Reducing Pressures on the Puget Sound Ecosystem from Wastewater

The Challenge

Pollution of the rivers, creeks, bays and open waters of Puget Sound comes from a variety of sources and travels along many pathways. This section focuses on the potential for pollution from wastewater collection, treatment, and disposal—the system that is designed to collect and treat used water and human waste from homes and businesses and, in some cases, wastewater from industrial processes and urban stormwater. Essentially, everything that goes down a sink or is flushed down a toilet ends up in the wastewater system. This includes not just human waste but also a wide range of household cleaning products and chemicals and personal care products.

Wastewater management involves a spectrum of approaches and technologies that can be used to effectively treat sewage in different situations. In every case, the selected approach and technology must be tailored to local site conditions and take into account such factors as development densities; capital, maintenance and operation costs; and protection of public health and water resources. Generally, wastewater is treated either through a wastewater treatment plant or through an on-site sewage system. Both types of systems are regulated and permitted by state and/or local agencies.

Local Strategies

Hood Canal, Island, North Central, and Stillaguamish and Snohomish are all considering a range or related local strategies to address this topic.*

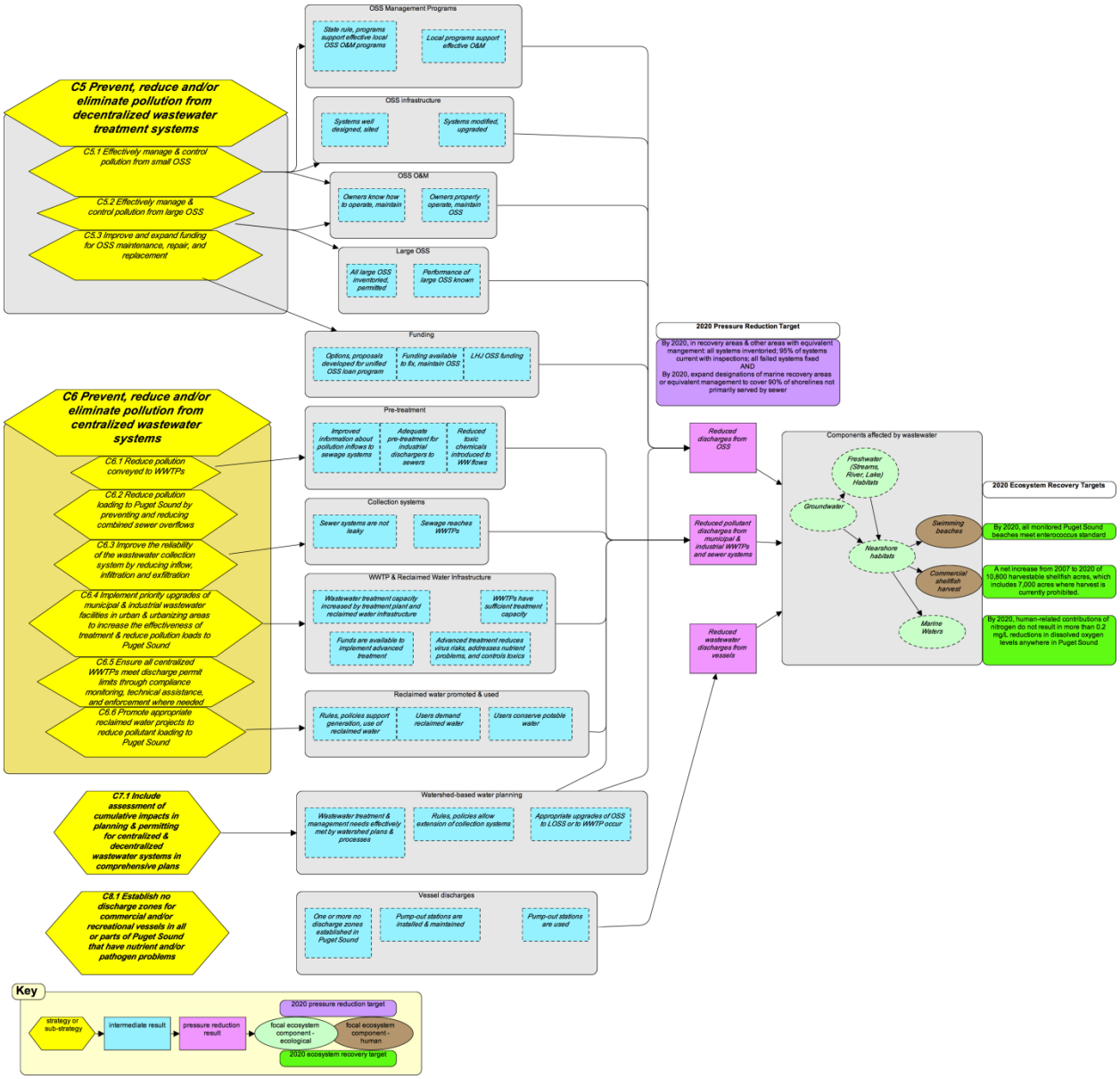
** See Local Areas Chapters for more detail on local areas that are in the process of completing strategy and action identification and prioritization.*

Wastewater treatment plants (WWTP) are centralized facilities that use sewer collection systems to serve a region's most populated and densely developed areas. These systems typically discharge treated effluent to surface water. On-site sewage systems, commonly known as septic systems, are decentralized or distributed systems that serve small communities, areas of limited development, and individual properties. They are called on-site systems because they treat wastewater on or near the site where the wastewater is generated.

Both types of systems are part of the region's permanent wastewater infrastructure. There are roughly 100 WWTP that discharge to surface waters in the Puget Sound region. There are about 300 large on-site sewage systems (LOSS) and more than a half million small on-site sewage systems (OSS) in the Puget Sound basin. Wastewater treatment systems play a critical role protecting public health and water quality, but they need proper management, operation, and maintenance to ensure effective treatment and to protect the infrastructure investments.

Ten centralized Puget Sound facilities include combined sewer overflows (CSOs) as part of their sewage and stormwater system. CSOs often are located in older parts of cities. Sewage and stormwater flow through a single piping system to a sewage treatment plant. During heavy rainfall events the system can be overwhelmed and is then designed to "overflow" untreated wastewater and stormwater at specific outfalls. In some locations, these CSO outfalls have been associated with sediment contamination and other impacts. Untreated wastewater also is discharged to Puget Sound from some boats and vessels.

Strategies for reducing pressures on Puget Sound from wastewater include efforts to prevent and control pollution from on-site sewage systems, wastewater treatment plants, and boats and vessels. They also include consideration of overarching approaches to promote watershed-based and integrated approaches to better manage the region's wastewater treatment needs.



Relationship to Recovery Targets

The 2020 target for the management of OSS is to inventory all OSS, fix all failures, and be current with inspections at 95 percent in marine recovery areas and other designated sensitive areas with equivalent enhanced operation and maintenance (O&M) programs. The target also calls on local health jurisdictions to expand these areas and programs to cover 90 percent of the region's unsewered marine shorelines by 2020.

Three other targets closely associated with the management of wastewater are (1) improved water quality and pollution controls to achieve a net increase of 10,800 harvestable shellfish acres; (2) ensuring human-related contributions of nitrogen do not result in more than 0.2 mg/l reductions in dissolved oxygen levels anywhere in Puget Sound by 2020; and (3) ensuring that all monitored Puget Sound beaches meet enterococcus (a pathogen associated with fecal matter) standards by 2020. Other pollution sources and management programs also directly influence progress toward these ecosystem recovery targets.

C5. Prevent, reduce and/or eliminate pollution from decentralized wastewater treatment systems.

On-site sewage systems are an essential and valuable part of Puget Sound's wastewater infrastructure. They provide a high level of treatment and great flexibility developing and using properties where construction of, or connection to, centralized sewer systems is not feasible or practical. They can be designed and configured to treat sewage in most settings. Small systems (peak design flows below 3,500 gallons per day) typically serve single family residences or multiple connections up to about ten homes. The vast majority of these systems are very small. The typical design for a 3–4 bedroom home is 360–480 gallons per day, and because of water efficiency measures such as low flow showers and faucets, most of these systems operate at closer to 250 gallons per day. Large systems (peak design flows up to 100,000 gallons per day) can be engineered to treat flows from up to 370 residential connections.

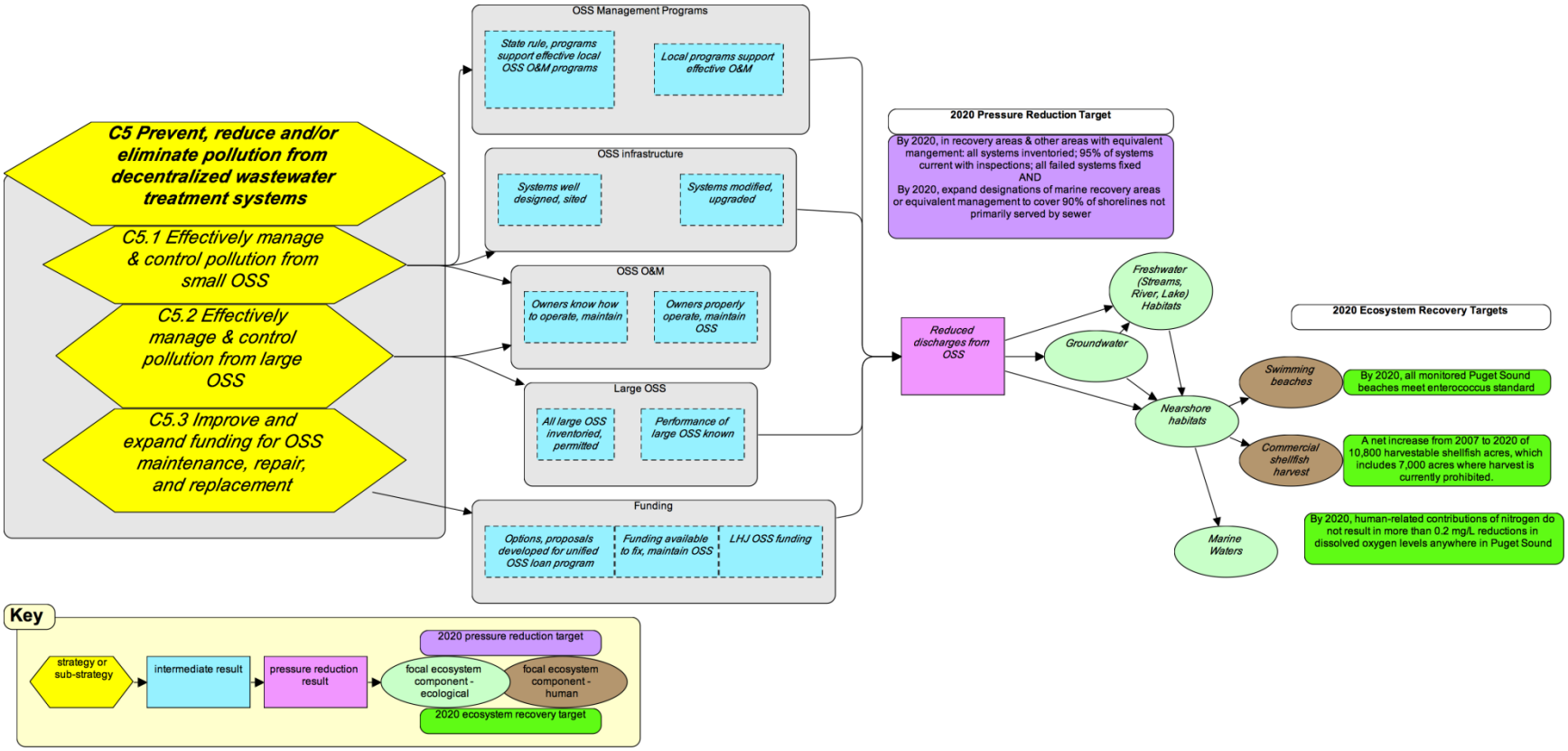
Small on-site sewage systems traditionally consist of collection pipes, a septic tank, and a drainfield. In this design, the septic tank holds and separates wastewater into solid and liquid components to allow initial decomposition and treatment in an anaerobic (septic) environment. From the tank, the liquid effluent flows into the drainfield, which is generally a series of perforated pipes or molded chambers installed in suitable soil. The drainfield provides further treatment by allowing the effluent to be exposed to an oxygen-rich environment where bacteria and other microbes continue to treat contaminants. The drainfield removes and inactivates pathogens as the effluent filters through the soil layers before entering the groundwater.

