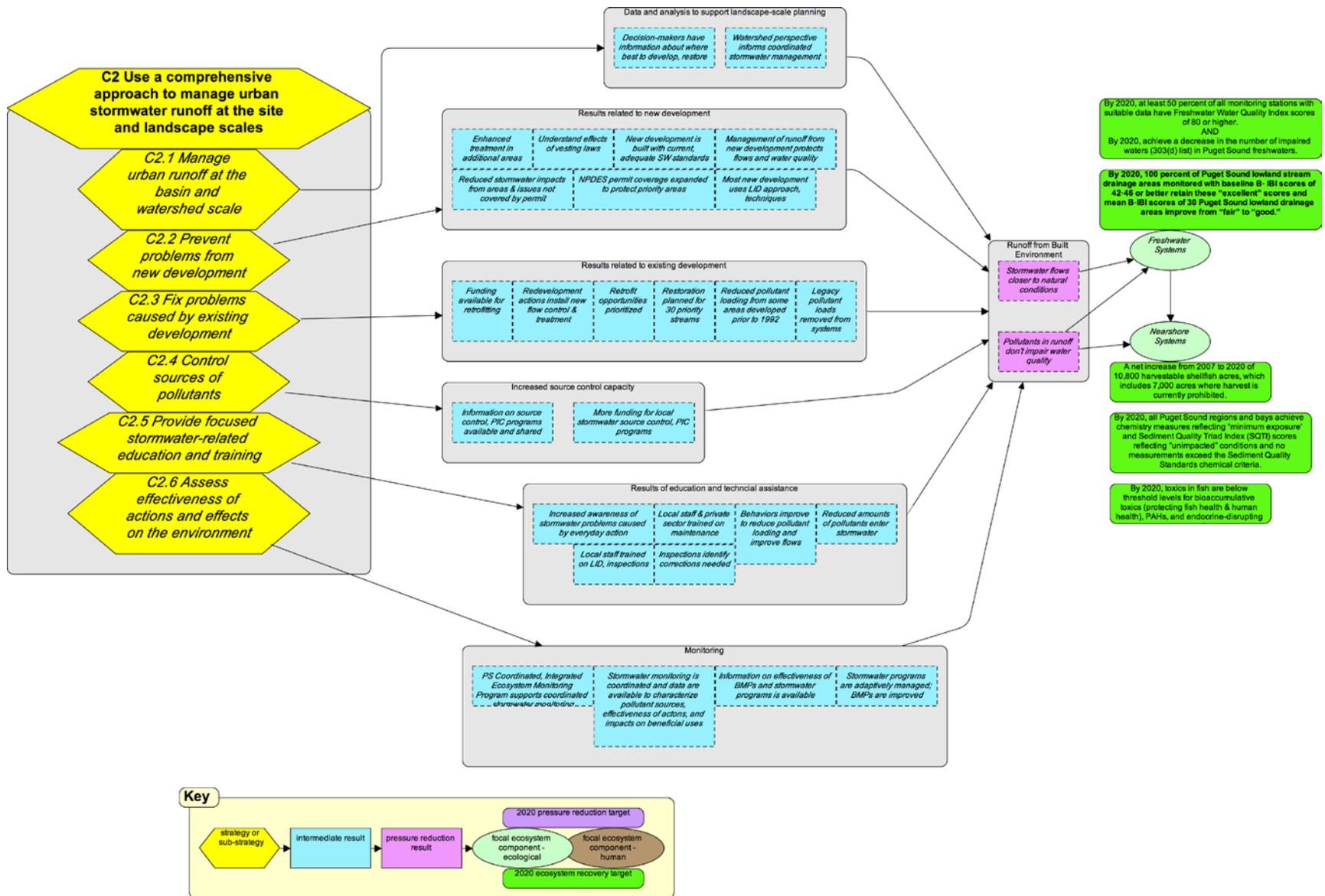
be recharged. This can lead to water shortages for people and inadequate stream flows and wetland water levels for fish and other wildlife.

SALMON RECOVERY

Managing and Reducing Stormwater – A Salmon Recovery Plan Priority: Improvement in water quality is identified in the salmon recovery plan with a call to resolve uncertainty about whether the regional water quality actions address the needs of salmon. Volume I identifies general concerns related to stormwater runoff. Watershed chapters for WRIA 8 and WRIA 9 have strategies/actions related to stormwater and water quality. One item that is of particular interest in WRIA 8 and 9 but also in other watersheds is the issue of pre-spawning mortality of different species of salmon.

