

Municipal Stormwater Management



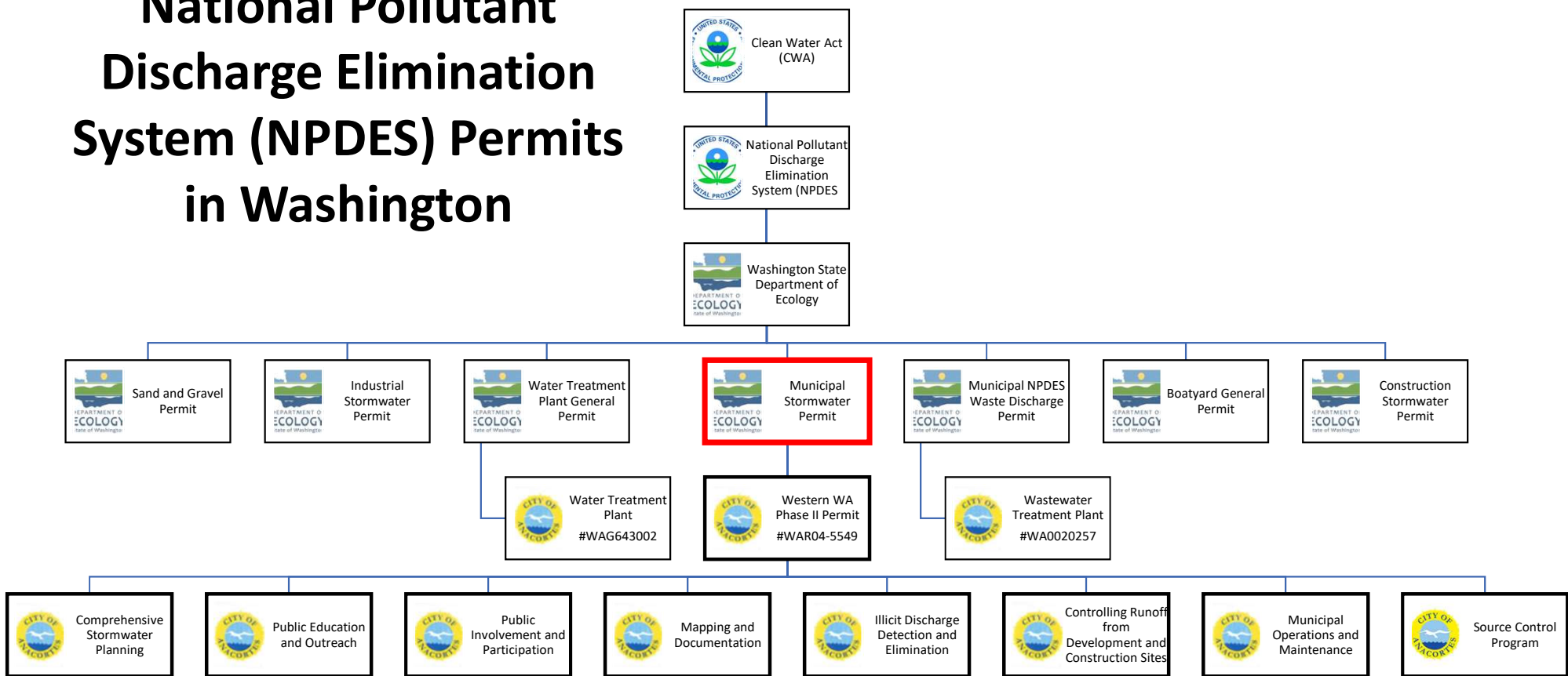
Detention Pond Maintenance Workshop

July 29, 2020

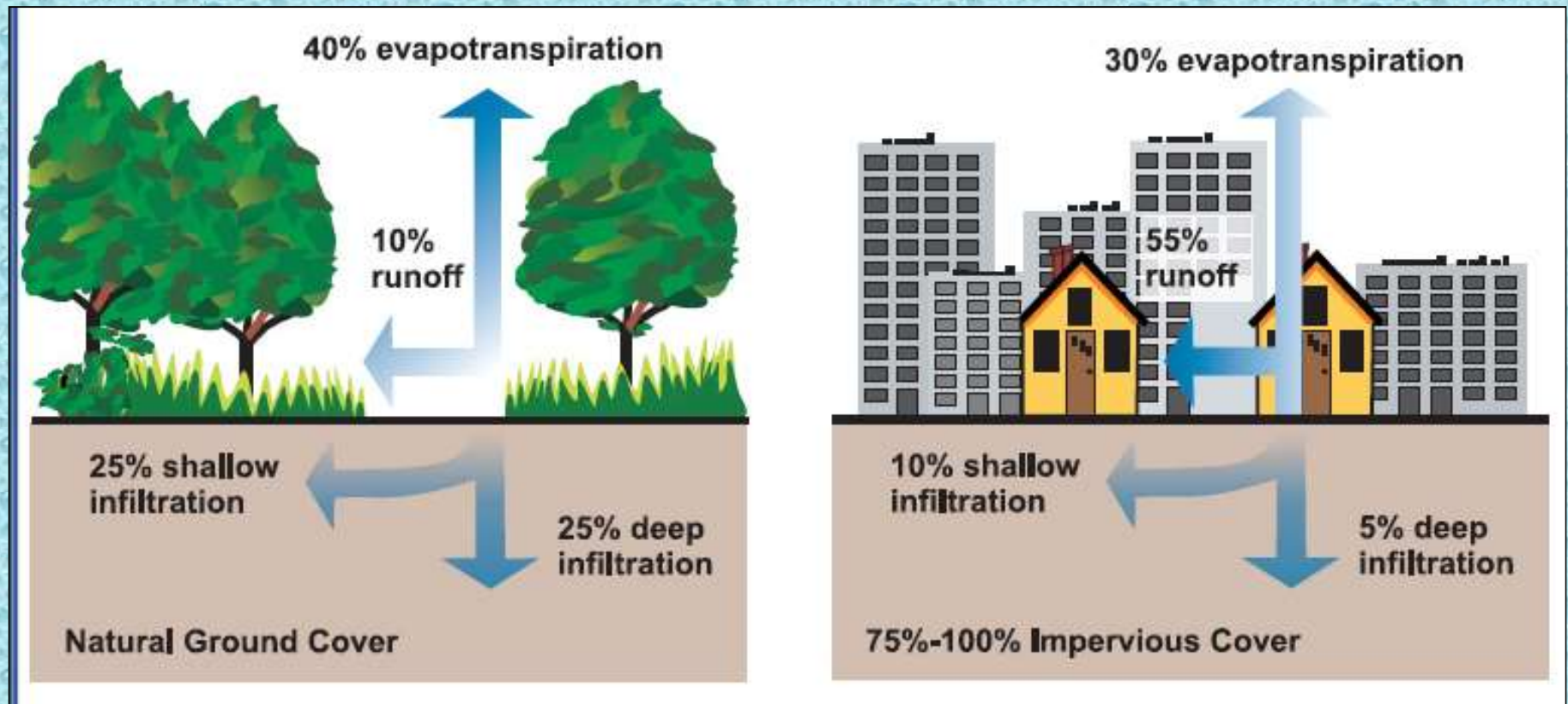
Purpose of Stormwater Management



National Pollutant Discharge Elimination System (NPDES) Permits in Washington



Development and Runoff





Components of a Stormwater System

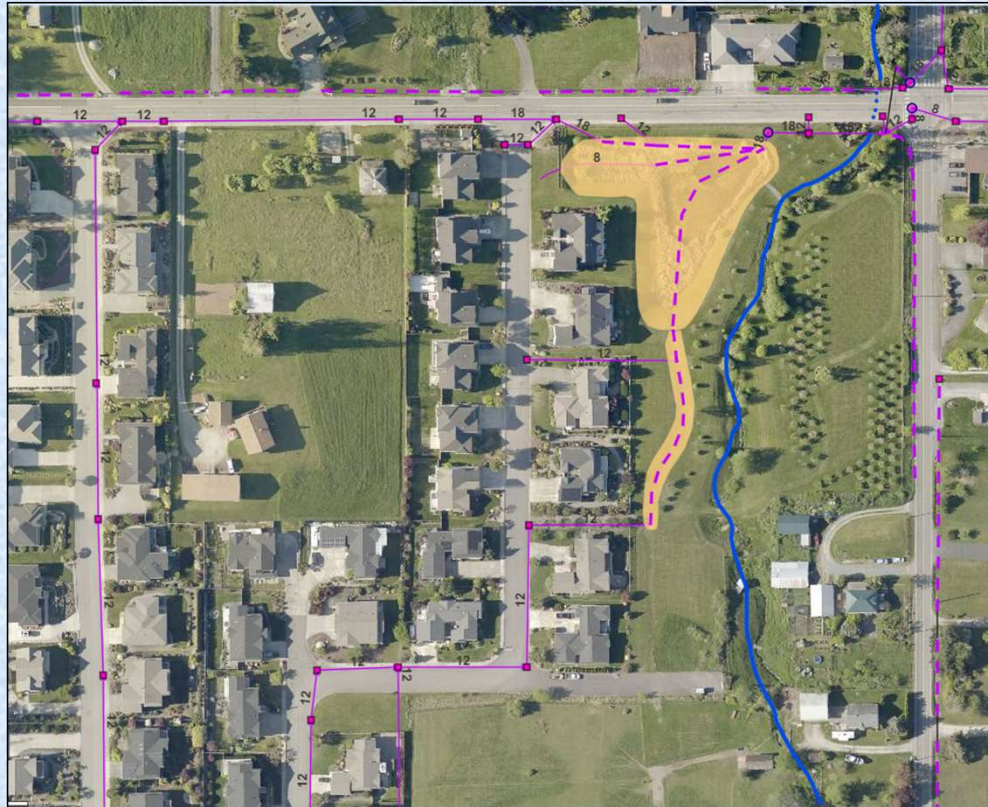
Conveyance:

- Catch basins
- Pipes
- Culverts
- Ditches
- Bioswales

Treatment:

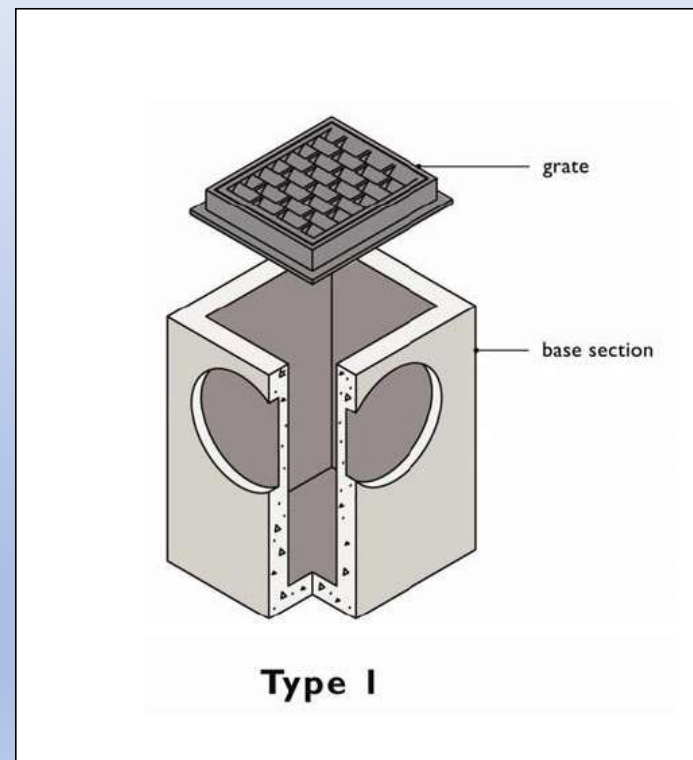
- Low Impact Development (LID)
- Vaults
- Detention Ponds