There are other treatment technologies in use that are collectively referred to as "alternative systems." These systems often use filters to screen solids and pumps to pressurize and distribute the septic tank effluent more evenly over the drainfield to promote better soil treatment. Large on-site sewage systems are often engineered to include additional or other types of treatment.

When on-site sewage systems don't function properly they can pollute groundwater or, if there is a direct connection, nearby surface water. The pathogens and chemicals in sewage can make people sick,

contaminate shellfish and other water resources, and disrupt ecosystem functions. Older on-site sewage systems and systems in sensitive areas often present higher risks. In addition, even properly operating systems can leach excess nutrients into Puget Sound; an issue that needs further study and action to address. Work is underway to better understand and document the sources, loadings, and impacts of nitrogen on Puget Sound and the appropriate steps to effectively address this emerging challenge.

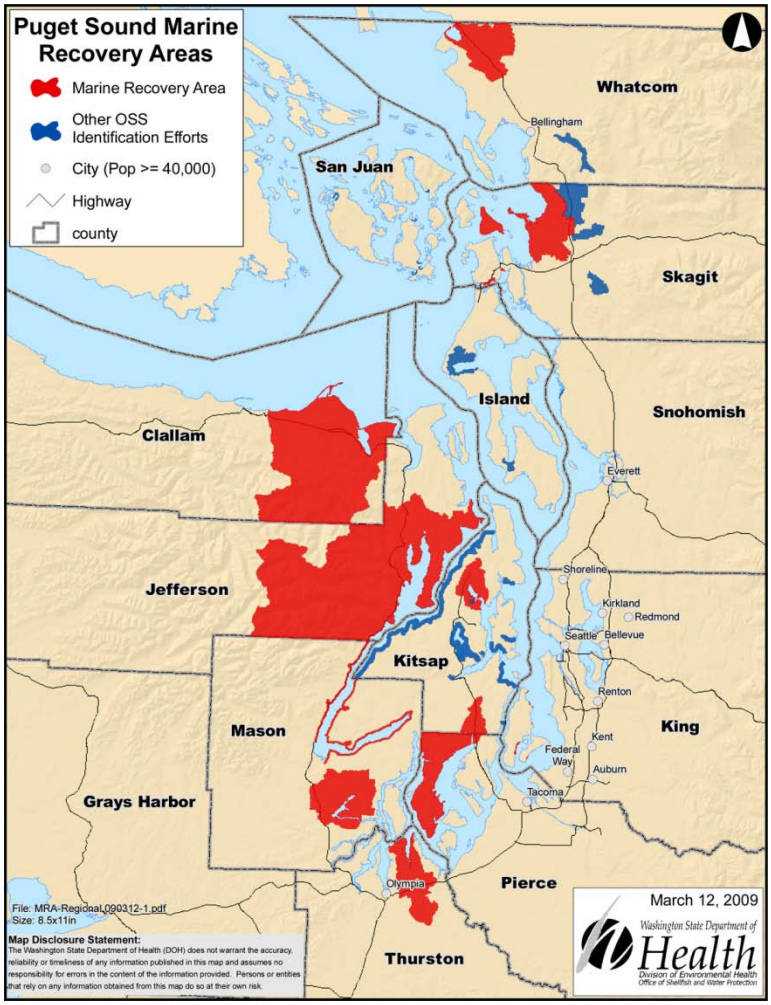
There are many strategies for improving the region's decentralized wastewater infrastructure. The key is life-cycle management and care of on-site sewage systems, making sure they are properly sited, designed, installed, operated and maintained. Overarching strategies include (1) implementing and funding effective state and local on-site sewage programs; 2) providing low-interest loans to help homeowners repair and replace failed and malfunctioning systems; 3) documenting problem areas and pollution impacts and developing appropriate wastewater treatment solutions; and 4) improving practices, partnerships, and professional services to effectively and efficiently manage and maintain on-site sewage systems.


C5 Prevent, reduce and/or eliminate pollution from decentralized wastewater treatment systems
C5.1 Effectively manage & control pollution from small OSS
C5.2 Effectively manage & control pollution from large OSS
C5.3 Improve and expand funding for OSS maintenance, repair, and replacement
OSS Management Programs
State rule, programs support effective local OSS O&M programs
Local programs support effective O&M
OSS infrastructure
Systems well designed, sited
Systems modified, upgraded
OSS O&M
Owners know how to operate, maintain
Owners properly operate, maintain OSS
Large OSS
All large OSS inventoried, permitted
Performance of large OSS known
Funding
Options, proposals developed for unified OSS loan program
Funding available to fix, maintain OSS
LHJ OSS funding
2020 Pressure Reduction Target
By 2020, in recovery areas & other areas with equivalent mangement: all systems inventoried; 95% of systems current with inspections; all failed systems fixed
AND
By 2020, expand designations of marine recovery areas or equivalent management to cover 90% of shorelines not primarily served by sewer
Reduced discharges from OSS
Freshwater (Streams, River, Lake) Habitats
Groundwater
Nearshore habitats
Marine Waters
2020 Ecosystem Recovery Targets
Swimming beaches
By 2020, all monitored Puget Sound beaches meet enterococcus standard
Commercial shellfish harvest
A net increase from 2007 to 2020 of 10,800 harvestable shellfish acres, which includes 7,000 acres where harvest is currently prohibited.
By 2020, human-related contributions of nitrogen do not result in more than 0.2 mg/L reductions in dissolved oxygen levels anywhere in Puget Sound
Key
strategy or sub-strategy
intermediate result
pressure reduction result
2020 pressure reduction target
focal ecosystem component - ecological
focal ecosystem component - human
2020 ecosystem recovery target

C5.1 Effectively manage and control pollution from small on-site sewage systems.

The Washington Department of Health (DOH) administers the state rule for OSS with peak design flows below 3,500 gallons per day (Chapter 246-272A WAC). This is the vast majority of all systems in Puget Sound. Local health jurisdictions adopt and implement this rule to regulate and permit OSS at the local level. Among other requirements, the rule sets standards for siting, designing, installing, operating and maintaining OSS. Once systems are in use, OSS owners are responsible for operating, monitoring, and maintaining their systems to make sure they function properly.

Under the state rule, the 12 Puget Sound local health jurisdictions are required to develop and carry out comprehensive plans to help ensure that systems are properly managed, with emphasis on operation and maintenance (O&M) activities and geographic areas where OSS pose an increased public health risk. The local O&M programs are designed and implemented differently in each county and are applied strategically to different types of systems, sensitive areas, and other situations (e.g., time-of-sale inspections) on the basis of public health risk and other criteria.



As part of the planning process, local health jurisdictions also are required to designate and protect marine recovery areas (Chapter 70.118A RCW). Marine recovery areas (MRAs) must be designated when the local health officer determines that existing OSS are a significant factor contributing to concerns associated with the degradation of shellfish growing areas, marine waters listed by the Department of Ecology for low-dissolved oxygen levels or fecal coliform, or marine waters where nitrogen has been identified as a contaminant of concern. The focus in marine recovery areas is to: (1) find existing failing systems and ensure that system owners make necessary repairs, and; (2) find unknown systems and ensure that they are inspected and functioning properly, and repaired if necessary.

Ongoing Programs

The state and local on-site sewage SS programs are designed to regulate the safe and appropriate use of OSS systems to effectively treat sewage and to protect public health and water quality. Ongoing implementation of these programs includes many activities and responsibilities. Some are unique to DOH, some are unique to the local health jurisdictions, and some are shared. The work includes the following performance objectives: (1) Reviewing and approving local rule changes and reviewing waivers to ensure ongoing consistency with the state rule; (2) reviewing and registering proprietary products, additives, and sewage tanks for use in the state; (3) regularly updating state standards and guidance documents for alternative technologies; (4) contracting with and distributing state funds to help implement the local OSS management plans and coordinating semi-annual performance reporting; and (5) adapting OSS management plan implementation and reporting to align with and make progress toward OSS performance measures adopted for GMAP and the Puget Sound Action Agenda.

All twelve Puget Sound counties have developed local management plans and submitted them to the Department of Health for approval, and nine counties have designated one or more marine recovery areas. The GMAP program has two measures for OSS. First the state tracks the number of on-site sewage system repairs or replacements funded by Ecology in Puget Sound counties. The target is 39 every 6 months. Ecology passes funding to local health jurisdictions that identify the systems for repair or replacement and oversee the work. Since 2007, performance has been at or above the target, and as of December 2010, 388 systems have been repaired or replaced by local health jurisdictions through financial assistance from Ecology. Second, the state tracks the status of OSS inventories and inspections in marine recovery areas. The target, consistent with the Puget Sound recovery goal, is to inventory and inspect 95% of systems in marine recovery areas and other sensitive areas by 2020.

Near-Term Actions

C5.1 NTA 1: **DOH, in consultation with Local Health Jurisdictions (LHJs), will evaluate the effectiveness of the state OSS rule, identify potential changes, and outline recommendations to the State Board of Health by 2013.**

Performance measure: Done or not

C5.1 NTA 2: **LHJs will work to inventory, inspect, and fix OSS and designate areas for enhanced management to make progress on the OSS ecosystem recovery target. To support this, DOH will work with LHJs to identify successes and best practices and develop common performance standards and recommend approaches to improve this work.**

Performance measure: progress towards the OSS ecosystem recovery target; information sharing on best practices, etc.

C5.1 NTA 3: **DOH will evaluate public domain OSS treatment technologies for nitrogen reduction and develop standards and guidance for their use if testing results indicate the technologies are effective and reliable. The evaluation will be complete by December 2013 and standards/guidance development, if needed, will begin after that.**

Performance measures: Evaluation complete or not; standards and guidance (if appropriate) done or not; number of OSS where nitrogen reduction technologies are deployed

C5.1 LNTA 4: **San Juan County Health and Community Services will fully implement the On-site Sewage System (OSS) Operation and Maintenance Program Plan, with a goal of 100% of systems in sensitive areas in compliance and current with inspections by 2014 and 60% of alternative systems to have inspections between 2010-2014.**[13]

Performance measure: To be determined

C5.2 Effectively manage and control pollution from large on-site sewage systems.