How these priorities are integrated: The approach to stormwater runoff in the built environment, including strategies and actions, is more detailed in the Action Agenda. From a salmon recovery perspective, the resolution about the effectiveness of actions still needs to be addressed.

A significant amount of the work completed for the 2011 Action Agenda Update was informed by the draft *Stormwater Vision and Financing Strategy for Puget Sound*, the *Task 1: Urban Stormwater Runoff Preliminary Needs Assessment Technical Memorandum*, (October 2010) and work by a subcommittee of the Ecosystem Recovery Board focused on stormwater funding. An interagency team of stormwater professionals used these foundation documents to suggest the draft strategies and near-term actions contained in this section. (See page ___ for a list of interagency team members.) The purpose of the *Stormwater Vision* is to suggest comprehensive actions and financing strategies that will reduce polluted surface runoff from urban and rural landscapes to Puget Sound. The *Stormwater Needs Assessment* details (1) the needs of regional local governments to fully implement the municipal NPDES stormwater permit programs, and (2) the need for stormwater retrofits (described below in the sub-strategy on existing development). Puget Sound permittees invested between \$160–170 million in 2009 to implement the municipal permits; this represents a significant portion of the total they spent on stormwater management. While state and federal assistance via grants and loans are substantial (in FY 2011 Ecology disbursed \$23.5 million for permit assistance and another \$23.4 million for low impact development and retrofit projects) the state and federal portion of total costs pales in comparison to what local governments spent. The ECB Stormwater Funding Subcommittee’s report details recommendations that include the need for greater overall investment in stormwater management in the region and the need for more financial assistance to local governments, who currently shoulder the majority of costs.



Relationship to Recovery Targets

The 2020 ecosystem recovery target for runoff from the built environment is native communities of insects in small, wadeable streams. This target was chosen because runoff from the built environment, or urban runoff, directly affects the structure, habitat and fish and wildlife in small, wadeable lowland streams of Puget Sound. Insects found in these small streams serve as good indicators for the relative biological health of Puget Sound freshwater stream systems. If communities of native insects in these streams are plentiful and diverse, other biological components, including salmonids, should be healthy as well. A functioning, resilient Puget Sound requires lowland streams that support the salmonids and invertebrates native to this region, as indicated by benthic index of biotic integrity (B-IBI) scores. The target states that, “by 2020, 100 percent of Puget Sound lowland stream drainage areas monitored with baseline B-IBI scores of 42–46 or better retain these ‘excellent’ scores and mean B-IBI scores of 30 Puget Sound lowland drainage areas improve from ‘fair’ to ‘good.’”

The Puget Sound Stream Benthos, a website developed by officials from the City of Seattle, King County, Pierce County, Snohomish County, and others provides a database that allows sharing of benthic macroinvertebrate data among organizations and provides tools for calculating metrics and indices. The database fulfills the goal of storing macroinvertebrate data in a manner that allows for reliable comparisons across sites and programs over time.

Other targets closely associated with the management of urban runoff at the site and landscape scales include land development, land use and land cover, freshwater quality, shellfish beds, toxics in fish, and marine sediment quality.

C2.1 Manage urban runoff at the basin and watershed scale

Urban runoff cannot be fully managed at the site and parcel level alone—it is also necessary to manage runoff at the broader basin and watershed scales. Numerous regional and national studies show that as native vegetation and soils are replaced by rooftops, roads and other hard surfaces, numerous environmental indicators decline. Local land use decisions (i.e., location, type and intensity of development) directly affect urban runoff quantity and quality within watersheds. In addition, a comprehensive inventory and clear understanding of the connectivity and treatment capacity of the region’s municipal separate storm sewer systems (MS4) is necessary to address stormwater runoff. Local governments, state and federal agencies, and tribes need to develop cooperative agreements for the mapping and inventorying of local municipal stormwater systems. This sub-strategy addresses protection of native vegetation, soils and high quality habitat; siting of new development; and better connection of land use to stormwater management. The near-term actions include a task regarding system mapping.