Typical Stormwater Facilities



Catch Basin

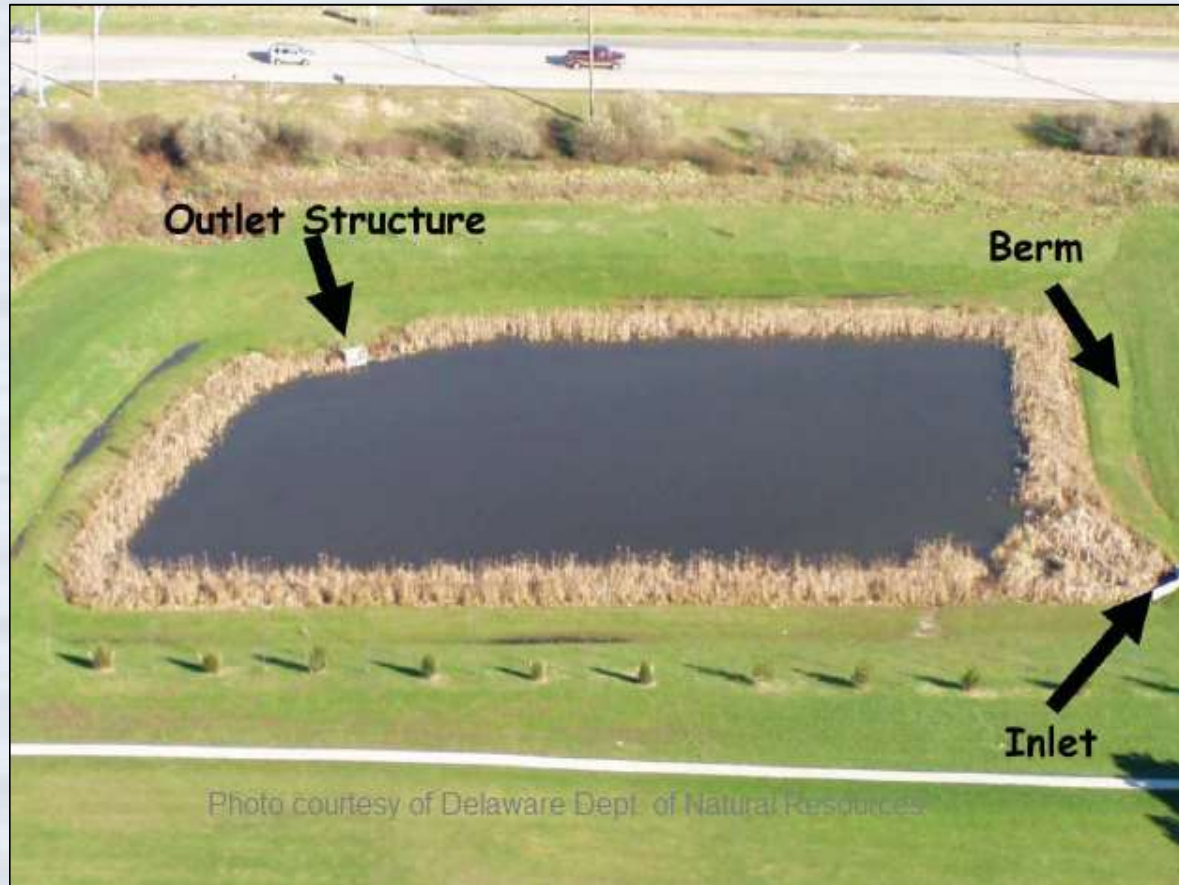
- An underground structure that collects stormwater
- Polluted sediments settle to the bottom
- Cleaner water on top flows out





Stormwater Ponds

- Stormwater ponds are engineered depressions that store rainwater.
- Most neighborhoods have either a dry pond, wet pond, or a combination.



Pond Components

Wet Ponds



- Often lined with clay or plastic to allow pooling.
- Pollutants settle to the bottom or are absorbed by vegetation.

Dry Ponds



- Store stormwater and gradually allow the water infiltrate.
- Designed to go dry within a few days (2-6 days).
- Usually seeded with grass to absorb pollutants.

Inlet/Outlet Pipes

- Typically have trash racks
- Inlet pipe may have splash pad of rip-rap



Flow Control Structure

- Metering devices that slowly release stormwater from a pond.
- Hire a professional for maintenance.



Overflow/Spillway



Allows water to overflow in a significant rain event.

Slow the Flow



Rock Baffle




Check Dam

Berms and Dams

- A berm is a sloping, earthen sidewall of a stormwater pond.
- Above ground earthen berms and concrete walls (dams) require closer attention since they hold back water.



A photograph of a wooden fence made of vertical slats and horizontal rails, surrounding a pond area. In the background, a white house with a grey roof and a boat covered in a blue tarp are visible on a slight rise. The fence is made of light-colored wood and is supported by darker wooden posts.

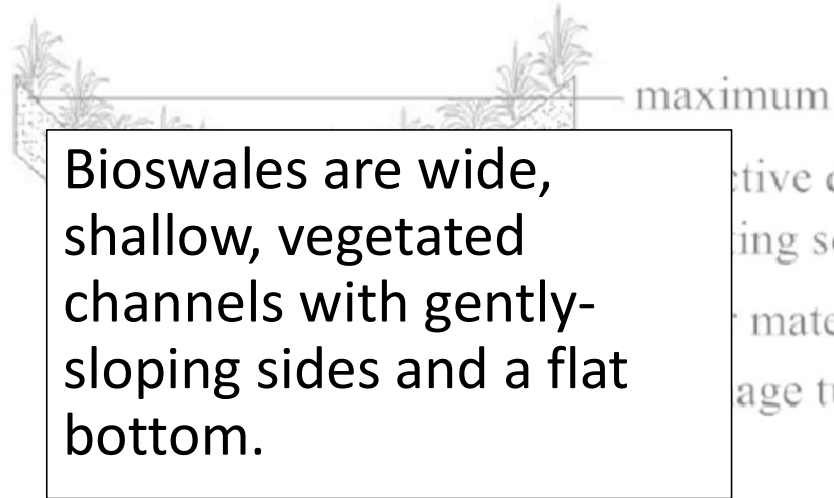
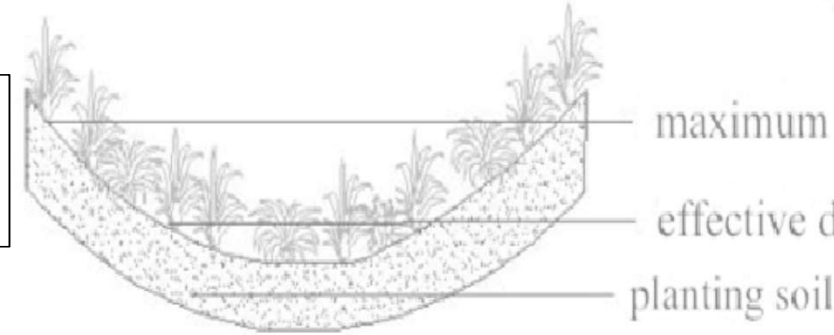
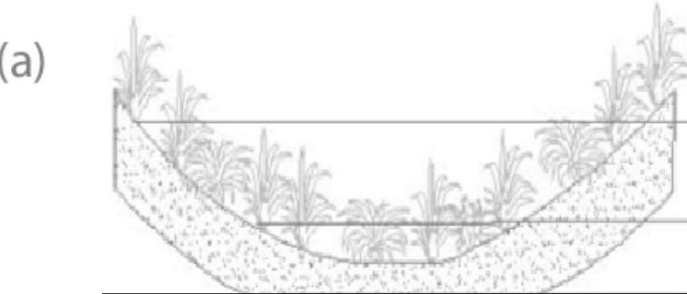
Fences

- Used for safety around steep ponds.
- Required when slope is greater than 3:1.
- Required if the pond's perimeter is made of concrete walls.

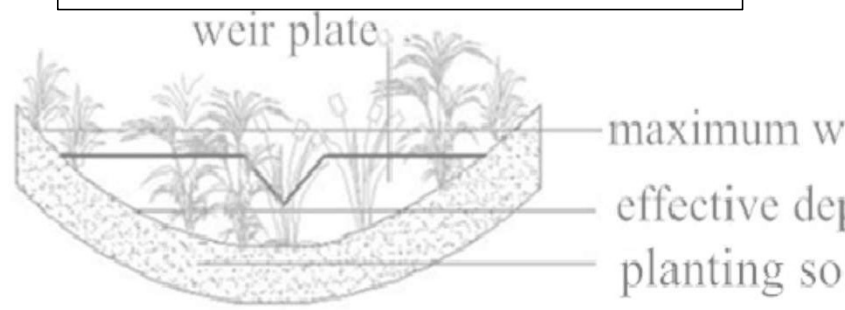
Access Roads and Ramps



Bioswales



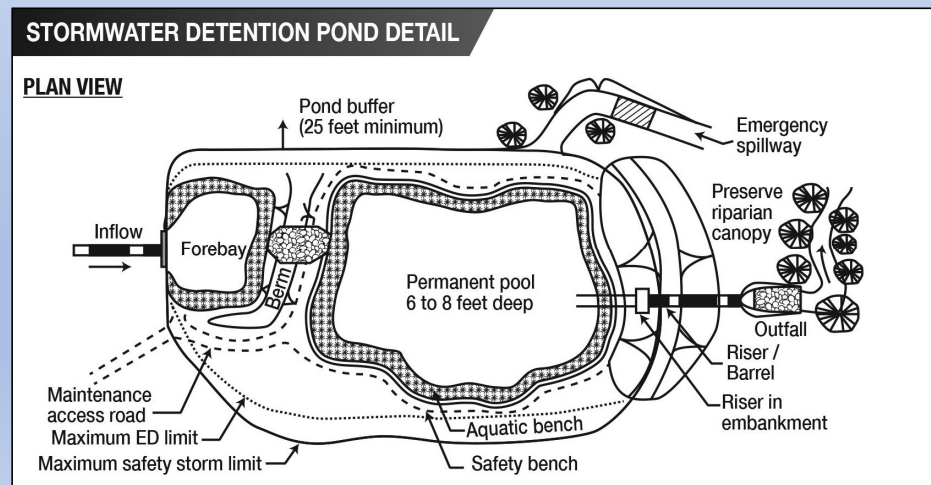
Bioswales are wide, shallow, vegetated channels with gently-sloping sides and a flat bottom.



Swales should never be filled in with pipes, gravel, decorative rock or beauty bark.