DOH directly regulates and permits large on-site sewage systems (LOSS) with flows between 3,500 and 100,000 gpd (chapter 246-272B WAC). DOH adopted a revised LOSS rule in 2011. Among other changes, the expanded LOSS program consolidates all LOSS permitting authority at DOH, requires annual operating permits for all LOSS, and requires protection of public health and the environment. The rule is structured to regulate and permit LOSS in different situations ranging from newly constructed LOSS to existing LOSS that have never been documented or permitted. The revised rule includes many new requirements and approaches for siting, designing, constructing, operating, maintaining, repairing, permitting and managing LOSS.

Ongoing Programs

The overarching performance objective of the LOSS program is to regulate the systems and owners to achieve effective long-term treatment and to protect public health and water quality. The program includes a strong focus on Puget Sound. The work includes the following performance objectives: (1) locate, assess, and permit all LOSS with emphasis on marine recovery areas and other sensitive areas; (2)annually review and renew operating permits; (3) issue permits for LOSS previously permitted by Ecology as the permits expire; (4) issue permits for LOSS previously permitted by local health jurisdictions as the permits transfer to DOH; (5) work with LOSS owners as needed to address deficiencies in order to achieve adequate treatment and compliance with the rule and permit conditions; (5) develop technical guidelines and standards for LOSS design and O&M, system evaluations, document submittals, and other program activities; and (6) reset and report on the LOSS performance measure for GMAP based on the new LOSS rule and database and make progress toward the targets.

The state GMAP performance measure for LOSS is the number of systems in compliance with state requirements. Recently efforts to identify and inspect LOSS have increased; therefore, the compliance rate has been dropping as systems that previously have not been accounted for in the inventory are found and inspected. In the third quarter of 2011 DOH identified 24 LOSS; of those 23 were not in compliance. The majority of LOSS identified are missing paperwork such as O&M manuals and system drawings; however, some have more serious compliance issues, such as proof of adequate treatment. Permits have compliance deadlines based on public health threat. There are currently 136 DOH-permitted LOSS in the Puget Sound region and DOH will be given responsibility for approximately 117 more when responsibilities transfer to DOH from Ecology and local health jurisdictions under the new

LOSS rule. As of the third quarter of 2011, there are an estimated 107 LOSS without permits; DOH's goal is to permit 62 of them by April 2012.

Near-Term Actions

None; work in the near-term will focus on implementation of ongoing programs and the new LOSS rule.

C5.3 Improve and expand funding options for small on-site sewage systems and local OSS programs.

Funding for proper operation and maintenance of on-site sewage systems and for replacement of failing systems is an ongoing challenge. The work is expensive; the average cost for a homeowner to replace a failing system can be as high as $40,000.

Funding assistance currently is comprised of a variety of grant and loan programs, including a $4.2 million state program administered by the Department of Ecology to help homeowners and small businesses in the 12 Puget Sound counties repair, replace, or improve their existing systems. (See discussion of performance objectives for ongoing OSS programs, above.) Since 2007, this program has funded replacement of 388 failing systems around Puget Sound. In addition, Enterprise Cascadia offers low interest loans to homeowners and businesses in Jefferson, Kitsap, Mason, and Clallam Counties for septic repair or replacement. Other Puget Sound counties have established their own low-interest loan programs, as well. While these programs have helped, eligibility for them can be constrained by the age and location of the system, the income level of the homeowner, and other criteria. Additional and more reliable sources of funding assistance are needed to support both O&M and repair or replacement of failing systems.

Near-Term Actions

C5.3 NTA 1: DOH, Ecology, and PSP will help evaluate options and support proposals to fund a unified, self-sustaining, low-interest loan program in the Puget Sound region to help OSS owners repair and replace their systems.

Performance measure: Loan program in place or not; coverage of loan program; capitalization of loan program; number of homeowners assisted; improvements in OSS/LOSS compliance rates

Emerging Issues and Future Opportunities

In addition to the specific ongoing program activities and near-term actions described above, there are a number of ideas for future work that might be considered to better address the Puget Sound region's wastewater treatment needs and further reduce pressures on the Puget Sound ecosystem. These ideas should be an ongoing part of the regional discussion about how to best address wastewater treatment needs in the Puget Sound basin, and may inform future funding decisions, programmatic priorities and guidance, and/or may become near-term actions in future Action Agenda cycles.

Many of these ideas have to do with exploring potential future funding to ensure local health jurisdictions can effectively oversee and administer programs for reliable operation, maintenance, repair and replacement for on-site systems. They include:

- Evaluate approaches and mechanisms (e.g., a flush tax or use of the state revolving fund) to establish a regional funding mechanism to provide stable, reliable funding to support local OSS management plans and O&M programs.
- Evaluate funding options to help local governments with projects involving OSS conversions to more centralized treatment and to decommission abandoned systems. Residences in older neighborhoods in some cities remain on OSS even though surrounding, newer neighborhoods are served by centralized wastewater treatment. It can be difficult to convert these neighborhoods to centralized treatment—often individual homeowners do not have adequate resources or incentives to work together to fund conversation, utilities have little incentive to convert older neighborhoods, and local governments do not have the resources to subsidize these efforts.
- Evaluate and discuss models and ways to engage private wastewater companies and public utilities in OSS management as pilot projects or in new working relationships.
- Explore approaches to expand funding options for LOSS.

Other ideas raise a range of issues related to targeting technical and financial assistance, considering cumulative impacts, and improving treatment technologies.

- Identify priority areas around Puget Sound needing focused technical and financial assistance to solve chronic sewage problems. Explore options to provide targeted technical and financial assistance to solve these problems.
- Revise the definition of OSS failure to account for cumulative impacts of multiple OSS. We need to address situations where the cumulative effect of pollution from OSS in a community has a significant effect on water quality, even though the individual systems do not meet the traditional definition of failure (i.e., sewage that surfaces or backs up into a structure). This may be the case, for example, where it is clear that a certain neighborhood is creating water quality impacts but no individual OSS in that area is failing.
- Objectively evaluate impacts of OSS for pollutants of concern other than fecal coliform, like nitrogen and toxic chemicals, and update regulations and management plan guidance to address these findings.
- Work with OSS industry and others to develop new, affordable and reliable technologies that reduce nutrient and fecal coliform concentrations in OSS effluent.
- Work to develop cost effective ways to effectively separate urine from wastewater.
- If funding is available, coordinate with LHJs and other interests to develop standards of practice for OSS O&M providers in the Puget Sound region by [date]. These standards will focus on providing standard criteria and guidance for successful O&M activities.

Target View: On-Site Sewer System Management

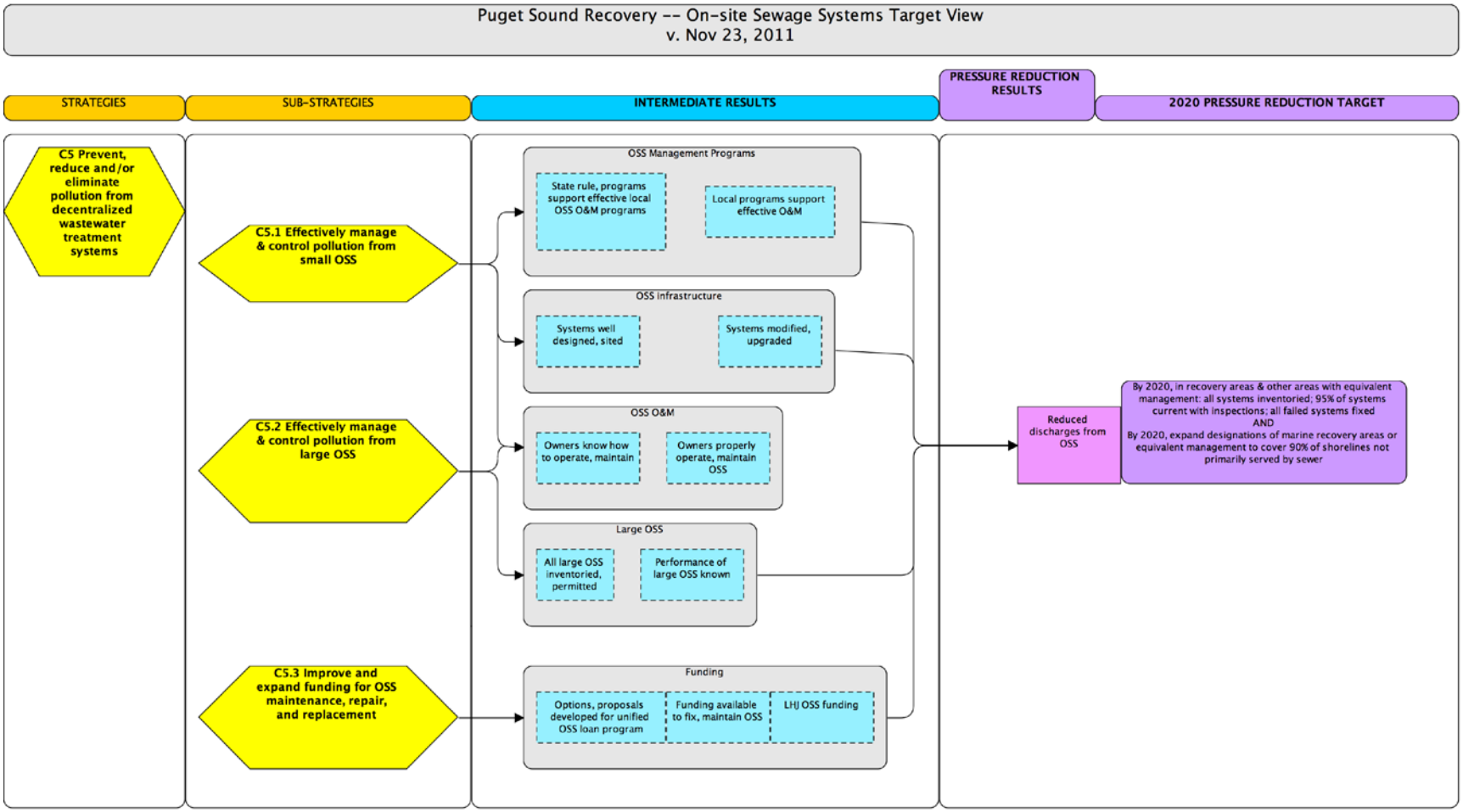
For many people, especially those in rural areas of Puget Sound, on-site sewage systems are the best option for sewage treatment. When properly designed and installed, these systems provide a high level of treatment. Proper care is the key to long-term performance of all sewage treatment systems. Older on-site systems and systems located in sensitive areas often present higher risks. With newer systems, advances in technology mean there's more need for regular maintenance to keep things working smoothly. Poorly maintained systems can break down, requiring costly repairs and polluting our prized waterways and water resources. Regular inspections help protect on-site sewage systems and Puget Sound.

The 2020 recovery target for on-site sewer system management has two components. The first is to inventory and fix all on-site sewage systems in marine recovery areas and other designated sensitive areas and to be current with inspections at 95 percent. The second part is to extend this work to cover 90 percent of Puget Sound's unsewered marine shorelines by 2020.