Native Vegetation and High Quality Streams

Protecting native vegetation, soils and high quality habitat, particularly in remaining stream drainages with “excellent” B-IBI scores through actions outlined in sections A and B requires mapping locations of these streams, and carrying out strategies to protect the streams. This involves using tools such as the Puget Sound Watershed Characterization Project (Watershed Characterization), growth management planning, critical areas and other land development regulations, proposed LID requirements in municipal

NPDES permits, stormwater management manuals, land conservation programs, landowner incentive programs, and other measures. More information on strategies and actions related to watershed characterization are in strategy A1.1.

Areas to Protect, Develop and Restore

Site new development appropriately, using the watershed characterization study, Growth Management Act (GMA), Shoreline Management Act (SMA), State Environmental Protection Act (SEPA), and other tools. Use Watershed Characterization, other watershed plans, and, where needed, finer scale analyses to identify areas most appropriate to protect, develop and restore through structural retrofits, legacy pollutant removal, and other means. Where development is targeted, use smart growth concepts to ensure compact, mixed-use, mass-transit supported development increases. More information on these issues is in strategies A2, A3 and A4.

Local Strategies

South Central and the Strait have both identified local priority strategies in this area - incorporate low impact development requirements into stormwater codes and develop and implement LID incentives; and update and implement stormwater management plans in Clallam, Jefferson, Port Angeles, Sequim, and Port Townsend, respectively.

Land Use and Stormwater

Support development of watershed plans based on Watershed Characterization data that integrate land use planning and stormwater management by either (1) reactivating and funding Clean Water Act Section 208 planning to include major land uses (urban, agricultural/rural, and forestry) and water resource elements such as stormwater, combined sewers, wastewater, water supply, reuse and non-point sources; or (2) supporting and funding the development of stormwater plans, watershed plans, and/or WRIA plans that address the full spectrum of water resource elements and land use on a regional basis. Evaluate impacts of land use decisions on stormwater runoff and receiving waters. Align regulations with watershed plans, including municipal, industrial and construction NPDES permits, non-point source control programs, critical areas ordinances, SMA, SEPA, Endangered Species Act, and the GMA if warranted.

Ongoing Programs

The Puget Sound Watershed Characterization (Watershed Characterization), a collaborative effort between Ecology, PSP, and Washington Department of Fish and Wildlife is designed to provide local governments with better information to improve land use planning and resource protection at the watershed scale. The Watershed Characterization is a regional-scale perspective that divides the Sound geographically into three areas: those most important to protect, those most beneficial to restore, and those most suitable for development. It is designed to:

- Describe a multi-scale framework for land-use planning.
- Provide results from assessments that can help guide the protection and restoration of watersheds and the habitats they support.
- Explain the role and proper application of these assessments.

Near-Term Actions

C2.1 NTA 1: Protect best remaining streams: King County, in cooperation with agencies populating the Puget Sound Stream Benthos database, identifies and maps remaining streams with B-IBI scores of at least 42–46 and develops an overall strategy and tailored actions to protect these areas.

Performance measure: Map of targeted streams delivered six months after receiving funding; strategies and actions to protect targeted stream drainages delivered 12 months after receiving funding.

C2.1 NTA 2: System mapping: A lead, to be determined, in cooperation with local governments, WSDOT, and Department of Natural Resources, helps improve understanding and management of the region’s stormwater infrastructure by developing protocols, methodology and definitions for stormwater system mapping, and developing geo-referenced databases that can be compiled into a regional geo-referenced database of the Sound’s regulated, municipal stormwater system.

Performance measures: Protocols, methodology and definitions to guide mapping and documentation efforts by March 2013; completed geo-referenced database by December 2013

C2.2 Prevent problems from new development at the site and subdivision scale

New development at the site and sub-division scale can be a significant source of stormwater-related problems. Under the CWA, Ecology administers NPDES stormwater permits for municipalities, industries, construction sites, boatyards, and the Washington State Department of Transportation (WSDOT).