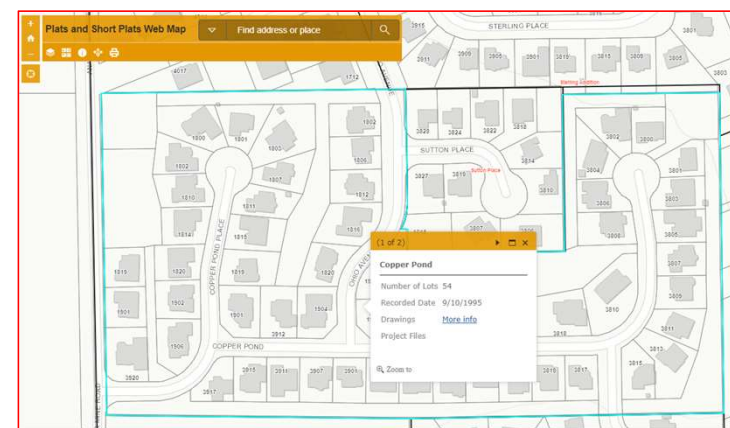
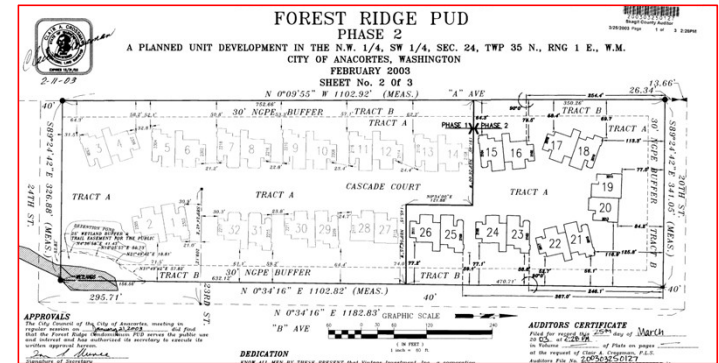
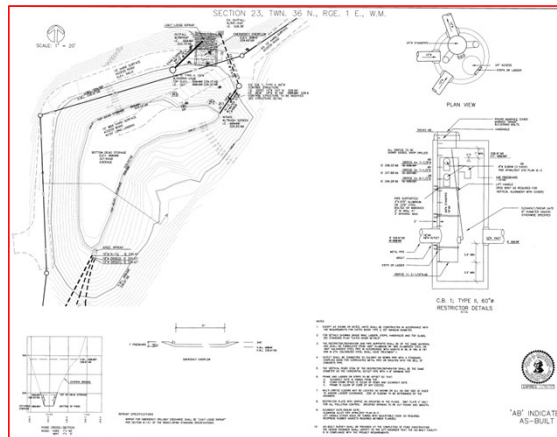
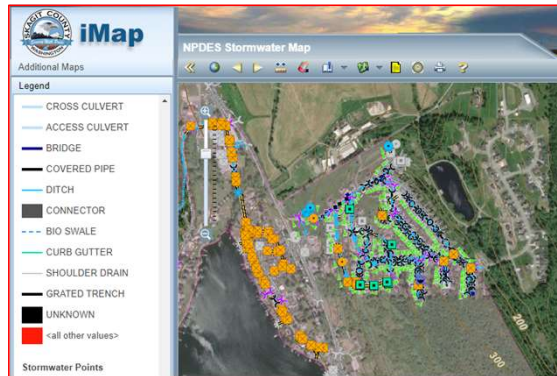


Maintenance starts with knowing your detention pond or facility!



Locating Records

- Plat map
- Drawings
- Operations & Maintenance Guide
- Covenants, Conditions & Restrictions (CC&Rs)
- Easements



A topographic map of Skagit County, Washington, showing terrain, roads, and water bodies. The map includes labels for various locations such as Skagit Valley College, Big Rock, Eaglemont Golf Course, Little Mountain Park, and several creeks and rivers. The text 'Document Resources' is overlaid on the map.

Document Resources

- **Skagit County**
iMap

<https://www.skagitcounty.net/Maps/iMap/>

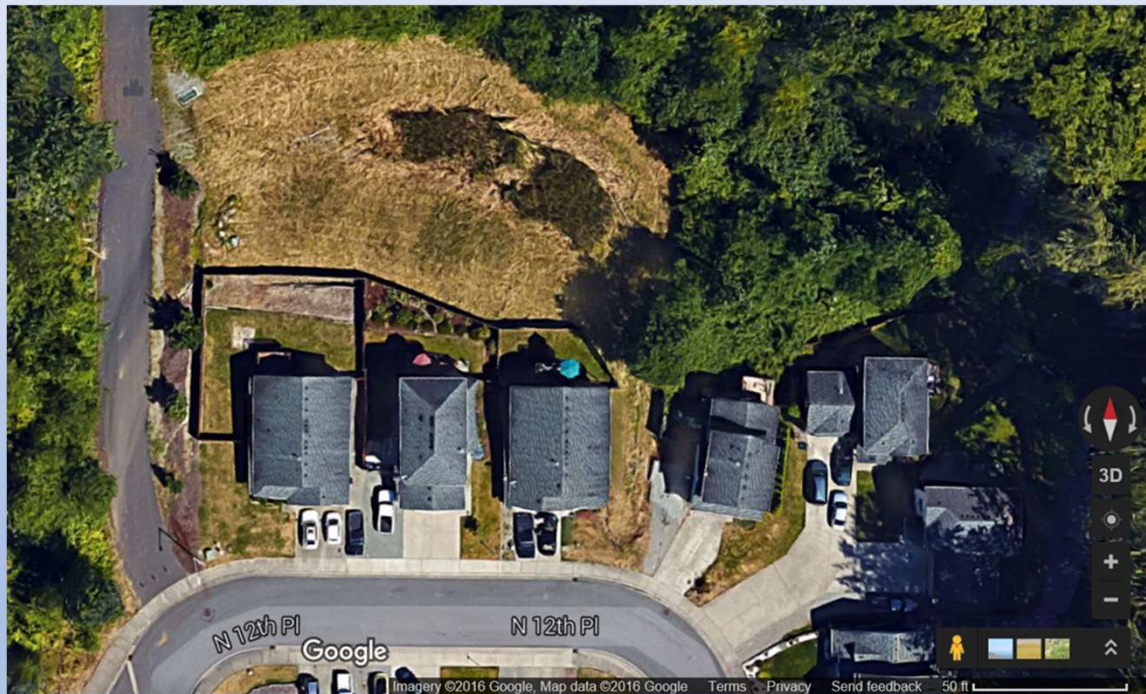
Auditor Files

<https://www.skagitcounty.net/Search/Recording/>

- **City Hall**
(County – Public Works Dept.)

Aerial Photos

(Google Maps, Skagit iMap)



Know Your Facility – Find the Features





Protect Features from Mowers (and mowers from features)!



Watch Your Pond/Facility

Before, during and after a storm event.



What if I don't have an Operations and Maintenance Plan?

- Department of Ecology's Stormwater Management Manual for Western Washington

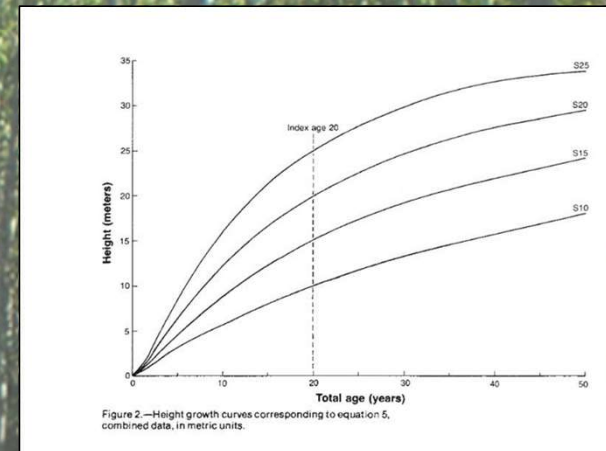
<https://fortress.wa.gov/ecy/ezshare/wq/Permits/Flare/2019SWMMWW/2019SWMMWW.htm>

- Professional guidance

Regular Inspection and Maintenance
Can Save \$\$



Mow to Outpace Trees



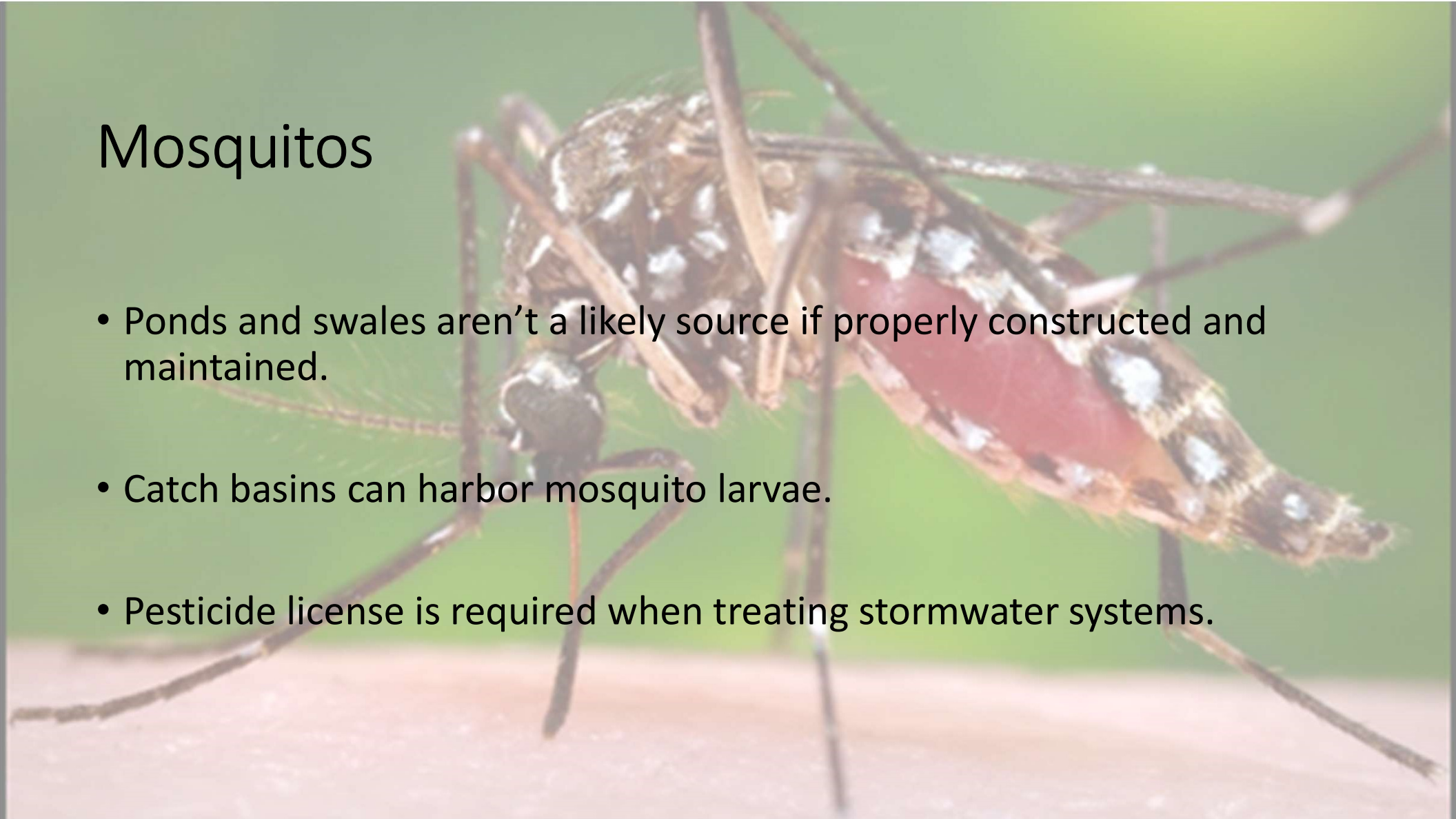
Harrington, Constance A., and Robert O. Curtis. 1986. Height growth and site index curves for red alder. USDA Forest Service, Research Paper PNW-358. Pacific Northwest Research Station, Portland, OR. 14 p.