The three Action Agenda strategies most related to achieving the recovery target for on-site sewer system management are:

- Effectively manage and control pollution from small on-site sewage systems (C5.1)
- Effectively manage and control pollution from large on-site sewage systems (C5.2)
- Improve and expand funding for on-site system maintenance, repair and replacement (C5.3)

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 -- On-site Sewage Systems Target View
v. Nov 23, 2011
STRATEGIES
SUB-STRATEGIES
INTERMEDIATE RESULTS
PRESSURE REDUCTION RESULTS
2020 PRESSURE REDUCTION TARGET
C5 Prevent, reduce and/or eliminate pollution from decentralized wastewater treatment systems
C5.1 Effectively manage & control pollution from small OSS
C5.2 Effectively manage & control pollution from large OSS
C5.3 Improve and expand funding for OSS maintenance, repair, and replacement
OSS Management Programs
State rule, programs support effective local OSS O&M programs
Local programs support effective O&M
OSS Infrastructure
Systems well designed, sited
Systems modified, upgraded
OSS O&M
Owners know how to operate, maintain
Owners properly operate, maintain OSS
Large OSS
All large OSS inventoried, permitted
Performance of large OSS known
Funding
Options, proposals developed for unified OSS loan program
Funding available to fix, maintain OSS
LHJ OSS funding
Reduced discharges from OSS
By 2020, in recovery areas & other areas with equivalent management: all systems inventoried; 95% of systems current with inspections; all failed systems fixed
AND
By 2020, expand designations of marine recovery areas or equivalent management to cover 90% of shorelines not primarily served by sewer

C6. Prevent, reduce and/or eliminate pollution from centralized wastewater systems.

Centralized wastewater treatment facilities are regulated through National Pollution Discharge Elimination System (NPDES) permits administered by EPA and Ecology under the federal Clean Water Act and state regulations. Untreated wastewater from municipal, industrial, and government facilities contains a broad spectrum of pollutants, including nutrients and pathogens. Wastewater treatment removes or transforms many, but not all, contaminants. Depending on the amounts and types of treatment, treated wastewater can contain a variety of contaminants, including personal care products, caffeine, endocrine-mimicking chemicals, pharmaceuticals, and industrial chemicals.

Approximately 100 municipal and industrial wastewater treatment plants discharge to the marine waters of Puget Sound and the Straits of Georgia and Juan de Fuca and to rivers and other water bodies in the Puget Sound watershed. The combined daily discharge of treated wastewater to Puget Sound is over 430 million gallons per day. In addition, during wet weather events, CSOs in some older urban areas of ten Puget Sound cities sometimes discharge mixed stormwater and untreated domestic and industrial wastewater when conveyance or treatment plant capacities are exceeded.

The effectiveness of pollutant removal at treatment plans varies with the treatment technology and to some degree the age of the treatment facility. Treatment effectiveness also depends on the amount and types of contaminants in the wastewater treatment facilities receive from residents and businesses. Municipal facilities have traditionally focused on removing pathogens, biochemical oxygen demand, toxic chemicals, and suspended solids with a primary objective of protecting human health. Industrial facilities typically have systems customized to the exact composition of their wastewater and/or discharge to municipal systems after pre-treatment on site. In Puget Sound most municipal wastewater treatment plants use secondary treatment technology, and few have needed to install advanced treatment technology to meet current discharge limits. All new facilities constructed in recent years have been built with advanced treatment.

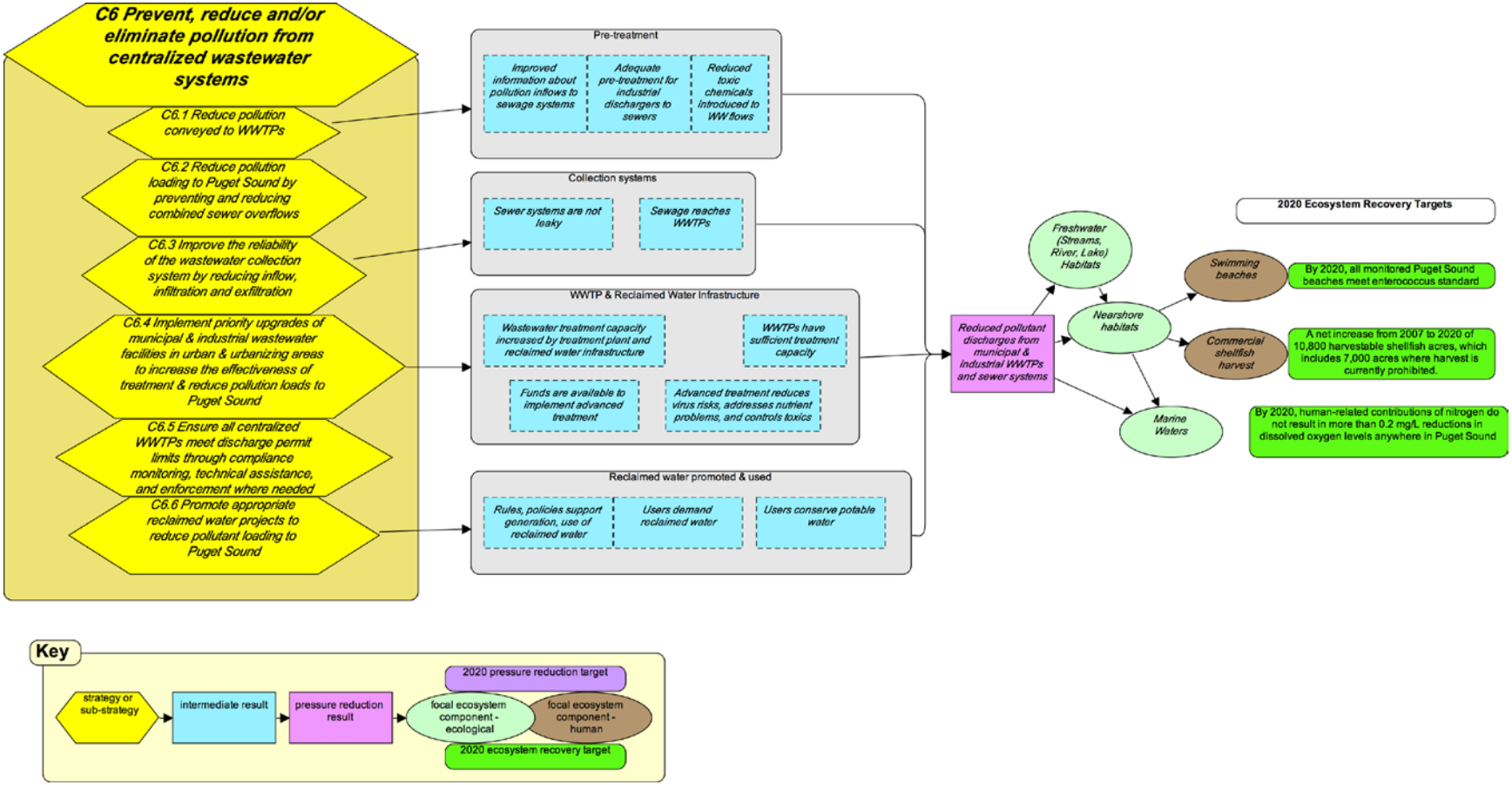
Reducing the amount of impervious surface also will reduce the frequency and extent of CSOs and Inflow and Infiltration (I&I). Implementing the stormwater actions described in Section C2 will help reduce the pressure on Puget Sound from wastewater.

Relationship to Recovery Targets

The 2020 target most associated with centralized wastewater treatment is the larger Puget Sound nutrient target—that the combination of all human sources must not contribute to dissolved oxygen depletion more than 0.2 mg/L anywhere in Puget Sound. This is similar to state water quality standards. Potential human contributions to oxygen depletion in areas of Puget Sound include wastewater treatment plant discharges, on-site wastewater systems, stormwater, and other sources. Computer models will be required to quantify progress towards the target.

Two other targets closely associated with the management of wastewater are (1) improved water quality and pollution controls to achieve a net increase of 10,800 harvestable shellfish acres, and (2) ensuring that all monitored Puget Sound beaches meet enterococcus standards by 2020. As with the

dissolved oxygen target, other pollution sources and management programs also directly influence progress toward these ecosystem recovery targets.


C6 Prevent, reduce and/or eliminate pollution from centralized wastewater systems
C6.1 Reduce pollution conveyed to WWTPs
C6.2 Reduce pollution loading to Puget Sound by preventing and reducing combined sewer overflows
C6.3 Improve the reliability of the wastewater collection system by reducing inflow, infiltration and exfiltration
C6.4 Implement priority upgrades of municipal & industrial wastewater facilities in urban & urbanizing areas to increase the effectiveness of treatment & reduce pollution loads to Puget Sound
C6.5 Ensure all centralized WWTPs meet discharge permit limits through compliance monitoring, technical assistance, and enforcement where needed
C6.6 Promote appropriate reclaimed water projects to reduce pollutant loading to Puget Sound
Pre-treatment
Improved information about pollution inflows to sewage systems
Adequate pre-treatment for industrial dischargers to sewers
Reduced toxic chemicals introduced to WW flows
Collection systems
Sewer systems are not leaky
Sewage reaches WWTPs
WWTP & Reclaimed Water Infrastructure
Wastewater treatment capacity increased by treatment plant and reclaimed water infrastructure
WWTPs have sufficient treatment capacity
Funds are available to implement advanced treatment
Advanced treatment reduces virus risks, addresses nutrient problems, and controls toxics
Reclaimed water promoted & used
Rules, policies support generation, use of reclaimed water
Users demand reclaimed water
Users conserve potable water
Reduced pollutant discharges from municipal & industrial WWTPs and sewer systems
Freshwater (Streams, River, Lake) Habitats
Nearshore habitats
Marine Waters
2020 Ecosystem Recovery Targets
Swimming beaches
By 2020, all monitored Puget Sound beaches meet enterococcus standard
Commercial shellfish harvest
A net increase from 2007 to 2020 of 10,800 harvestable shellfish acres, which includes 7,000 acres where harvest is currently prohibited.
By 2020, human-related contributions of nitrogen do not result in more than 0.2 mg/L reductions in dissolved oxygen levels anywhere in Puget Sound
Key
strategy or sub-strategy
intermediate result
pressure reduction result
2020 pressure reduction target
focal ecosystem component - ecological
focal ecosystem component - human
2020 ecosystem recovery target

C6.1 Reduce the concentrations of contaminant sources of pollution conveyed to wastewater treatment plants through education and appropriate regulations, including improving pre-treatment requirements.

Preventing sources of pollution conveyed to wastewater treatment plants will be a key part of reducing the overall threat to Puget Sound. Strategies and actions related to reducing sources of toxics are addressed in strategy C1 and include developing safer alternatives for chemicals in use, advancing programs to help prevent chemicals from entering the Puget Sound environment, education and technical assistance, and other strategies.

Ongoing Programs

In addition, effective implementation of the pre-treatment program plays a vital part in ensuring contaminants are not conveyed to wastewater treatment plants in amounts excess of the plants' treatment capacity or acceptance requirements. Pretreatment programs are focused on working with businesses and industrial facilities that discharge wastewater to municipal treatment plants. The programs are focused on preventing the introduction of pollutants that could interfere with treatment plant processes, impact receiving water or biosolids quality, and/or threaten workers' safety.

Near-Term Actions

C6.1 NTA 1: Ecology will evaluate expanded monitoring of phthalates in priority pollutant scans for all industrial users in pretreatment programs by 2013.