Municipalities with populations over 100,000 are currently covered by National Pollutant Discharge Elimination System (NPDES) “Phase I” permits. In Puget Sound, this includes King, Pierce and Snohomish counties and the cities of Seattle and Tacoma. Municipalities with populations under 100,000 located in urbanized areas, as defined by U.S. EPA rules, are covered under “Phase II” permits. An NPDES municipal stormwater permit also exists that covers WSDOT’s transportation facilities within the Phase 1 and 2 permit areas. Ecology also maintains the region’s stormwater technical manual, which contains minimum requirements, technical standards and approved best management practices for managing stormwater from new development and redevelopment projects in the basin.

Local Strategies

North Central and Stillaguamish and Snohomish are considering related local strategies.*

** See Local Areas Chapters for more detail on local areas that are in the process of completing strategy and action identification and prioritization.*

Stormwater NPDES Permits

Issue, implement, oversee, enforce compliance with, and improve over time NPDES stormwater permits for western Washington according to federally established timelines. Ensure municipal permits contain requirements for LID, monitoring, and structural retrofits. Evaluate need to bring in additional local governments under municipal permits to cover more land area of the basin. Seek funding for municipal permittees to carry out permit requirements. Ensure permits for federal and tribal lands/facilities are consistent with state-issued NPDES stormwater standards and permits. Ensure that state-approved stormwater manuals are updated as needed.

LID

Continue to develop new and revise existing technical guidance and educational materials to help transition the region to the use of low impact development (LID) and other green infrastructure approaches. Continue to refine how these techniques are modeled, sited, designed and maintained in state-approved runoff manuals. Continue to provide guidance to local governments on integrating LID into codes and standards. Continue to provide information on projects, costs, performance, longevity, and maintenance needs. Continue to refine and provide incentives for LID and other green infrastructure approaches. Seek funding for local governments for review of development proposals, inspections, enforcement, and maintenance of facilities.

Consistent Management of New Development Basin-wide

To protect and restore resources and beneficial uses everywhere in the basin, including shellfish harvest areas and salmon habitat, ensure that new development outside NPDES-permitted areas also includes stormwater management standards and thresholds that are technically equivalent to the Stormwater Management Manual for Western Washington.

Ongoing Programs

Anticipated results from Ecology's efforts to control stormwater pollution include reducing contamination of streams, rivers, estuaries, lakes, and groundwater due to urban stormwater runoff. Expected performance measures include:

- 3,500 construction and industrial stormwater dischargers that require permits are managed. (NOTE: PS or statewide?)
- New permit applicants get a response within 60 days of application receipt.
- 120 municipal stormwater permits are managed. (NOTE: PS or statewide?)
- Permittees get Web-based information and support for low-impact development, emerging treatment technologies, and permit technical assistance.

In 2009, the state legislature directed Ecology to work with stakeholders to establish a stormwater technical resources center. The Washington Stormwater Center, jointly managed by Washington State University Extension, Puyallup and the University of Washington, Tacoma Urban Waters will provide technical assistance to municipal and industrial stormwater NPDES permittees, education and training, research and monitoring of LID practices, and review and approval of new stormwater best management practices (BMPs).

Another element of effective management of urban runoff is promoting the use of innovative LID measures. WSU Extension, Puyallup and PSP, with help from regional professionals, are revising the region's manual on LID, the "LID Technical Guidance Manual for Puget Sound." PSP is developing "Integrating LID into Local Codes: A Guidebook for Local Governments" to help local staff integrate LID into their codes and standards. Many local governments, developers and builders, and consulting engineers provide leadership by designing and building innovative LID projects.

Near-Term Actions

C2.2 NTA 1: Within NPDES municipal permitted areas: Ecology provides financial assistance to permittees for implementation, particularly for code changes, stormwater system mapping, operations and maintenance, inspections and enforcement. This will require additional resources to Ecology for permit oversight, technical assistance, and enforcement. Provide incentives to NPDES permittees who, by interlocal agreement, lead or carry out regional or watershed scale NPDES implementation.

Performance measures: Additional resources to Ecology by July 2013; financial assistance provided to permittees by December 2013; incentives provided to permittees for regional implementation by December 2013

C2.2 NTA 2: Treatment standards: Ecology evaluates under which circumstances (i.e., for which pollutants, from which land uses) discharges to Puget Sound should be required to provide treatment beyond sediment removal (i.e., TSS removal) to help meet 2020 recovery targets.