Weedwhack areas that can't be reached with a mower



Mosquitos

- Ponds and swales aren't a likely source if properly constructed and maintained.
- Catch basins can harbor mosquito larvae.
- Pesticide license is required when treating stormwater systems.



Report Spills



- Know your local spill hotline number
- For emergency situations that include spills of raw sewage, gasoline, or other hazardous materials – Dial 911

A photograph of a stormwater pond. The pond is filled with water and is bordered by a grassy bank on the left and a rocky spillway on the right. The background shows a sandy area and some trees.

Summary

- Know your pond
- Maintain your pond to avoid costly repairs
- Report illegal discharges into stormwater

Thank you...



For additional information, contact:
Diane Hennebert, Stormwater Program Manager
dianeh@cityofanacortes.org or 360-299-1966

Neighborhood and Commercial Stormwater Facilities



INSPECTING AND MAINTAINING YOUR FACILITY

Reid Armstrong
Kulshan Services, LLC

Topics

- Importance of maintenance
- First steps
- Systems overview
 - Key maintenance concerns and inspection activities
- What to do; when to do it; and who should do it
- Liabilities and record keeping
- Plan for current and future needs



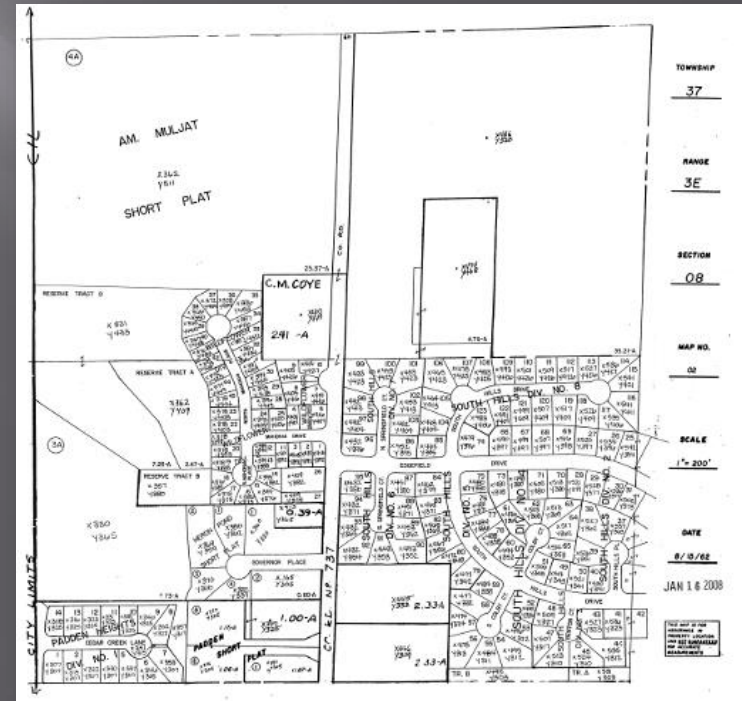
Why is maintenance important?



- Small regular investments prevent costly repairs in the future
- Stormwater systems need regular maintenance to operate properly
- A properly functioning system protects aquatic ecosystems and reduces the risk of flooding and liability

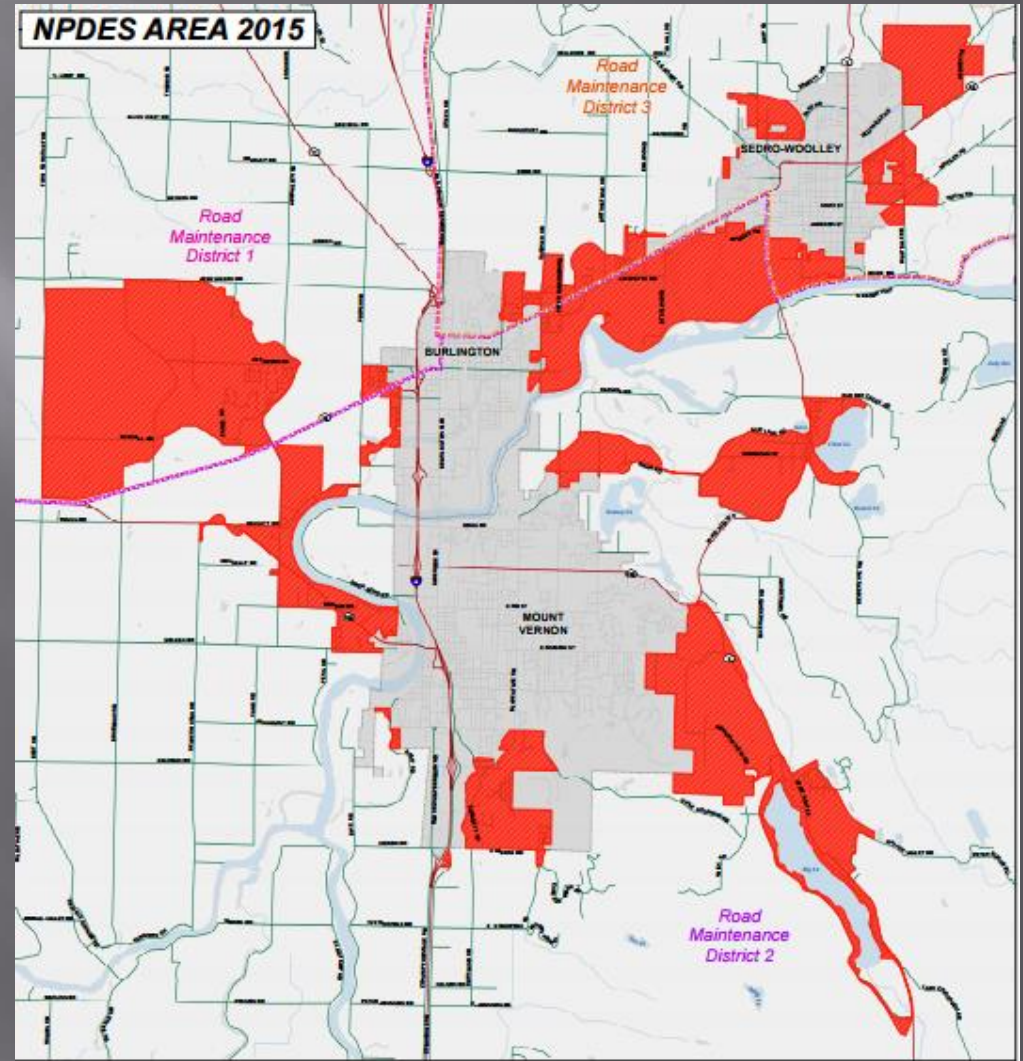
What are the first steps?

- What do you own?
- What are you required to do?
- What condition is it in?

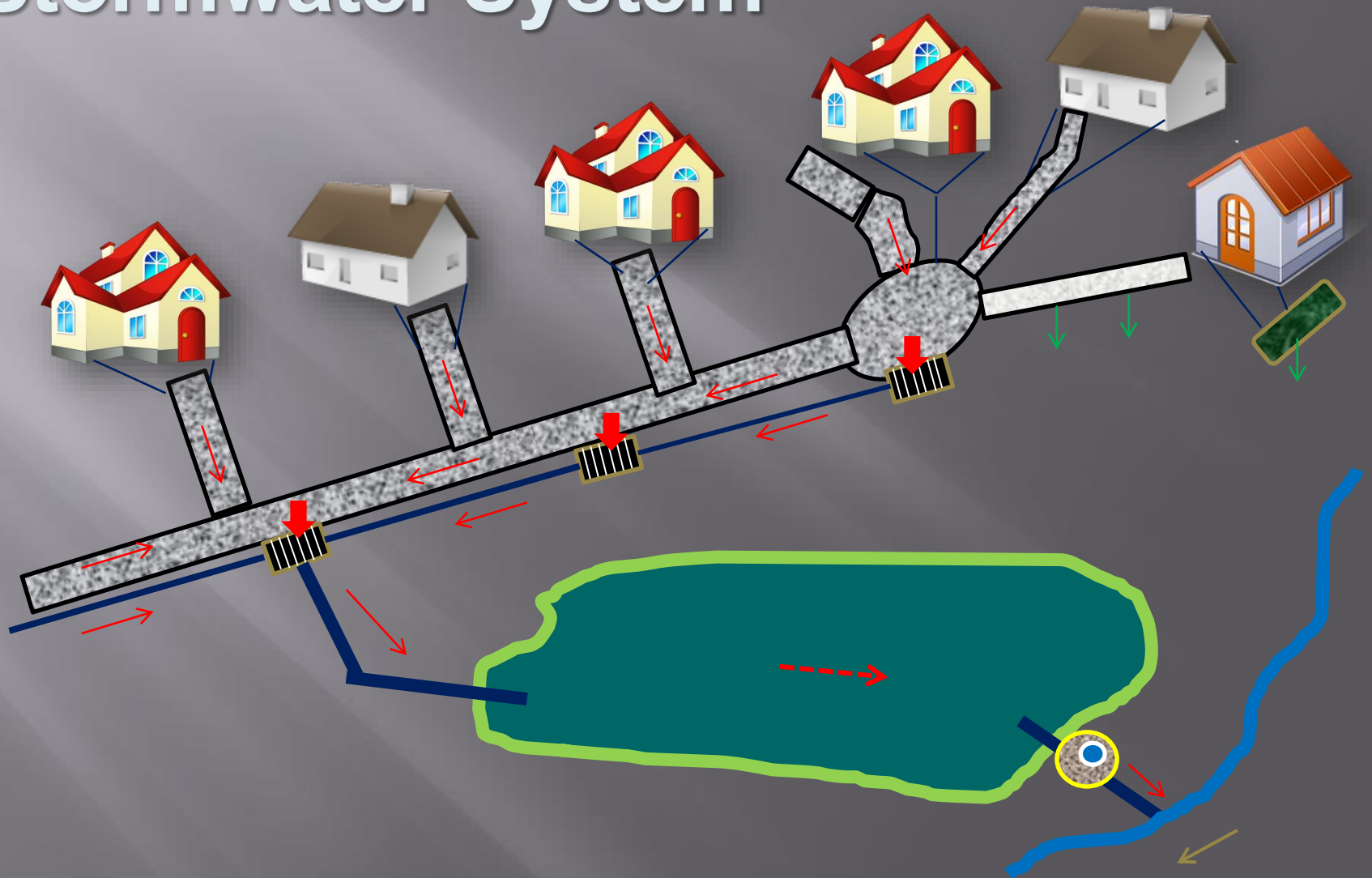


What are you required to do and when?