Performance measures: Done or not; number of industrial users who complete phthalates scans

C6.2 Reduce pollution loading to Puget Sound by preventing and reducing Combined Sewer Overflows.

Combined sewer systems are wastewater collection systems designed to carry sanitary sewage (consisting of domestic, commercial, and industrial wastewater) and stormwater in a single piping system to a treatment facility. In periods of rainfall or snowmelt, total wastewater flows can exceed the capacity of the sewer collection systems and/or treatment facilities. When this occurs, the combined sewer system is designed to overflow directly to nearby streams, lakes, and harbors, discharging untreated sewage and stormwater. These overflows are called combined sewer overflows (CSOs) and can cause contribute to water and sediment quality problems.

Contaminants in CSOs can include pathogens, oxygen consuming pollutants, solids, nutrients, toxic chemicals, and floatable matter—all of which can harm the health of people, fish and wildlife. CSOs can contribute to shellfish harvesting restrictions, contaminated sediment, impairment of the aquatic habitat, and aesthetic degradation due to unsightly floating materials associated with raw sewage. Ten Puget Sound cities have combined sewage and storm collection systems.

CSO control is a vital part of the statewide effort to reduce and control stormwater discharges. CSO reduction programs are in place in 11 cities in Washington. In 1988, Ecology estimated that the average

volume of untreated CSOs discharged to the state waters was 3.3 billion gallons per year. Since then, Washington has made progress in addressing this pressure, with a reduction of CSOs to less than one billion gallons in 2009.

A number of communities have been successful in controlling and reducing their CSOs completely and the remaining communities continue to make progress in CSO control. Strategies for controlling CSOs include separation, storage, or treatment of flows. More recently, "green" stormwater infrastructure (GSI) has been used alone or in concert with other control strategies as a cost effective approach for some CSO reduction projects. Many different tools, including a variety of stormwater control strategies, could be used to reduce pressures on the Puget Sound ecosystem from CSOs.

Ongoing Programs

One of EPA's National Priorities for enforcement and compliance assurance for FY 2008–2010 addresses CSOs and sanitary sewer overflows (SSOs). The priority focuses on enforcement of the Clean Water Act and the codified CSO Control Policy which requires that CSO discharges to be reduced to a level that does not contribute to violations of the water quality standards.

Ecology requires that CSO discharges be controlled to an average of one discharge per year per outfall, consistent with the EPA's CSO Control Policy. As of February 2011 the following Puget Sound CSO facilities have been determined to meet this standard: Anacortes, Bellingham, Bremerton, and LOTT (in Olympia). Other facilities are under permits or compliance orders to meet the standard: Everett (estimated compliance date 2017), King County (estimated compliance date 2030), Mount Vernon (estimated compliance date 2015), Port Angeles (estimated compliance date 2015), Seattle (estimated compliance date 2025), and Snohomish (no estimated compliance date).

Ecology's work on CSOs is focused on ensuring that facilities current in compliance so, and on providing technical assistance to facilities developing compliance plans and activities to ensure they meet their compliance dates.

Near-Term Actions

None; work in the near-term will focus on implementation of ongoing programs.

C6.3 Improve the reliability of the wastewater collection system by reducing inflow, infiltration and exfiltration.

Most sewers in the Puget Sound region are not combined sewers; they are designed to convey only wastewater. However, because of the ages of the systems, many of these "separated" sewers also convey groundwater and stormwater that enter through leaky pipes, improper storm drain connections, and other means. There is some evidence that a substantial portion of excess water entering conveyance lines derives from side sewers that connect individual homes and businesses to the collection system. Excess water that flows into sewer pipes from groundwater and stormwater is called infiltration and inflow, or I/I. Groundwater (infiltration) can seep into sewer pipes through holes, cracks, joint failures, and faulty connections. Stormwater (inflow) can rapidly flow into sewers via roof drain downspouts, foundation drains, storm drain cross-connections, and through holes in manhole covers. Most I/I is caused by aging infrastructure that needs maintenance or replacement. This excess water

takes up capacity during peak flows that could otherwise be used for wastewater treatment alone and generates the need to build added capacity in pipelines, treatment plants, and other wastewater facilities.

Ongoing Programs

Wastewater treatment providers manage inflow and infiltration as part of the overall maintenance of the conveyance system; however where I/I derives largely from side sewers or individual homes or businesses opportunities for centralized utilities to find and repair the sources of I/I can be limited, and present funding challenges. NPDES permits do not necessarily specify a target for the percent of water delivered to treatment plants that comes from I&I rather than through wastewater. Permittees are required to report I&I in their annual reports to Ecology. I&I levels are reviewed along with any permit violations or SSOs. SSOs are considered spills and must be reported to Ecology. Ecology may issue a compliance order to plants that have multiple problems, and I&I controls would be one of several actions required. Currently one plant in South Puget Sound is under a compliance order. Recent permits added a new requirement that permittees pressure test force mains for exfiltration. Plants that have high levels of I&I in the winter are more likely to produce exfiltration in the summer months. In addition, permits stipulate that any gravity sewers close to water bodies must pressure test once per permit cycle.

Key Ongoing Program Activities

- Ecology, in accordance with NPDES permits issued under the Clean Water Act, will continue to work with permittees to reduce SSOs in all areas of Puget Sound, with an emphasis on MRAs.
- Ecology will work with permittees reduce inflow and infiltration in centralized wastewater collection systems in all areas of Puget Sound with an emphasis on watersheds with declining baseflows or watersheds closed to additional withdrawals or otherwise water stressed.
- Ecology will work with permittees to reduce exfiltration in all areas of Puget Sound with an emphasis on watersheds and marine waters where bacteria concentrations violate water quality standards.
- Ecology will complete evaluations of I/I project effectiveness in Puget Sound Basin and review evaluations from elsewhere to determine the potential effectiveness of I/I reduction programs.

Near-Term Actions

None; work in the near-term will focus on implementation of ongoing programs.

C6.4 Implement priority upgrades of municipal and industrial wastewater facilities in urban and urbanizing areas to increase the effectiveness of treatment and reduce pollution loads to Puget Sound.

EPA has delegated authority to Ecology to administer the Clean Water Act provisions for NPDES permits. This includes both individual permits to discharge and general permits that cover multiple dischargers in particular categories of sources (e.g., municipal stormwater permits). All wastewater treatment plants that discharge to Puget Sound have individual NPDES permits, which are highly tailored to meet water quality standards for the pollutants in the discharge.

Ecology also is responsible for establishing Total Maximum Daily Loads (TMDLs) for impaired water bodies that are identified as not meeting state water quality standards. In marine waters such as Puget Sound, TMDLs require that contributions from the combined total of human point and nonpoint sources cannot cause dissolved oxygen levels to fall below particular concentrations; where concentrations naturally fall below these levels, the combined total of all human sources cannot cause more than a 0.2 mg/L depletion at any time. Marine waters with measured concentrations below the thresholds must be assessed to determine whether human activities are contributing to the low levels or whether the low levels result from natural conditions. Through implementation of the TMDL program, Ecology can identify when and where wastewater treatment discharge limits for individual treatment plans must be lowered to achieve water quality goals.

Ongoing Programs

To support TMDL processes in Puget Sound, Ecology is carrying out a number of studies to determine how nitrogen from a variety of sources affects dissolved oxygen levels in South Puget Sound and other areas with low levels of dissolved oxygen. These studies are a critical first step in determining what will be needed to improve water quality. The results of the studies may show that human-related sources of nitrogen need to be reduced to keep South Puget Sound and other regions healthy. If reductions are needed, the study will also help determine where reductions might need to occur and what actions might be needed, such as upgrading wastewater treatment plans to advanced treatment. These studies also will identify areas where nonpoint sources, include contamination from onsite systems and polluted runoff, need to be reduced. The TMDL program and related near-term actions are described in Section C11.

Near-Term Actions

None; work in the near-term will focus on implementation of ongoing programs; see C11.

C6.5 Ensure all centralized wastewater treatment plants meet discharge permit limits through compliance monitoring, technical assistance, and enforcement where needed.

NPDES permit holders, including all WWTP that discharge to Puget Sound must report compliance in Daily Monitoring Records (DMRs) submitted to Ecology. Ecology reviews these DMRs and also inspects facilities for compliance.

Ecology's goal is that all WWTP maintain compliance with permits written to meet standards for all permit limits. Consistent with this goal, Ecology recognizes WWTP for perfect performance – that is, meeting every permit condition, every day, for an entire year. In 1995 only 14 plants in Washington State were in full compliance with permit requirements; in 2010, over 100 plants were in full compliance including 40 within the Puget Sound watershed.

When violations are found, Ecology's goal is to ensure plants return to compliance quickly. EPA guidance defines a major violation as any parameter violated by a permittee for the months in a row. In that case, Ecology's permit manager initiates contact with the permittee and takes a range of action to ensure a return to compliance. Ecology may issue enforcement orders if a permittee is unable to correct the violation. Ecology's goal is to inspect major plants once a year and minor plants every two years.

Near-Term Actions

None; work in the near-term will focus on implementation of ongoing programs.

C6.6 Promote appropriate reclaimed water projects to reduce pollutant loading to Puget Sound.

Reclaimed water is derived from domestic wastewater and small amounts of industrial process water or stormwater. The process of reclaiming water, sometimes called water recycling or water reuse, involves a highly engineered, multi-step treatment process that speeds up nature's restoration of water quality. The process provides a high-level of disinfection and reliability to assure that only water meeting stringent requirements leaves the treatment facility.

Reclaimed water can be used for a wide variety of beneficial uses such as irrigation, industrial process and cooling water, toilet flushing, dust control, construction activities, and many other non-potable uses. Reclaimed water also can be used as resource to create, restore, and enhance wetlands, recharge groundwater supplies, and increase the flows in rivers and streams. Reclaimed water is classified based on intended use. Class A reclaimed water must meet strict standards. Reclaimed water must not cause a violation of state water quality standards.

Ongoing Programs

Expansion of reclaimed water programs will be a vital part of Puget Sound recovery. In 2006 the Legislature directed Ecology to adopt a rule for reclaimed water use by 2010. Currently this rulemaking is delayed per the Governor's directive placing a moratorium on rulemaking; the earliest the rulemaking can be adopted under that moratorium is 2013. When final, the rule will provide a consistent, predictable, and efficient regulatory process. It also will encourage the generation and beneficial use of reclaimed water while preserving and protecting public health, the environment, and existing water rights.

Key Ongoing Program Activities

- Ecology will resume the Reclaimed Water Rule no earlier than 2013 or as directed by the Governor. The intent of this rule is to encourage the appropriate use of reclaimed water.
- Ecology will develop materials that describe the full range of beneficial uses for reclaimed water, best and appropriate uses, and public health issues (in consultation with DOH) to expand market demand for reclaimed water. The draft guidance document developed for the rule is on hold along with the Reclaimed Water Rule until 2013 at the earliest.
- As part of the future Reclaimed Water Rule, PSP and Ecology will develop a comprehensive outreach and education approach to promote the appropriate use of reclaimed water, including incentives for reclaimed water use where appropriate, and reduce barriers to reclaimed water projects.

Near-Term Actions

None; work in the near-term will focus on implementation of ongoing programs.