Performance measure: Evaluation with supporting documentation by March 2014

C2.2 NTA 3: Outside permitted areas: Ecology, in coordination with the state Department of Health, identifies two high priority shellfish growing areas degraded by urban stormwater discharges and works with local governments and other key parties to reduce these impacts to the areas.

Performance measures: Assistance provided to non-permitted local governments by September 2012; documentation of reduced impacts

C2.2 NTA 4: Vesting: Washington Stormwater Center or Puget Sound Institute assesses projected implications and impacts of current state vesting laws on aquatic resources and beneficial uses. Prepare report for the Science Panel, ECB and LC.

Performance measure: Report on projected implications and impacts of current vesting laws developed and shared by December 2012

C2.2 LNTA 5: San Juan County Community Development and Planning Department (CDPD) and the Town of Friday Harbor will improve the stormwater permit review process with pre-disturbance site review and follow-up site visits at 50% of properties permitted between 2012-2013 and 50% of properties permitted between 2013-2014.¹³

Performance measure: To be determined

C2.2 LNTA 6: Stormwater Management Program Updates and Implementation (Clallam, Jefferson, Port Angeles, Sequim, and Port Townsend)

- › City of Port Townsend stormwater management plan
- › City of Sequim stormwater management plan
- › City of Port Angeles CSO reduction
- › City of Port Angeles NPDES stormwater management program implementation
- › Jefferson County public education plan implementation
- › Jefferson County low impact development and BMP staff training
- › Jefferson County low impact development and BMP training for development community
- › Clallam County stormwater technical assistance
- › Clallam County outreach and education
- › Clallam County stormwater monitoring a data analysis
- › Clallam County stormwater management staff training
- › Clallam County land use analysis
- › Clallam County stormwater management plan
- › Speaker forum on reducing stormwater impacts from roads

(Note: this action is also relevant to Strategies C2.1, C2.3, C2.4, C2.5, and C2.6)

Performance measures: Adoption of LID incentives and ordinances by all 5 Strait Action Area local jurisdictions; Alternative Option: Initiate or complete 25% of the new Priority Actions identified by the Strait ERN for the Strait Action Area

Local Action

The South Central area identified funding and implementation of municipal stormwater management programs as a high priority action, including:

- Structural stormwater retrofits
- O&M of existing stormwater infrastructure
- Source control (e.g., business inspections, education & outreach)
- Incorporation of LID requirements into stormwater codes
- Development and implementation of LID incentives
- Incentives for business to help

This action also is relevant to Strategies C2.3, C2.4 and the Funding Strategy.

C2.3 Fix problems caused by existing development

Most development within the Puget Sound basin was built prior to the use of local and state stormwater manuals that require management of stormwater discharges. This development, unless already retrofitted, may be presumed to be discharging untreated or undertreated stormwater, and inadequate

management of high flows. Stormwater discharges from existing development can be mitigated through a variety of means: Structural retrofits, regular and enhanced maintenance to remove legacy pollutant loads, and/or redevelopment policies. The “Urban Stormwater Runoff Preliminary Needs Assessment Technical Memorandum” (October 2010), in a survey of 20 permittees, found that system cleaning was highly effective: 234,000 tons of total solids were removed in 2009. This is believed to be due to “past underfunded maintenance” of stormwater systems. The report further estimates that, conservatively, an estimated \$3–15.6 billion is needed to upgrade existing stormwater systems within municipal permit areas for treatment. The report states that “prioritization is necessary” (given the huge investment required) and that “acceleration of the maintenance, inspection, and pollutant source investigation elements of the... permit program, in combination with addressing the highest priority retrofits, is recommended.”

Structural Retrofit

Over time upgrade, as needed, existing development with flow control and treatment techniques that contribute towards meeting 2020 ecosystem recovery targets. Focus on areas that would benefit most, and assess whether structural upgrades or other means (e.g., source control, maintenance) will achieve objectives. Assess level of effort needed (i.e., number of projects and acres retrofitted) to meet goals. Develop new, adequate funding to ensure significant progress is made.

Maintenance

Ensure stormwater pollution prevention plans are carried out and all stormwater systems are regularly inspected and maintained to function to engineering design standards. Assess need for and carry out removal of legacy loads from portions of systems. Build on City of Tacoma’s study on removal of legacy loads. Provide technical and financial assistance to help local governments.