Specific maintenance and inspection requirements for:
Burlington
Mt. Vernon
Sedro-Woolley
Skagit County UGAs



Typical Neighborhood Stormwater System



Stormwater System Components

- Ditches
- Pipes
- Catch basins
- Ponds
- Vaults
- Bioswales
- Raingardens



Ditches

Inspection:

Monthly and after large storms

BMPs:

- Check dams – replace rocks if necessary
- Vegetation – mow, cut back & remove (no trees or shrubs)
- Structure – remove sediment; repair undercutting, scouring or slumping; remove trash



Photo: Whatcom County Public Works



Grass taller than 9", trees, or shrubs may impede the flow of water

Ditches



Photo: RE Sources

Conveyances (ditches and pipes) along private roads are the owner's responsibility. Conveyances along city and county roads are not owner's responsibility, but they may impact your facility. Call for maintenance when needed.

Pipes

Inspect:

Monthly & after large storms

BMPs:

- Remove sediment if exceeds 20% of diameter
- Remove vegetation growth blocking openings and outlets
- Prevent erosion at inlets and outlets
- Repair damage that may create an obstruction or erosion



Type 1 Catch Basins

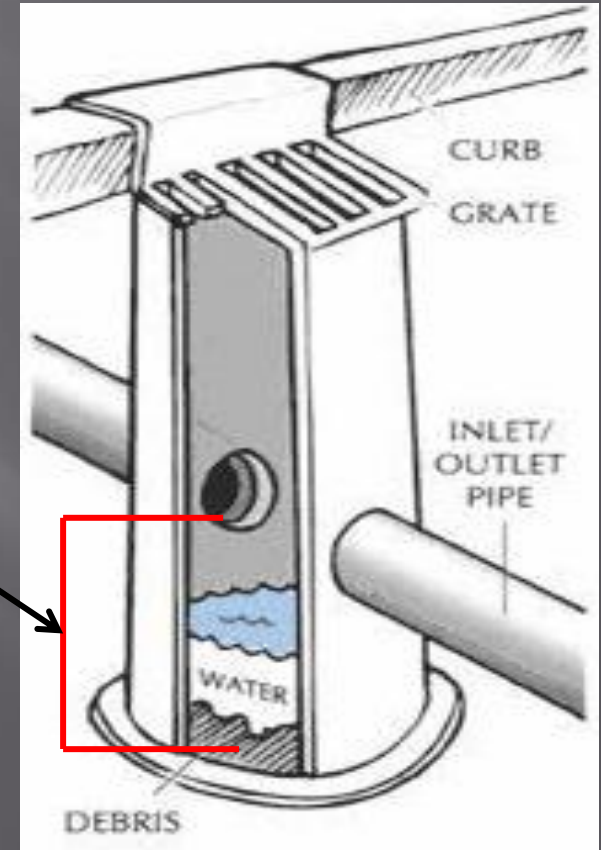
Inspect:

- Monthly and after storms check exterior
- Annually check interior for sediment and debris
- Catch Basins along public roads are maintained by the city

BMPs:

- Remove debris from grate
- Check structure and grout for cracking
- Remove sediment when 60% of sump is filled or <6 inches of invert clearance.

Sump



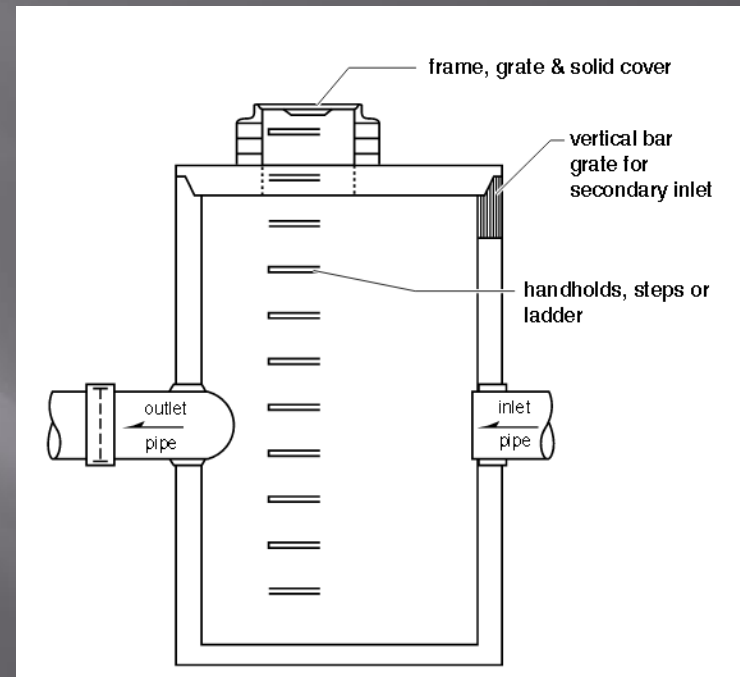
Type 2 Catch Basins

Inspect:

- Annually and after large storms

BMPs:

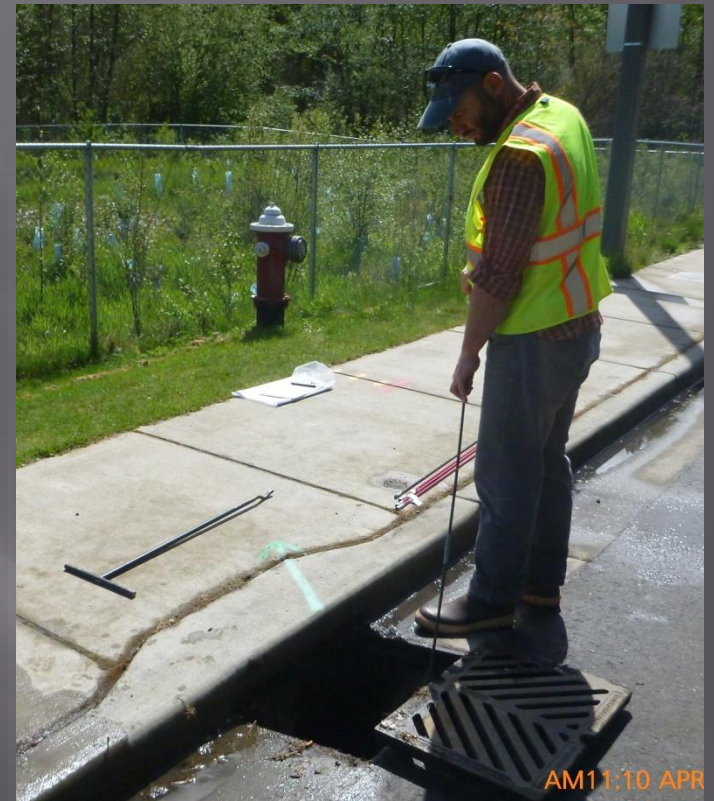
- Remove trash and debris
Remove sediment when it <12" clearance to invert or > than 1/3 of the sump depth.
- Caution! Confined space.
Do not Enter without proper training and equipment!
Toxic Gas!