Emerging Issues and Future Opportunities

In addition to the specific ongoing program activities and near-term actions described above, there are a number of ideas for future work that might be undertaken to address the Puget Sound region's ongoing need for centralized wastewater treatment and to further reduce pressures on the Puget Sound ecosystem. These ideas should be an ongoing part of the regional discussion about how to best address wastewater treatment needs in the Puget Sound basin, and may inform future funding decisions, programmatic priorities and guidance, and/or may become near-term actions in future Action Agenda cycles. They include the following.

- Consideration of whether increasing nutrient removal requirements should be applied through the water quality based programs such as TMDL implementation, or whether Ecology should pursue a revision in secondary treatment technology standards for new treatment plants and upgrades at treatment plants that discharge to Puget Sound before all TMDLs are complete. Some stakeholders advocate requiring advanced secondary treatment (largely for nitrogen removal) and/or tertiary treatment (largely for additional chemical treatment or other forms of polishing) for all WWTPs that discharge to Puget Sound; others are concerned about making such a large investment (and thereby precluding other needed investments) without specific documentation that such treatment is needed to protect water quality.
- Exploration of the feasibility and pros/cons of moving or eliminating some outfalls where specific water quality conditions or aquatic resource issues are of concern, through, for example, an outfall siting analysis by an interdisciplinary team. This could be particularly relevant to shellfish bed restoration, since some shellfish growing areas are closed simply because of their proximity to an outfall, and the potential for pollution this proximity raises, rather than due to any specific documented water quality problem.
- Better understanding and addressing other contaminants of concern. Due to new detection and sampling methods and new products and consumption patterns we are increasingly aware of chemicals that can threaten human and environmental health in effluents from wastewater treatment plants at very low concentrations. These include pharmaceuticals, personal care products, caffeine, natural hormones, and other chemicals. We should better understand where this is occurring and the impacts of these chemical in the environment and continue to refine source control and wastewater treatment programs to address chemicals of concern.
- Replacement of aging infrastructure.

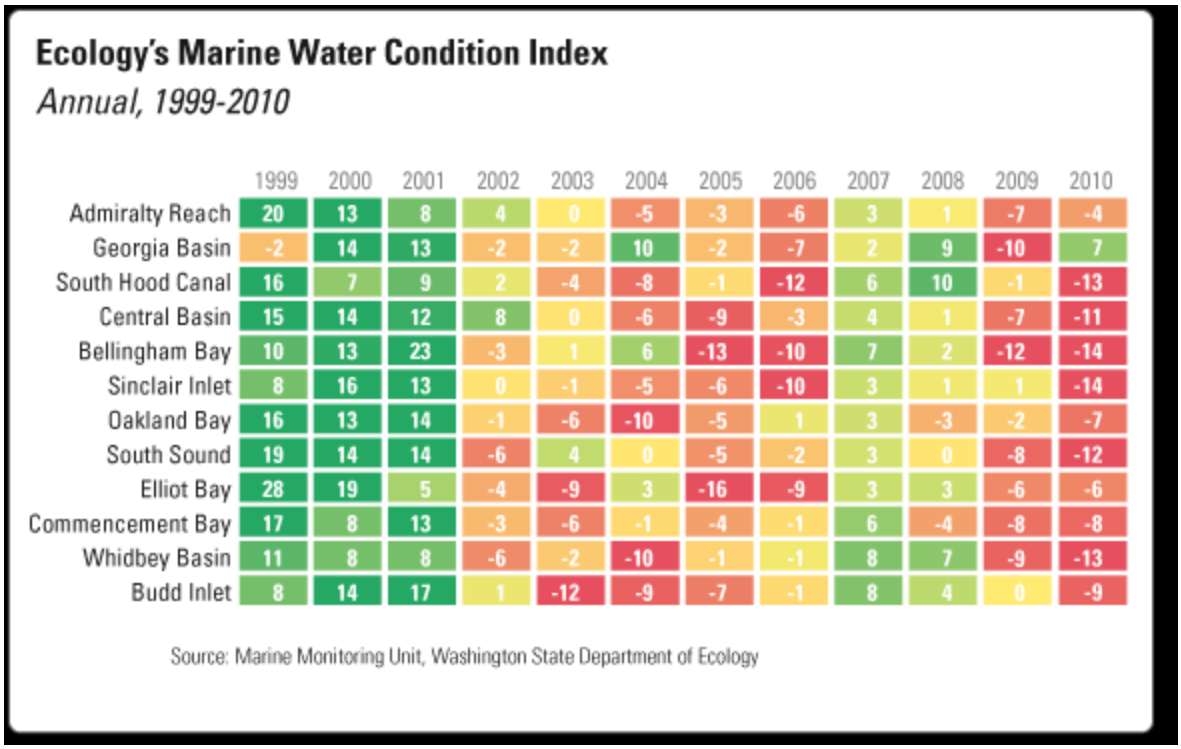
Target View: Dissolved Oxygen in Marine Waters

One important measure of water quality and a component of the Marine Water Condition Index is the amount of dissolved oxygen in the water. Fish, crabs, and many other species living in Puget Sound need oxygen to survive. As dissolved oxygen decreases, animals become stressed. When levels of dissolved oxygen get too low, fish and other animals may die, often in widespread "fish kills." An over abundance of nitrogen can be a major cause of low dissolved oxygen since it fosters growth in marine plants and algae. When these plants and algae die, their decay robs the water of oxygen. Nitrogen occurs naturally in water, but we also add more through discharge from wastewater treatment plants, septic systems, and run-off from developed and agricultural lands. One way we can improve marine water quality is to reduce the amount of nitrogen we contribute from these sources. Linking the amount of nitrogen pollution from humans to the growth of algae and the amount of dissolved oxygen is critical to protecting water quality.

The 2020 recovery target for improving water quality is to keep dissolved oxygen levels from declining more than 0.2 milligrams per liter (mg/L) in any part of Puget Sound as a result of human inputs.

Because dissolved oxygen concentrations are a result of many natural and human influences, we cannot simply measure dissolved oxygen and understand how much humans contribute directly. This target requires a combination of monitoring data, studies on the sources of nitrogen and sophisticated mathematical models to determine whether human inputs are contributing to a decline in dissolved oxygen.

The Washington Department of Ecology and others are currently working on such studies. Initial results will be available sometime in late 2012. At that time we will understand whether humans contribute to low levels of dissolved oxygen and what management actions may be necessary to address them. In the future we will update these results using better models and more recent estimates of nitrogen loads coming into Puget Sound. Together, model assessments and the Marine Water Condition Index will be used to track current conditions and long term changes in dissolved oxygen and overall water quality of Puget Sound.

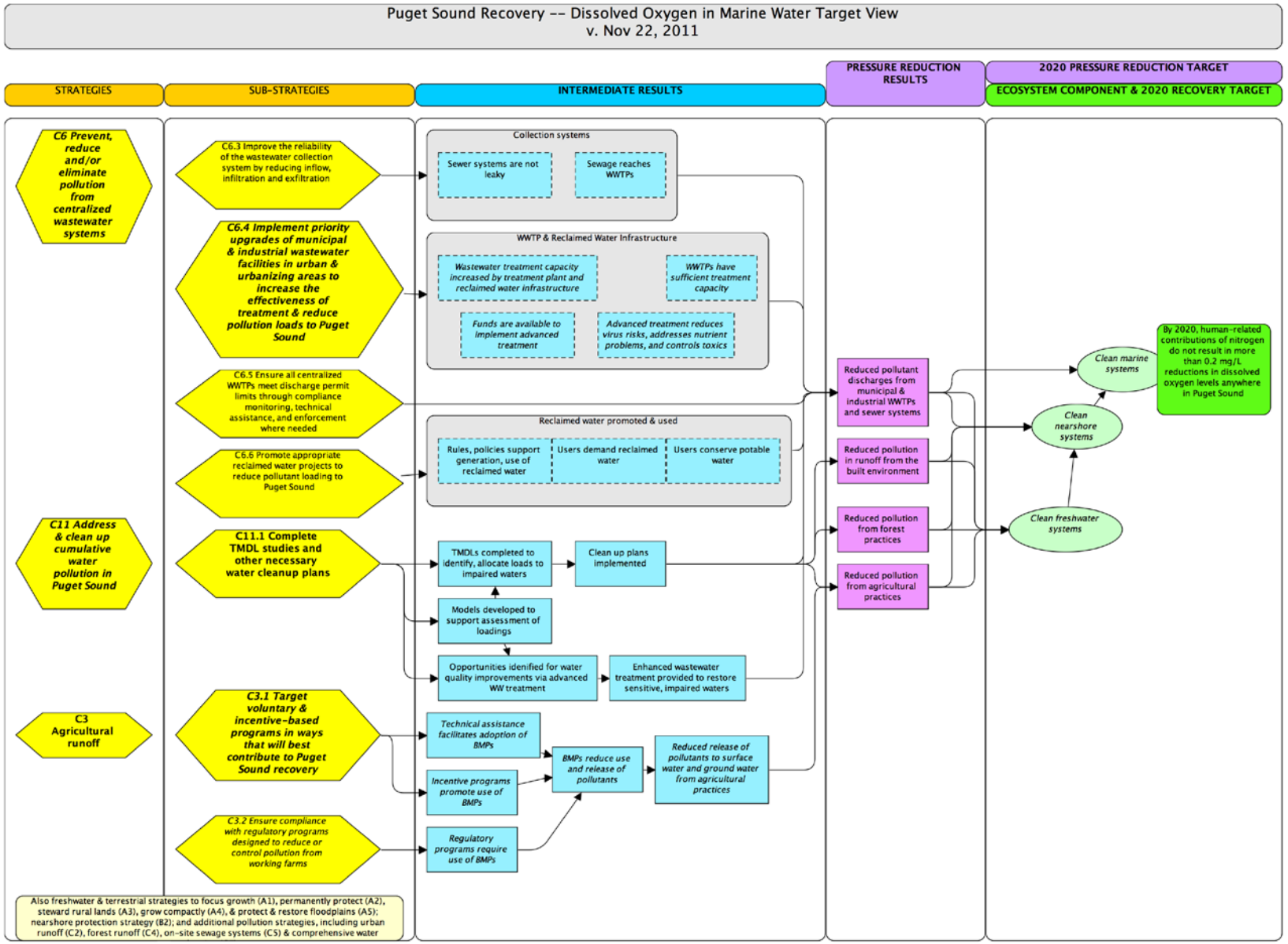


The Marine Water Condition Index combines measurements relevant to water quality in Puget Sound. Changes in water quality are reported with numbers greater than zero indicating improving water quality in green and numbers smaller than zero indicating decreasing water quality in red. Although the index is well suited to track changes in water quality in Puget Sound it cannot be used to identify the specific sources of human contribution that are causing poor water quality.