Redevelopment

Ensure that redevelopment policies in state-approved stormwater manuals are fully implemented and bring about improvements to runoff from existing development. Revise policies as needed as one tool to upgrade stormwater controls on existing development.

Local Strategies

A number of local areas support this regional strategy, including the South Central which has identified a related local priority strategy to fund and implement stormwater retrofits and improve operations/ maintenance of existing stormwater infrastructure operations. Hood Canal, Island, and Skagit are also considering complementary local strategies.*

* See Local Areas Chapters for more detail on local areas that are in the process of completing strategy and action identification and prioritization.

Near-Term Actions

C2.3 NTA 1: The Puget Sound Regional Council, building on retrofit prioritization work funded by the EPA in King County and elsewhere, identifies the top priority retrofit projects associated with the transportation infrastructure in the urbanized portions of King, Pierce, Kitsap and Snohomish counties and completes conceptual design to a stage sufficient to seek project implementation funding. The project should be replicable in other urban and suburban areas around the Sound.

Performance measure: New regional stormwater retrofit prioritization process and list of projects by December 2012

C2.3 NTA 2: King County, in cooperation with agencies populating the Puget Sound Stream Benthos database, identifies and maps stream drainages with “fair” B-IBI scores, and develops prioritized list, strategies and actions to improve scores of 30 of these streams.

Performance measures: Map of targeted drainages six months after providing funding; prioritized list for restoration and strategies, actions, and budgets 12 months afterwards

C2.3 NTA 3: Ecology, in cooperation with local governments, provides guidance and financial assistance to local governments to help them remove legacy pollutant loads from their stormwater systems.

Performance measures: Shared guidance; financial assistance to permittees by December 2013

C2.4 Control sources of pollutants

Stormwater runoff from urban and rural areas is a significant source of toxics, nutrients, and pathogens delivered to Puget Sound. (Even small concentrations of polluted runoff can be harmful to fish and other aquatic life.)

Proper control and treatment of this stormwater, as discussed in earlier strategies and actions, is critical to Puget Sound recovery. It also is important to reduce the amount of contamination that becomes caught up in the stormwater stream. Many pollutants, such as dissolved metals, are very expensive and difficult to remove from the stormwater stream through treatment BMPs. Other pollutants, like pathogens, are commonly found in stormwater, and, like other pollutants, cause problems in receiving waters. It is far more cost-effective to minimize the introduction of pollutants to stormwater than to rely only on stormwater flow control and treatment.

Local Strategies

The San Juan Islands have two local priority strategies that address this concern – create effective compliance mechanisms for stormwater and implement best practices to reduce pollution of source wastes by residential runoff and non-point sources.

Local Pollution and Control Programs

Develop and carry out local programs to identify and track sources of stormwater-related pollutants and carry out measures to control/eliminate the sources. Provide guidance and ongoing financial assistance to local governments.

Inspections and Enforcement

Carry out periodic inspections of businesses and industries with high likelihood of discharging pollutants of concern, work with property owners & operators to use best management practices to reduce discharges, and use technical assistance, incentives and enforcement to achieve compliance. Use information from local pollution identification efforts, watershed plans, and regional monitoring activities to identify pollutant hotspots/areas to restore. Provide guidance and ongoing financial assistance to local governments.

TMDLs

Develop and carry out water quality implementation plans to eliminate impairments to water quality from stormwater discharges. Conduct follow up work to ensure plans are achieving goals. Provide technical and financial assistance to local governments charged with carrying out actions. Additional information on water quality implementation plans can be found in strategy C11.1.

Near-Term Actions

C2.4 NTA 1: Ecology and local governments increase inspection, technical assistance, and enforcement programs for high-priority businesses and at construction sites.

Performance measure: Increased number of inspections, technical assistance, and enforcement activities by December 2012

C2.4 NTA 2: PSP, in cooperation with WSDOT and an advisory committee, convenes a group to discuss options for developing a new program to inspect and eliminate privately-owned vehicle drips and leaks.