Catch basins

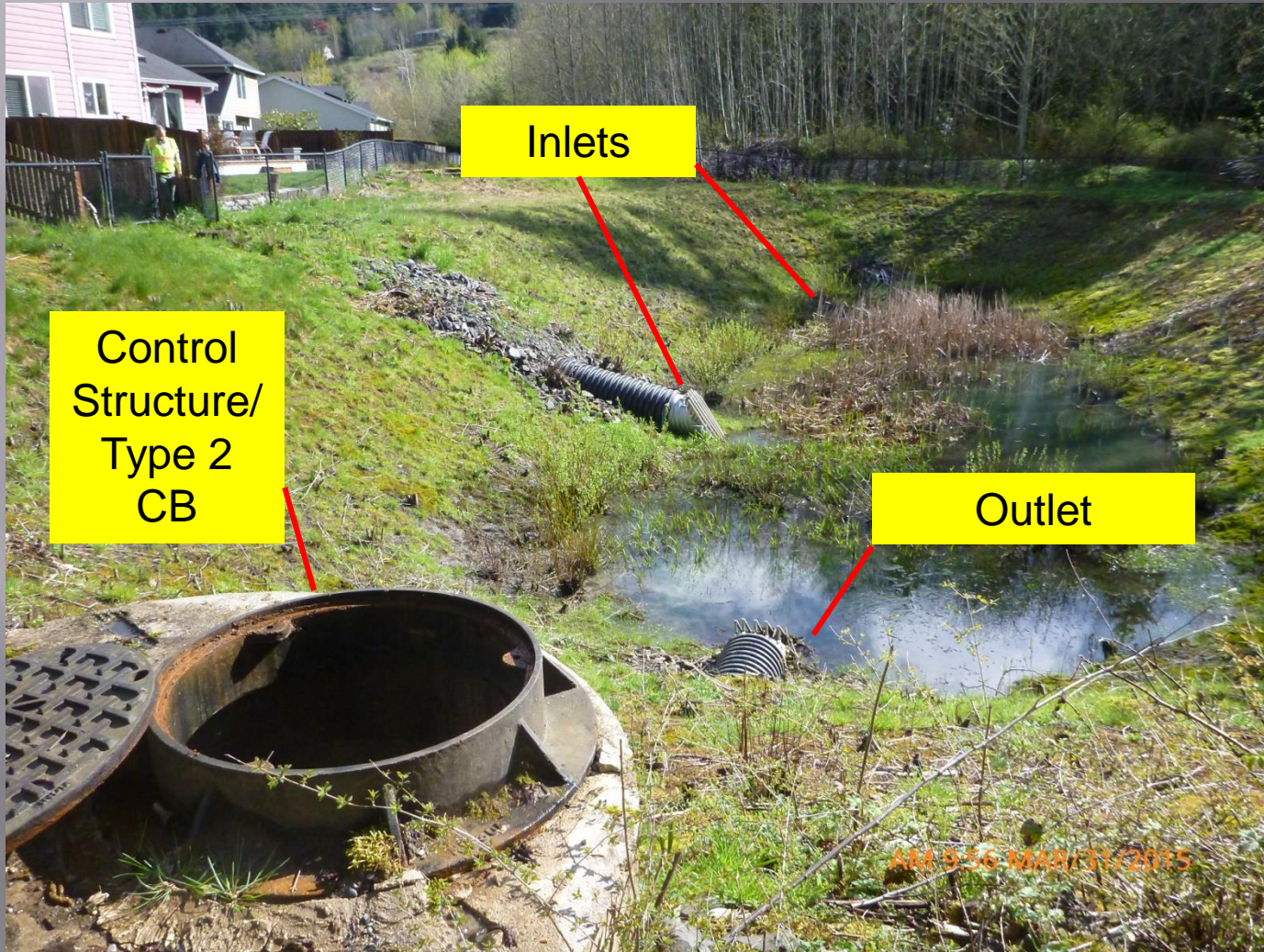


Vactor truck cleaning out catch basins

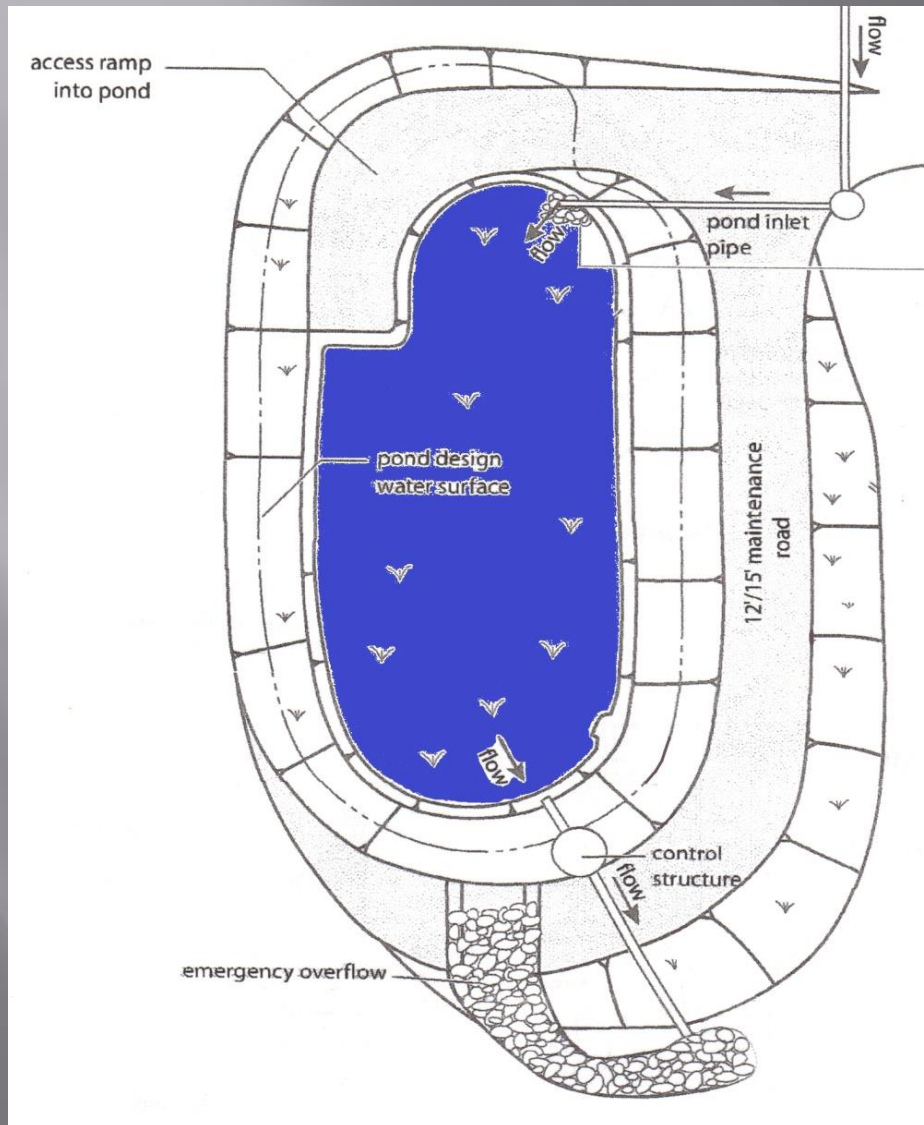


Checking sediment depth

Typical Stormwater Pond



Typical Stormwater Pond



- Access ramp into pond
- Energy dissipater
- Emergency overflow
- Pond Inlet Pipe
- Pond Outlet Pipe
- Control Structure

Dams, Berms, Spillways, and Ramps



Berm failure

- Erosion, bare soils, boring animals, settlement, and sloughing can lead to major costly problems



Photo: WA Department of Ecology



Photo: RE Sources

Trees vs. Grass?



- Trees in right places are good for aesthetics, stabilization and habitat
- Remember – no trees on berms!

- Access, visibility, shading, inspection, leaf and debris management
- Keep grass < 9" long and remove after cutting

Dams, Berms, Spillways, and Ramps

Inspect:

Quarterly and after major storms

BMPs:

- Control vegetation – Remove trees >4” and brush; control invasive species
- Repair erosion – Keep slopes vegetated
- Address structural problems – Slumping and settling >4 inches; Get an engineer
- Protect the overflow – Keep rocked and limit vegetation growth
- Remove burrowing animals

Inlets and Outlets

- Keep inlets and outlets clear, and well marked



Marked inlet to pond



Blocked outlet to control structure

Pond Bottom

Inspect.

Check pond bottom annually during the dry season and check inlets and outlets monthly and after major storms

BMPs:

- Inlets and outlets – clear of vegetation, leaves and debris
- Erosion control – add or restore energy dissipaters
- Remove cattails and sediment if cattails cover 25-50% of the pond and sediment is > 12”
- Remove trees and woody vegetation
- Exposed or damaged liner – cover or repair
- Oils, fuel or chemical smells – investigate and report
- Debris and trash – remove

Cattails

- Build organic sediment
- Release nutrients

Fix by:

- Cut and remove annually
- Pulling out when small
- Removing with associated sediment



Good vegetation

- Low growing plants with less biomass
- Native species enhance habitat and beauty of a pond



Sedge



Salal / Ferns



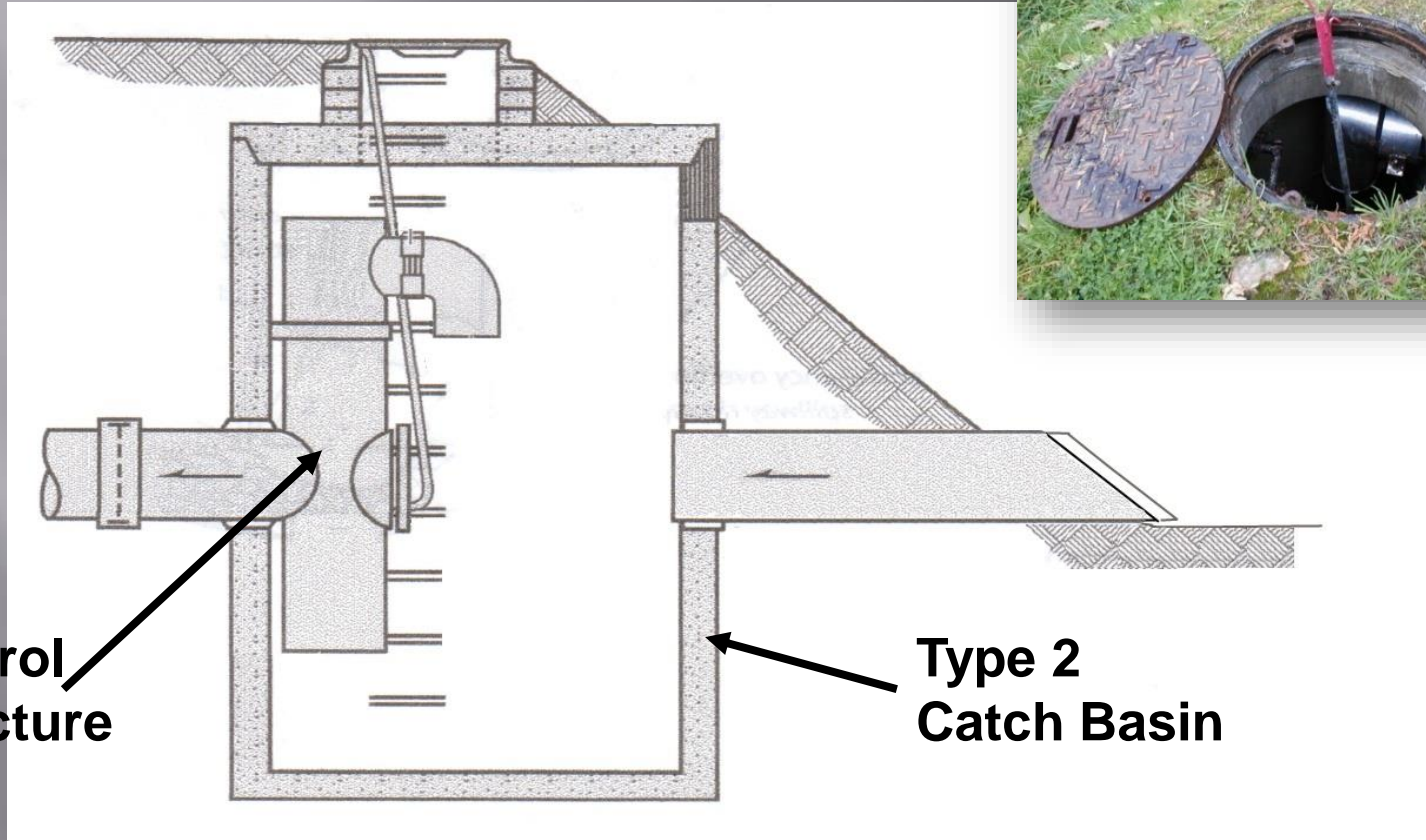
Rush

Energy dissipaters

- Add rock to prevent erosion and to maintain energy dissipaters



Control Structures



The heart of the stormwater facility!