The three Action Agenda strategies most related to achieving the recovery target for dissolved oxygen in marine waters are:

- Implement priority upgrades of municipal and industrial wastewater facilities in urban and urbanizing areas to increase the effectiveness of treatment and reduce pollution loads to Puget Sound (C6.4)
- Complete Total Maximum Daily Load (TMDL) studies and other necessary water cleanup plans for Puget Sound to set pollution discharge limits and determine response strategies to address water quality impairments (C11.1)
- Target voluntary and incentive-based programs in ways that will best contribute to Puget Sound recovery (C3.1)

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 -- Dissolved Oxygen in Marine Water Target View
v. Nov 22, 2011
STRATEGIES
SUB-STRATEGIES
INTERMEDIATE RESULTS
PRESSURE REDUCTION RESULTS
2020 PRESSURE REDUCTION TARGET
ECOSYSTEM COMPONENT & 2020 RECOVERY TARGET
C6 Prevent, reduce and/or eliminate pollution from centralized wastewater systems
C6.3 Improve the reliability of the wastewater collection system by reducing inflow, infiltration and exfiltration
C6.4 Implement priority upgrades of municipal & industrial wastewater facilities in urban & urbanizing areas to increase the effectiveness of treatment & reduce pollution loads to Puget Sound
C6.5 Ensure all centralized WWTPs meet discharge permit limits through compliance monitoring, technical assistance, and enforcement where needed
C6.6 Promote appropriate reclaimed water projects to reduce pollutant loading to Puget Sound
C11 Address & clean up cumulative water pollution in Puget Sound
C11.1 Complete TMDL studies and other necessary water cleanup plans
C3 Agricultural runoff
C3.1 Target voluntary & incentive-based programs in ways that will best contribute to Puget Sound recovery
C3.2 Ensure compliance with regulatory programs designed to reduce or control pollution from working farms
Collection systems
Sewer systems are not leaky
Sewage reaches WWTPs
WWTP & Reclaimed Water Infrastructure
Wastewater treatment capacity increased by treatment plant and reclaimed water infrastructure
WWTPs have sufficient treatment capacity
Funds are available to implement advanced treatment
Advanced treatment reduces virus risks, addresses nutrient problems, and controls toxics
Reclaimed water promoted & used
Rules, policies support generation, use of reclaimed water
Users demand reclaimed water
Users conserve potable water
TMDLs completed to identify, allocate loads to impaired waters
Clean up plans implemented
Models developed to support assessment of loadings
Opportunities identified for water quality improvements via advanced WW treatment
Enhanced wastewater treatment provided to restore sensitive, impaired waters
Technical assistance facilitates adoption of BMPs
Incentive programs promote use of BMPs
BMPs reduce use and release of pollutants
Reduced release of pollutants to surface water and ground water from agricultural practices
Regulatory programs require use of BMPs
Reduced pollutant discharges from municipal & industrial WWTPs and sewer systems
Reduced pollution in runoff from the built environment
Reduced pollution from forest practices
Reduced pollution from agricultural practices
Clean marine systems
Clean nearshore systems
Clean freshwater systems
By 2020, human-related contributions of nitrogen do not result in more than 0.2 mg/L reductions in dissolved oxygen levels anywhere in Puget Sound
Also freshwater & terrestrial strategies to focus growth (A1), permanently protect (A2), steward rural lands (A3), grow compactly (A4), & protect & restore floodplains (A5); nearshore protection strategy (B2); and additional pollution strategies, including urban runoff (C2), forest runoff (C4), on-site sewage systems (C5) & comprehensive water

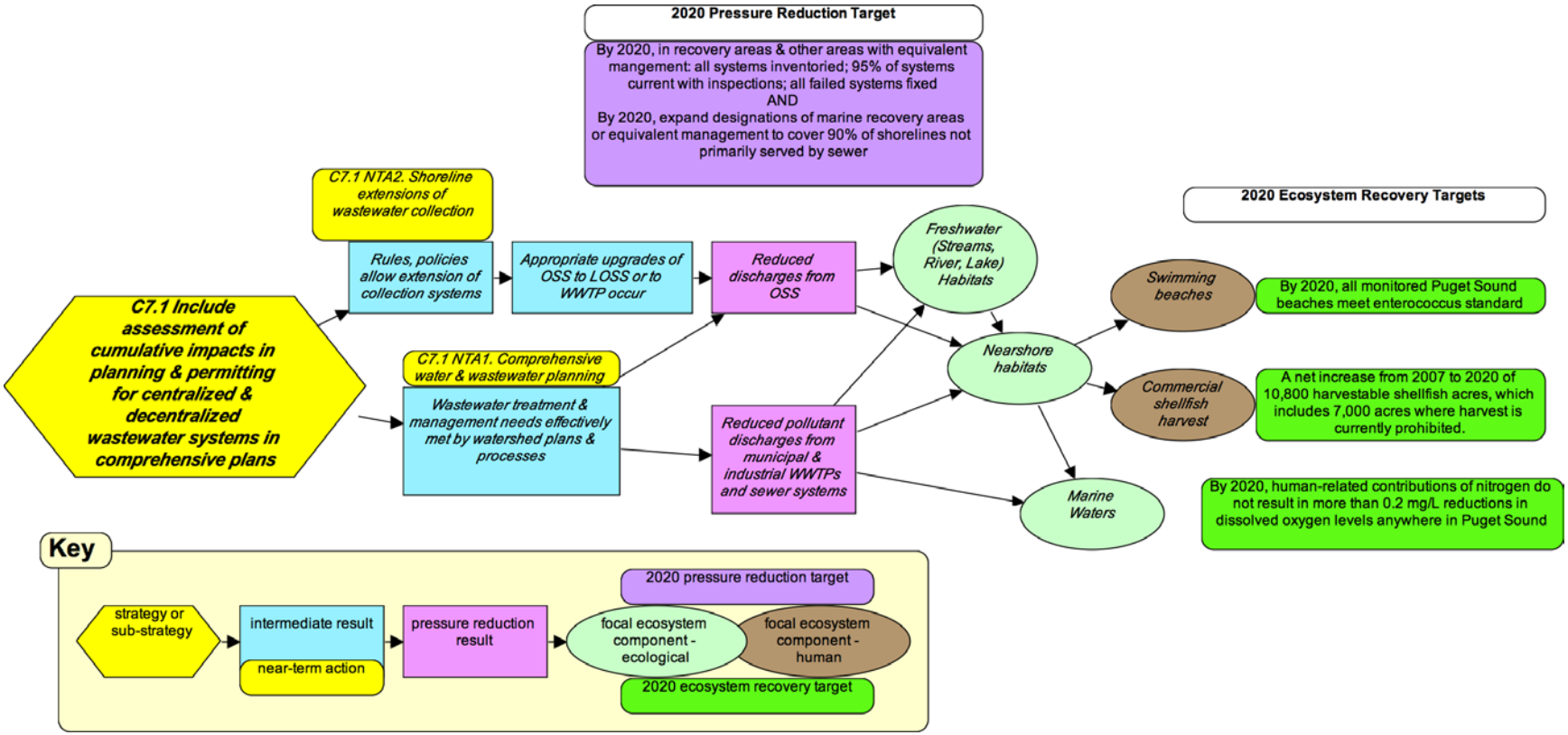
C7. Rethinking How We Plan for and Approach Wastewater Control and Management

Planning, regulatory and permitting approaches to controlling potential pollution from wastewater have evolved largely in separate programs, with state and local health departments generally leading the efforts related to OSS and federal and state governments generally leading efforts related to centralized wastewater treatment, with state oversight. Over time, growth management and other planning processes have also begun to influence wastewater strategies by defining where certain types of infrastructure are appropriate.

While coordination across programs and among planning, permitting and regulatory agencies is already a goal, the differences in the underlying systems can sometimes create unintended consequences. For example, growth management guidelines generally prevent extension of collection systems for centralized wastewater treatment outside of urban growth boundaries; however, in many jurisdictions there are areas outside urban growth boundaries, developed before growth management planning, that have urban densities which were developed before growth management planning. This often happens along marine and freshwater shorelines, where the desirability of the location resulted in narrow lot sizes and dense populations. These non-conforming or legacy uses generally are grandfathered in under growth planning, and can create cumulative impacts from multiple OSS along the shoreline.

Relationship to Recovery Targets

Comprehensive improvements to wastewater management have the potential to affect many recovery targets. The four targets most closely associated with wastewater management are: (1) inventorying all OSS, fixing all failures, and being current with inspections at 95 percent in Marine Recovery Areas and other areas with equivalent enhanced O&M programs and expanding these designated areas and programs to cover 90 percent of the region's unsewered marine shorelines by 2020; (2) improved water quality and pollution controls to achieve a net increase of 10,800 harvestable shellfish acres; (3) ensuring human-related contributions of nitrogen do not result in more than 0.2 mg/l reductions in dissolved oxygen levels anywhere in Puget Sound by 2020; and (4) ensuring that all monitored Puget Sound beaches meet enterococcus standards by 2020. Other pollution sources and management programs also directly influence progress toward these ecosystem recovery targets.


2020 Pressure Reduction Target
By 2020, in recovery areas & other areas with equivalent mangement: all systems inventoried; 95% of systems current with inspections; all failed systems fixed
AND
By 2020, expand designations of marine recovery areas or equivalent management to cover 90% of shorelines not primarily served by sewer
2020 Ecosystem Recovery Targets
C7.1 Include assessment of cumulative impacts in planning & permitting for centralized & decentralized wastewater systems in comprehensive plans
C7.1 NTA2. Shoreline extensions of wastewater collection
Rules, policies allow extension of collection systems
Appropriate upgrades of OSS to LOSS or to WWTP occur
Reduced discharges from OSS
C7.1 NTA1. Comprehensive water & wastewater planning
Wastewater treatment & management needs effectively met by watershed plans & processes
Reduced pollutant discharges from municipal & industrial WWTPs and sewer systems
Freshwater (Streams, River, Lake) Habitats
Nearshore habitats
Marine Waters
Swimming beaches
By 2020, all monitored Puget Sound beaches meet enterococcus standard
Commercial shellfish harvest
A net increase from 2007 to 2020 of 10,800 harvestable shellfish acres, which includes 7,000 acres where harvest is currently prohibited.
By 2020, human-related contributions of nitrogen do not result in more than 0.2 mg/L reductions in dissolved oxygen levels anywhere in Puget Sound
Key
strategy or sub-strategy
intermediate result
near-term action
pressure reduction result
2020 pressure reduction target
focal ecosystem component - ecological
focal ecosystem component - human
2020 ecosystem recovery target

C7.1 Include assessment of cumulative impacts in planning and permitting for centralized and decentralized wastewater systems in comprehensive plans.

Centralized wastewater management options largely flow from the location at which the wastewater is generated—inside or outside an urban growth area; served by centralized treatment or not. Options to reduce wastewater generation through re-use of gray water, and to re-use treated water through reclaimed water projects are implemented largely on an ad hoc basis. There may be opportunities to take a more holistic approach to wastewater planning and thereby to better and more efficiently provide needed treatment and use all water resources fully. This issue also is discussed in strategy A8 on freshwater availability.