Performance measure: Report on options, benefits, costs, and feasibility by June 2013

C2.4 LNTA 3: San Juan County Public Works will convene Community Development and Planning Department (CDPD), Department of Health and Community Services (DHCS), and the San Juan Islands Conservation District (CD) to identify and coordinate best management practices for stormwater, on-site septic systems, and animal wastes with community participation by 2013. CDPD, DHCS, CD, and the Town of Friday Harbor will publicize information by the second quarter of 2014 at the DHCS, CDPD, and Town permit counters and associated websites, with a goal to target 100% of applicants by the end of 2014. San Juan County will provide for identified best management practices in County Code by 2014.¹³

(Note: this action is also relevant to Strategies C3.2 and C6.1)

Performance measure: To be determined

In addition, strategies and actions related to Pollution Identification and Correction (PIC) programs are described in C11.4.

C2.5 Provide focused stormwater-related education and training

Cities and counties need education and training to develop effective local stormwater programs. By developing additional guidance and model ordinances, and providing technical and financial assistance, stormwater can be more effectively managed throughout the region.

Education and Training

Provide focused information, education and training on stormwater-specific issues for multiple audiences:

- Citizens (especially homeowners): Importance of problem, sources of contaminants and effects, their role in helping to solve problems.
- Legislators and elected officials: Issues, funding needs, results of significant studies and reports, product bans & phase-outs.
- Local government staff: Training on permit activities, including inspections and maintenance, source control, spill response, and LID implementation.
- Business owners: Source control training, best management practices, proper material disposal, and other technical assistance.

Utilize **Puget Sound Starts Here (PSSH)**, STORM and other regional efforts for public education & stewardship efforts. Include transportation-related topics.

Ongoing Programs

PSSH is a partnership of regional governments dedicated to improving water quality in Puget Sound and local lakes, rivers and streams. PSSH is a consortium of 57 cities and counties that form the STORM coalition, a Sound-wide consortium of municipalities collaborating on a Sound-focused campaign, and effectiveness enhancement of respective local programs.

The Washington Stormwater Center also provides NPDES education, permit technical assistance, stormwater management and new technology research, development, and evaluation.

Key Ongoing Program Activities

- PSP, Ecology, local governments and non-profit organizations carry out a broad stormwater-focused education and behavior change campaign. Emphasize problems, sources, solutions and roles, funding needs, and stormwater management on home lots. Provide focused information for legislators on problems, issues, funding needs, results of toxics loading studies, 2020 recovery targets, and ideas and options relating to needed product bans and phase-outs.

Near-Term Actions

C2.5 NTA 1: Washington Stormwater Center; Ecology and PSP provide focused training for local government staff on LID project review, and inspections and approvals, as well as to local government staff and private sector on maintenance. Develop new professional certification for stormwater maintenance specialists. Provide business staff and contractors with training on source control, spill recognition, spill response, and erosion control.

Performance measures: Increased professional training with additional emphases on topics listed by July 2013; new certification for maintenance specialists by December 2013; new source control training for businesses by December 2013

In addition, actions related to stormwater-focused education are described in D7.

C2.6 Assess effectiveness of actions and effects on the environment

Monitoring & Assessment

Ensure the region has a robust, effective program to regularly monitor and assess the effects of stormwater runoff on receiving waters and the effectiveness of BMPs, programs and permit requirements in mitigating these effects. Provide ongoing support to the Stormwater Work Group to coordinate this effort. Ensure the region has an effective process to regularly evaluate new BMPs (TAP-E) and carry out monitoring and science-based research. Provide support to the Washington Stormwater Center for this work. Use results of significant studies, such as the toxics loadings studies, to guide future work.

Ongoing Programs

In addition to the work previously mentioned about the Washington Stormwater Center, the Stormwater Work Group (SWG), an interjurisdictional team of scientists and stormwater practitioners, is collaborating to develop a regional stormwater monitoring program for Puget Sound. The group was convened at the request of PSP and Ecology, and is focused on status and trends in key receiving waters, assessing the effectiveness of BMPs and overall programs, and sharing information on source control activities.

Key Ongoing Program Activities

- Ecology continues to carry out the recommendations of the Stormwater Work Group (SWG) for status & trends monitoring, BMP and program effectiveness, and source control by June 2012. The SWG develops priorities for and expands implementation of the *2010 Stormwater Monitoring and Assessment Strategy for the Puget Sound Region* beyond municipal permit requirements by June 2013.
- Washington Stormwater Center carries out research and shares results on LID BMP= research, and reviews and approves new technologies, and provides assistance to municipalities and businesses by July 2012.