Control Structures

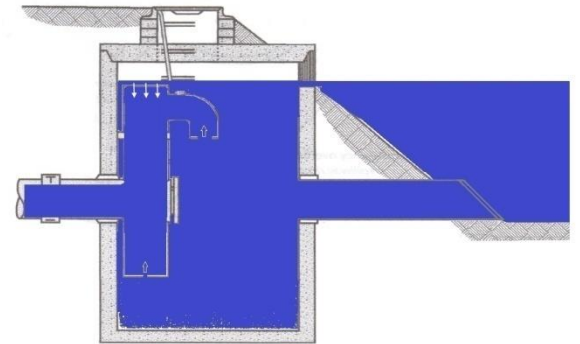
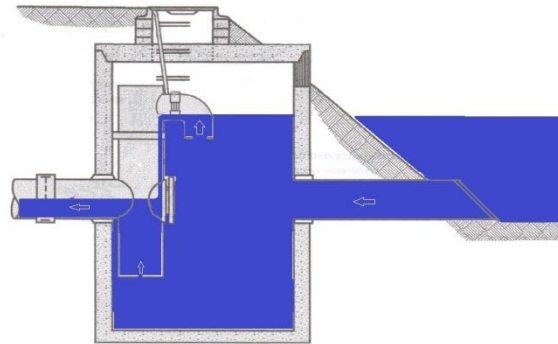
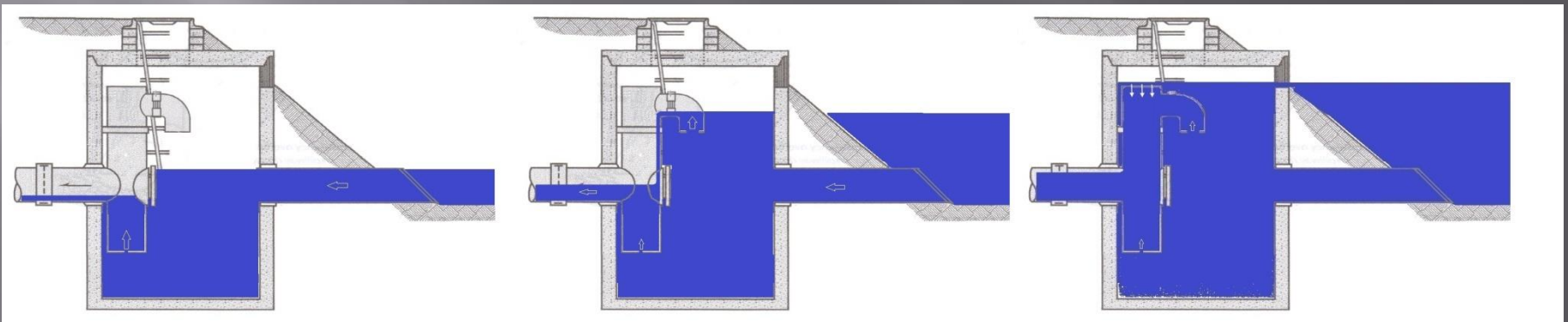
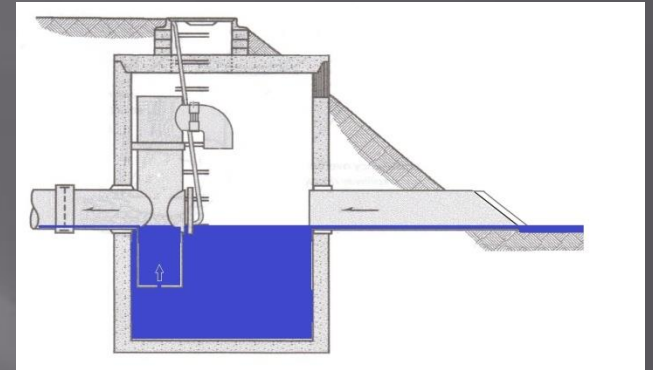
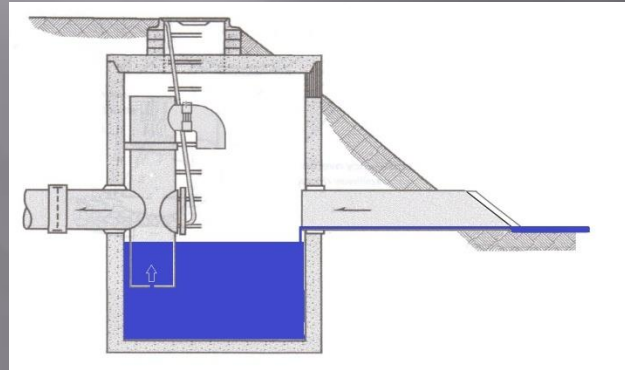
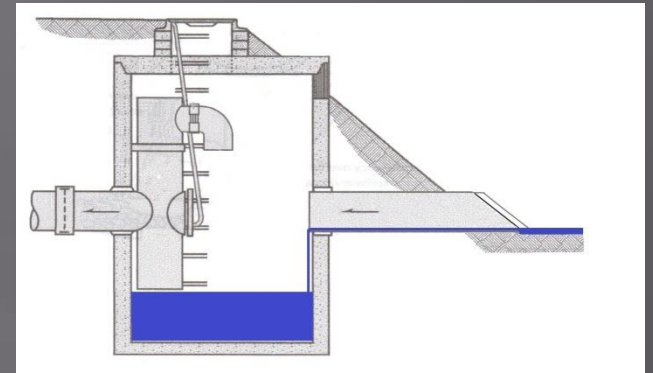
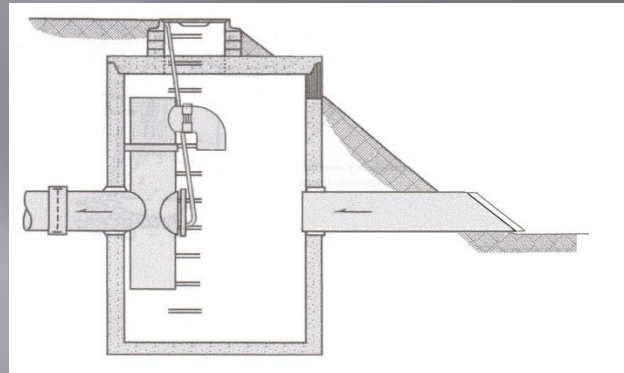


Caution!
Confined space!

Do not enter!



Typical Control Structure Operation



Control Structures

Inspect:

Annually and after storms

if ponding levels abnormal

BMPs:

- Cover & Ring – Repair grouting, reposition ring
- Sediment – Remove if clearance <12” or more than 1/3 of sump depth
- Debris and Trash - Remove
- Piping – Repair cracks in concrete and grouting; secure pipes
- Shear Gate– Operational; handle or chain intact; leakage; closed
- Water level - should be about bottom of shear gate between storms

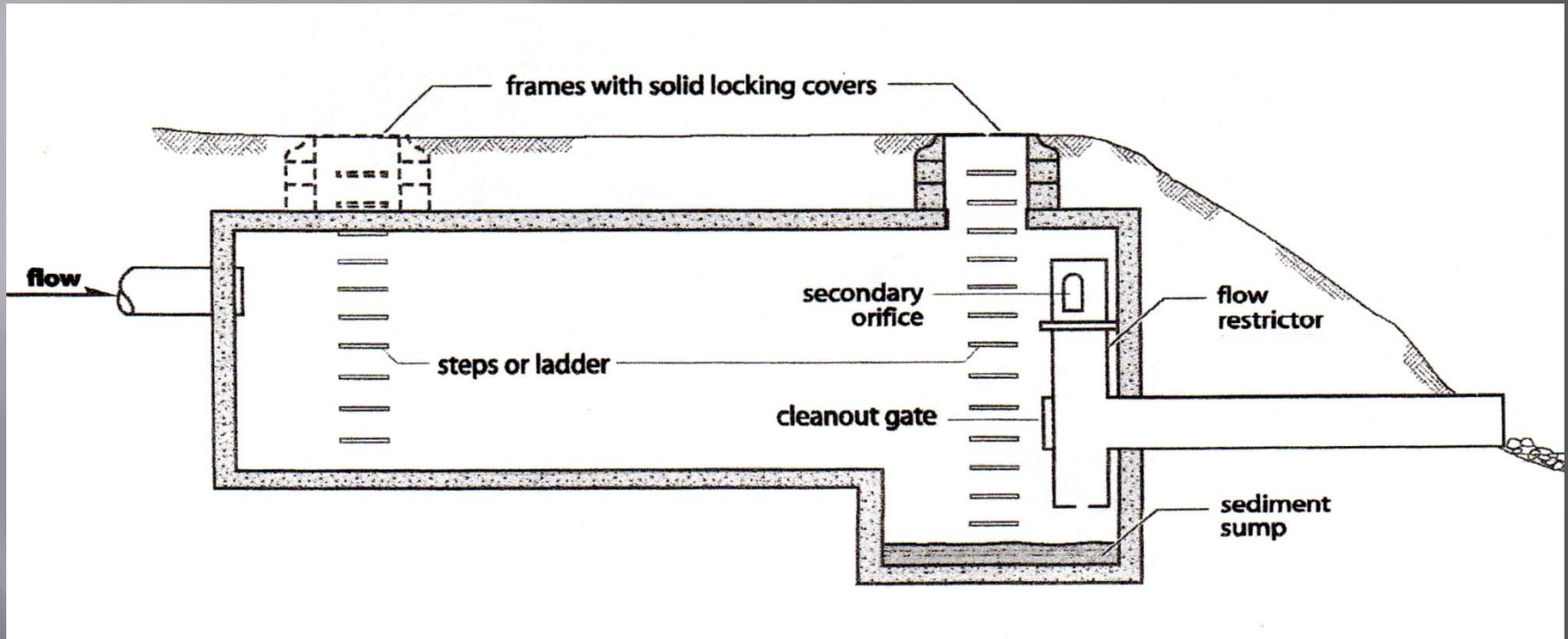


Control Structures

- Watch for indications of high water and high water for long periods of time (tub line)



Vaults



Remember – No entry to confined spaces!

Vaults

Inspect:

Annually and after major storms

BMPs:

- Sediment – Remove if clearance to invert $<12''$ or more than $1/3$ of sump depth
- Debris and trash – Remove (pool net)
- Oils, fuel or chemical smells – note and report
- Control Structure - Grouting, strapping, piping, vertical
- Shear Gate – Operational, handle or chain intact, leakage, closed
- Water level - should be about bottom of shear gate between storms

Bioswales

Inspect:

Quarterly and after large storms

BMPs:

- Remove excess sediment
- Replant bare spots
- Maintain desirable plants and remove inappropriate species
- Clear inlets and outlet



Bioretention and Raingardens



- Follow same inspection schedule and BMPs as bioswales

Access Control

Inspect:

Quarterly

BMPs:

- Access – Maintain perimeter access to inlets, outlets, berm, overflow and control structure
- Poisonous plants and insects – Remove if they limit access
- Yard waste dumping – Work with property owners



Fencing – Keep in good condition



Invasive Vegetation

Inspection:

Semi-annually, during growing season

BMPs:

- Remove or control using appropriate methods
- Pull out or cut back before they go to seed



Blackberry



Knotweed



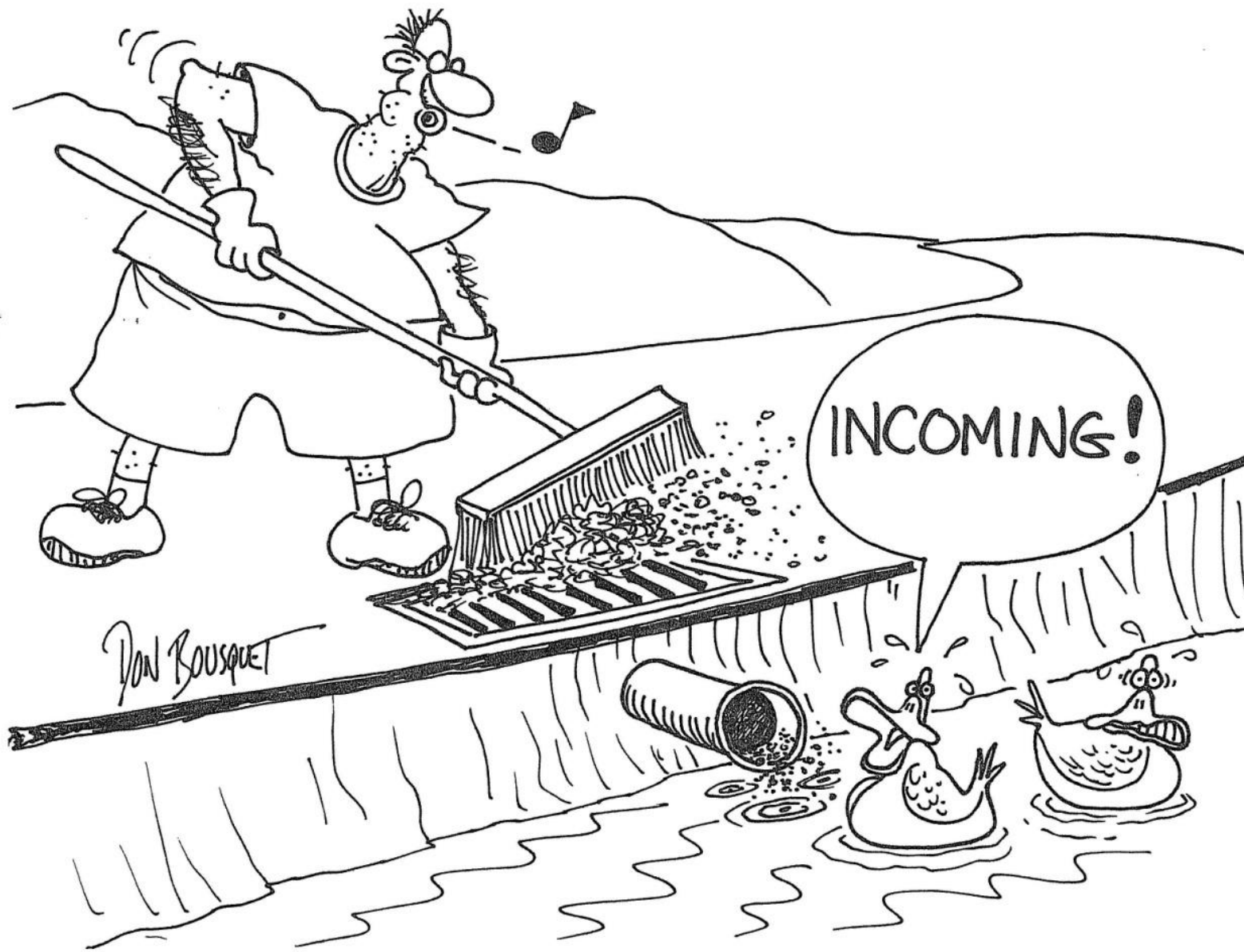
Photo: RE Sources

English Ivy

Discharge to Streams

- Observe turbidity of water
- Outlets should have energy dissipaters
- Check for proper placement of rocks, and replace if necessary





DON BOUSQUET

INCOMING!