Near-Term Actions

C7.1 NTA 1: **Commerce, Ecology, and DOH will encourage communities to more comprehensively provide for wastewater treatment on a watershed basis, using water budgeting tools and striving to use all water resources available (including reclaimed water) to meet the needs of people and the environment by aligning existing plans and planning processes to more effectively meet wastewater treatment and management needs. This might take the form of a pilot program in a watershed that has or will soon have a full TMDL assessment and a water cleanup plan.**

Performance measure: Pilot project done or not

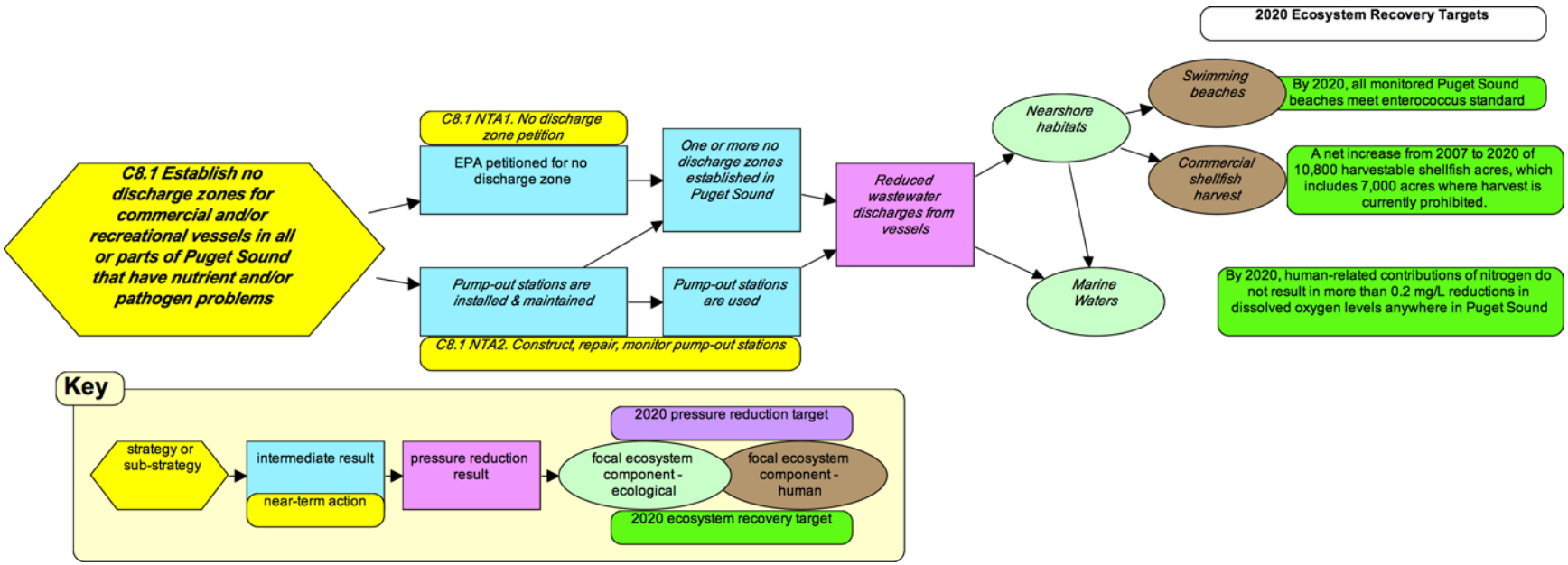
C7.1 NTA 2: **Commerce, Ecology and DOH will identify shoreline areas outside urban growth boundaries where residential densities are great enough that it may be appropriate to extend centralized wastewater collection systems and that are in close enough proximity to centralized treatment that extension of infrastructure may be feasible. The goal of this effort is completion of one pilot project by 2012.**

Performance measure: Pilot program in place or not

C8. Control and manage pollution from discharges of wastewater from boats & vessels

Commercial vessel operation is a major Puget Sound use, and recreational boating is widely popular in the Puget Sound and promotes appreciation of the Sound's resources, public access and well-being, and economic development. Operation of vessels and boats in marine and fresh waters can contribute to water quality problems if pollution is improperly contained and disposed.

Section 312 of the Clean Water Act provides states with a tool to protect their citizens and aquatic habitats through a "no-discharge zone" (NDZ) designation for vessels. NDZs can be designated to protect aquatic habitats where pump-out facilities are available. EPA designates NDZs based on petitions from states. The availability of sewage pump-out stations, the importance of the waterbody for human health and recreation, and the desire for more stringent protection of a particular aquatic ecosystem are important considerations in the designation of NDZs for vessel sewage.


2020 Ecosystem Recovery Targets
C8.1 Establish no discharge zones for commercial and/or recreational vessels in all or parts of Puget Sound that have nutrient and/or pathogen problems
C8.1 NTA1. No discharge zone petition
EPA petitioned for no discharge zone
One or more no discharge zones established in Puget Sound
Pump-out stations are installed & maintained
Pump-out stations are used
C8.1 NTA2. Construct, repair, monitor pump-out stations
Reduced wastewater discharges from vessels
Nearshore habitats
Marine Waters
Swimming beaches
By 2020, all monitored Puget Sound beaches meet enterococcus standard
Commercial shellfish harvest
A net increase from 2007 to 2020 of 10,800 harvestable shellfish acres, which includes 7,000 acres where harvest is currently prohibited.
By 2020, human-related contributions of nitrogen do not result in more than 0.2 mg/L reductions in dissolved oxygen levels anywhere in Puget Sound
Key
strategy or sub-strategy
intermediate result
near-term action
pressure reduction result
2020 pressure reduction target
focal ecosystem component - ecological
focal ecosystem component - human
2020 ecosystem recovery target

C8.1 Establish NDZs for commercial and/or recreational vessels in all or parts of Puget Sound that have nutrient and/or pathogen problems.

Establishment of a NDZ along with sufficient and convenient pump out capacity and an effective outreach and education program will reduce pollution from vessels. The availability of sewage pump-out stations, the importance of the water body for human health and recreation, and the desire for more stringent protection of a particular aquatic ecosystem are important considerations in the designation of NDZs for vessel sewage. Discharge of untreated or partially treated human wastes from vessels sends toxic chemicals as well as pathogens, such as fecal coliform and viruses, into the water and increases human health risks. Excessive amounts of nutrients from vessel sewage exacerbate the known nutrient and low dissolved oxygen problems in Puget Sound.

Ongoing Programs

Using National Estuary Program grant funds, Ecology and DOH coordinate with State Parks' Clean Vessel Program to inventory and improve existing pump-out facilities, gauge stakeholder support, and determine the geographic scope of a NDZ. This work will culminate in a draft petition to EPA for the designation of a NDZ by fall 2013, with a final petition by the end of 2016. Expected performance measures include:

- Improved pump-out capacity
- Successful designation of NDZ in Puget Sound
- Reduction in vessel sewage discharged into Puget Sound

Near-Term Actions

C8.1 NTA 1: **By Fall of 2013 Ecology and DOH, in coordination with the Department of Natural Resources, will conduct an evaluation and draft a petition to EPA to establish a NDZ for commercial and recreational vessels to eliminate bacteria, nutrients, and pathogens from being discharged to all or parts of Puget Sound. The evaluation will include researching petition requirements; gathering background information and pump-out station data for the petition; identifying, reaching out to, and getting input of stakeholders; identifying and prioritizing which areas of the Puget Sound are feasible for petition; and evaluating how to implement the designation.**

Performance measure: Done or not

C8.1 NTA 2: **Ecology and DOH will coordinate with Washington State Parks' Clean Vessel Program to assist in construction, repair and monitoring of pump-out stations to meet requirements of the NDZ petition.**

Performance measures: Number of pump-out stations added or improved; amount of sewage pumped out; pump out capacity is able to support a NDZ designation

C8.2 Control other sources of boat and vessel pollution including oils and other toxics.

In addition to wastewater management, boats and vessels have the potential, because they are operated in the marine environment, to be a source of other pollutants to Puget Sound. These include oils, greases, paints, soaps and trash. Programs like the Clean Marina program, a collaboration between Puget Soundkeeper Alliance, Northwest Marine Trade Association, EnviroStars Cooperative, Washington Sea Grant, Ecology, DNR, and the State Parks and Recreation Commission work with marinas to help boat owners reduce and eliminate all sources of pollution to Puget Sound.

Near-Term Actions

None; work in the near-term will focus on implementation of ongoing programs.

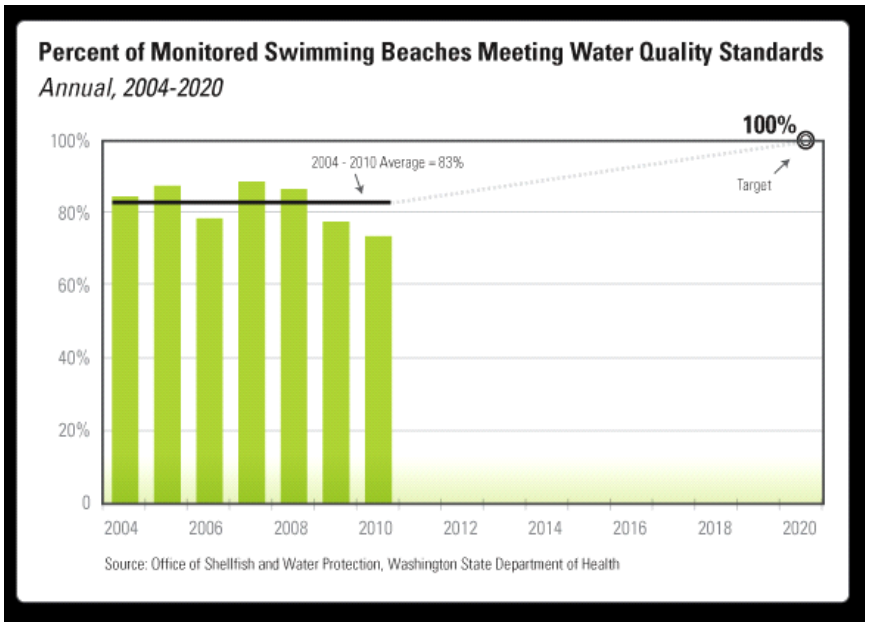
Science Needs

- Support for DOH's ongoing work on technologies for nutrient reduction from OSS
- Fate and impact of micropollutants on groundwater quality from reclaimed water discharges to land or wetlands.
- Effect of wastewater plant designs on micropollutant removals

Target View: Swimming Beaches

The 2020 target for swimming beaches is that all monitored beaches – about 70 locations – meet standards for a type of fecal bacteria called enterococcus. Fecal bacteria are found in human and animal waste. These contaminants can enter the water through a variety of means, including leaky or inadequate septic systems, wastewater treatment overflows, boat and vessel discharges, and stormwater contaminated by pet and animal waste. Controlling these sources of pollution is the key to improving water quality at swimming beaches.

Luckily, many of Puget Sound's swimming beaches already meet high standards for clean water – almost half of routinely monitored beaches consistently met the standards between 2004 and 2010; another third met the standard except for one or two years. At the same time, there is room for improvement. In any given year from 2004 - 2010, 7 to 15 beaches failed to meet standards, resulting in the issuance of health advisories to the public.



Percent of Puget Sound marine swimming beaches meeting water quality standards for healthy human use, allowing for one exception per swimming season. In general, samples are collected weekly. The basic measure is for enterococcus, but fecal coliform bacteria and E. coli are also sampled if warranted.

Many strategies and actions will work together to better control pollution and thereby improve water quality at swimming beaches. The basic chain of events is to identify sources and potential sources of pollution to swimming beaches, assess these sources and improve the consistency and efficacy of pollution controls which will, in turn, improve water quality. Key strategies and actions related to this work include:

- Fix stormwater problems caused by existing development (structural upgrades; regular and enhanced maintenance) (C2.3)
- Restore and protect water quality at swimming beaches and recreational areas (C11.3)
- Develop and implement local and tribal pollution identification and correction programs (C11.4)

The results chain, or logic model, below illustrates how strategies and actions lead to water quality improvements at swimming beaches. The yellow polygons identify strategies and actions from the

Action Agenda that we believe will contribute significantly towards meeting the swimming beach 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.