Near-Term Actions

C2.6 LNTA 1: San Juan County Public Works Stormwater Utility will lead and work jointly with the Stormwater Committee, the Water Resources Committee, the Marine Resources Committee, and the Town of Friday Harbor to implement an annual strategic monitoring plan by 2013 to measure levels of fecal coliform bacterias, heavy metals, persistent organic pollutants, and polycyclic aromatic hydrocarbons in priority basins to test the effectiveness of BMPs. In the first year post-implementation, monitor 100% of priority basins, with monitoring actions ongoing after 2014.¹³

Performance measure: To be determined

Emerging Issues and Future Opportunities

Significant additional new investment in stormwater management is needed—current levels of investment by all levels of government are not sufficient to address the extent of the problems. Current investments by local governments in municipal NPDES permit programs far exceed state and federal-level investments via grant and loan programs, as reported in the *Stormwater Needs Assessment*. Current investments in addressing problems caused by existing development through structural retrofits are not nearly sufficient—the cost to retrofit existing development for treatment alone is estimated to cost, at a minimum, \$3–16 billion (*Stormwater Needs Assessment*). Local stormwater utilities in many cases will need to be increased, and local governments need support to successfully raise local stormwater rates. Concurrently, the level of investment by the state and federal government must be increased significantly to help share the burden of costs so that we can adequately address the scope of stormwater problems and meet related 2020 ecosystem recovery targets.

Science Needs

The following is a preliminary list of science needs that have been identified:

- Will there be any effects on groundwater (i.e., hydrology or quality) from increased infiltration of stormwater?
- Do we need better treatment than basic (80 percent TSS removal) for discharges to Puget Sound? (Refers to pollutants not binding to sediments, like oil and grease and dissolved metals and nitrogen.) If yes, for which pollutants, and under which circumstances (from which land uses)? Is it better to provide a higher level of treatment for some portion of an area, or provide basic treatment to a broader geographical area? (Tacoma is one resource for this—they're modeling this—how dense do we need to put in BMPs to reduce impacts of effects?)
- What is the full range of benefits and limitations of LID, given varying soil types, land uses, and other factors?
- How much retrofit is needed to meet goals? What “level” of effort is needed, in terms of number of projects and acreage retrofitted?
- Are there more effective approaches to regional stormwater management than the current general municipal permit NPDES structure (e.g., individual or watershed-based permits tailored more to local needs and issues)?

Target View: Insects in Small Streams

Insects in Small Streams

Runoff from developed lands and clearing of trees along waterways can harm the health of small streams that support salmon, other aquatic life, and wildlife. Water insects (benthic macroinvertebrates) are an indicator of biological health of stream systems, and a common method for quantifying this indicator is the Benthic Index of Biotic Integrity (B-IBI), which produces a numerical value to indicate a stream's ecological condition.

The 2020 recovery target related to urban runoff is for 100 percent of Puget Sound lowland stream drainage areas monitored with baseline B-IBI scores of 42-46 or better to retain these "excellent" scores and mean B-IBI scores of 30 Puget Sound lowland drainage areas improve from "fair" to "good." Further information on the B-IBI scoring system is available at the Puget Sound stream benthos website (www.pugetsoundstreambenthos.org), an ongoing project to store and analyze data from macroinvertebrate sampling programs. Sound-wide results have not been reported, but King County data show that about 37 percent of sites are rated "good" or "excellent" with the remaining 63 percent rated "fair" or "poor."

The three Action Agenda strategies most related to achieving the recovery target for urban runoff are:

- Manage urban runoff at the basin and watershed scale (C2.1)
- Prevent problems from new development at the site and subdivision scale (C2.2)
- Fix problems caused by existing development (structural upgrades; regular and enhanced maintenance) (C2.3)

In the following results chain, or logic model, yellow polygons identify strategies and actions from the Action Agenda that we believe will contribute significantly towards meeting the target. Arrows to the blue boxes describe the intermediate results the strategies and actions are expected to achieve. The purple boxes show the reduced pressure on the ecosystem that is expected to occur, the green ovals show the areas of the ecosystem where the change will be observed, and the dark green square shows the recovery targets.

Puget Sound Recovery -- Insects in Small Streams Target View
v. Nov 23, 2011