What can you do?

- Grass cutting and brush clearing
- Trash rack clearing
- Cattail & brush removal near inlets and outlets
- Garbage clean-up
- Fence and signage upkeep
- Clean catch basin grates (dog walks)



Other things you can do...



- Observe seasonal pond conditions
- Control access and unauthorized uses
- Prevent encroachments that limit access
- Prevent dumping of yard waste or garbage
- Keep leaves and bark out of the street
- Request street sweeping and catch basin cleaning when needed
- Watch out for runoff from construction piles

Safety Concerns



- Confined spaces
- Steep and slippery slopes
- Insects and poisonous plants
- Lifting and exertion
- Equipment

What work should professionals do?

- Vault inspections and cleaning
- Confined spaces
- Pesticide application
- Large vegetation removal
- Sediment removal
- Structural or plumbing repairs or improvements
- Design planting program



What are your liabilities?

- Personal injury
- Damage to public or private property
- Regulatory – water quality and/or habitat



Record Keeping

- Record observations on paper
- Take photos of issues
- Report any problems to managers
- Keep in a file

Stormwater System Inspection Checklist

INSPECTOR'S NAME: _____

DATE: _____

NAME & ADDRESS OF STORMWATER FACILITY: _____

GENERAL OBSERVATIONS (IS WATER FLOWING?): _____

WEATHER: _____

	Checked? (Y/N)	Maintenance Needed? (Y/N)	Maintenance Completed/ Observations & Remarks
Type 1 catch basins			
Look for debris and sediment blocking catch basin grate. If found, remove.			
Inspect filter. Change if torn or clogged.			
Look for sediment and trash in catch basin sump. Clean out if sediment fills 60% of the sump or comes within 6" of a pipe.			
Look for damage or cracks to frame, grate, basin walls or bottom. If found, repair or replace.			
Type 2 catch basins			
Remove trash blocking grates or inlets; replace if broken.			
Remove lid and check for sediment accumulation. Remove trash. Remove sediment if more than 1/3 full.			
Check integrity of ladder rungs, clearout gate, and orifice plate. If bent or obstructed, take appropriate action.			

2

Planning current and future needs

- Understand condition of your facilities and how they function over time
- Identify ongoing and major maintenance requirements
- Understand your liabilities and water quality concerns
- Consider enhancements if opportunities are there
- Seek support of neighbors and/or members
- Develop a simple plan with a prioritized list of activities and projects

Budgeting current and future needs

- Evaluate what work can be done in house vs. contracted
- Prioritize projects
- Solicit estimates
- Develop budget scenarios
- Get support and approval
- Use annual assessments
- Implement plan
- Review your plan and facility conditions each year



Maintaining your stormwater system will:

- Reduce long-term maintenance and repair costs
- Protect water quality
- Protect downstream property from flooding and erosion
- Retain and enhance property values
- Provide a green space amenity



QUESTIONS?

Please contact the Kulshan Services
Stormwater Team

www.KulshanServices.com

Welcome

Managing Stormwater Facilities: Maintenance Guidelines for Private Property Owners and HOA's



Agenda

- 5:30 pm Welcome & Introductions - Kristi Carpenter, SCD
- 5:35 pm Municipal Overview - Diane Hennebert, City of Anacortes
- 6:00 pm The Nuts and Bolts – Reid Armstrong, Kulshan Services
- 6:40 pm Involving Your Neighborhood - Kristi
- 6:45 pm Questions/Answers
- 7:00 pm Adjourn

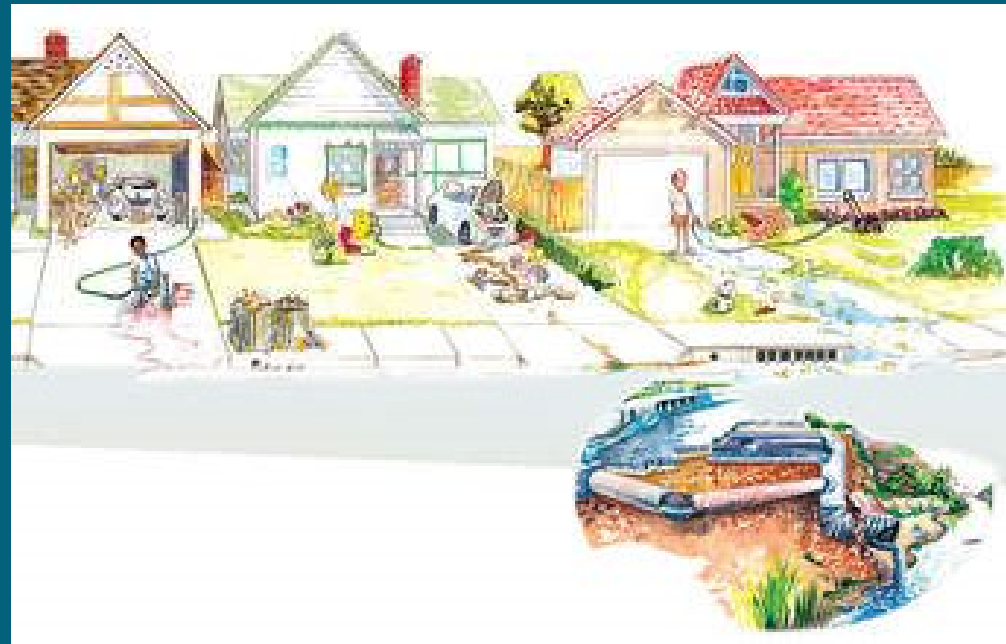
The Value of Educating and Involving Your Neighborhood Community



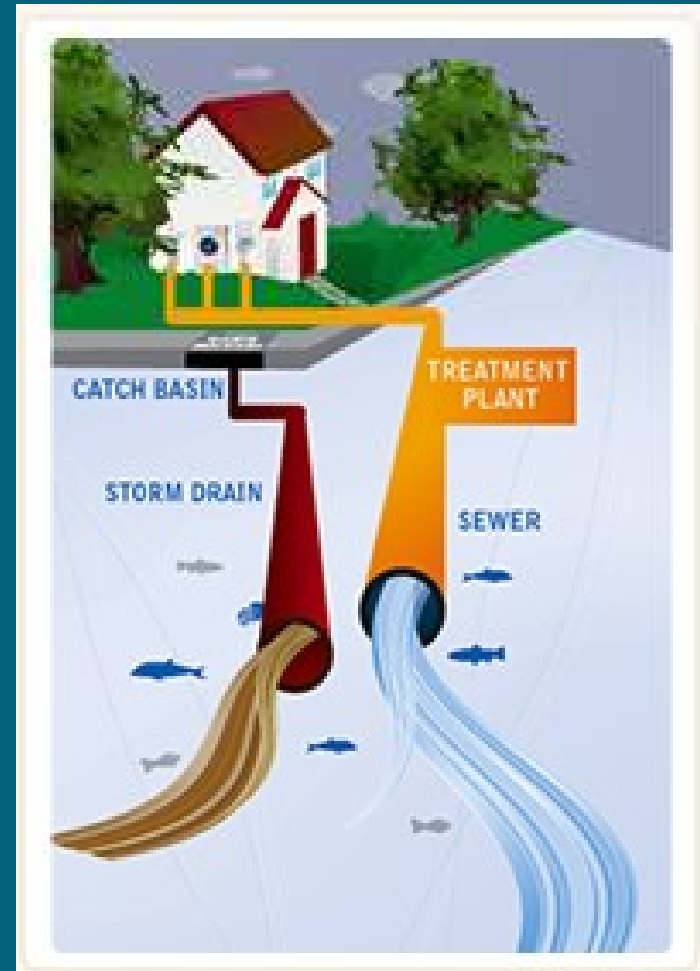
By: Kristi Carpenter
Skagit Conservation District

Stormwater picks up and transports many of the pollutants it encounters:

- oil
- grease
- metals
- yard and garden chemicals
- bacteria
- sediment
- nutrients
- pet & livestock waste
- other pollutants from paved areas



Where does my stormwater go?



Beyond our backyard



The way we landscape and manage our yards affects water quality and habitat in our streams, rivers, and marine waters

What you can do to Reduce Stormwater Runoff

- Never dump *anything* down storm drains or in ditches
- Check your car for leaking fluids and recycle your motor oil
- Don't litter! Pick up trash you see on the ground (even if it is not yours) and participate in a creek or neighborhood clean-up!



Pick up after your pet

There's no such thing as the
Poop Fairy

**Only you can make your
pet's waste disappear.**

Pet waste contains harmful bacteria and parasites that make people and pets sick. When it is left on the ground, it washes down storm drains and contaminates our streams and rivers.

Scoop it. Bag it. Trash it.



Estimated daily production of dog waste in Skagit County is over
6,135 pounds per day.

Sweep sidewalks, driveways, and steps

- Sweeping your driveway and sidewalk rather than using a hose will save you as much as 100 gallons of water every time you do it. And, it will reduce stormwater runoff pollution.



- Direct downspouts and gutters into lawn and plant beds or into rain barrels, cisterns, or contained areas
- Use fertilizers, pesticides and herbicides sparingly
- Reduce size of lawn – add more trees, shrubs and plants – consider natives!
- Support Low Impact Development – such as rain gardens and bioswales, permeable pavement, green roofs



Reduce Lawn



Support Low Impact Development Practices

- Rain gardens and bioswales
- Permeable pavement
- Rain barrels
- Native plantings
- Green roofs



The Case for sustainable landscapes

- Human populations have grown substantially over the past century.
- Growing population places increasing pressure on our soils, waters, forests, and other natural resources.
- It is difficult, expensive, and sometimes impossible to duplicate these natural services once they are destroyed.



Do not empty a household fish aquarium into the stormwater detention pond.



Neighborhood clean up events



Neighborhood Storm Drain Labeling Project





EVEN THE SMALLEST PERSON CAN CHANGE THE COURSE OF THE FUTURE." - BILBO BAGGINS, THE HOBBIT

It is important to protect our resources for our benefit and the benefit of future generations.



“Never doubt that a small group of thoughtful, committed people can change the world; indeed it's the only thing that ever has.”

Margaret Mead (1901-1977), Anthropologist

