



# **Stormwater Best Management Practices: Protecting Pullen Creek, an Urban Stream**

A Manual for the Borough of Skagway, Alaska  
Compiled through Research and Interviews by  
The Taiya Inlet Watershed Council

**Spring/Summer 2012**



# Taiya Inlet Watershed Council

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The Taiya Inlet Watershed Council (TIWC) is a non-profit organization in Skagway, Alaska. Formed in 2003 to promote watershed stewardship, TIWC is a community partnership working to protect and improve the health of the watershed through education, communication, research, and restoration.

The development of this manual was a cooperative effort that relied on energies at the local and state levels. The project was funded by the Alaska Clean Water Actions (ACWA) Grant Program run by the Alaska Department of Environmental Conservation (DEC). Support and interviews with members of the Skagway community, the Municipality of Skagway, the Skagway Traditional Council, as well as local commercial interests were all very valuable in the production of this document.

## Thank You

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# Introduction

The goal of this manual is to let developers, the Municipality of Skagway, and Skagway residents know what they can do to improve water quality in Pullen Creek. The Best Management Practices (BMPs) listed in this manual are actions that the community of Skagway can take at the residential, commercial, and municipal levels to reduce stormwater pollution to Pullen Creek, an anadromous, urban stream. Also included in this manual is information about permits required for construction and industrial activities that could potentially increase stormwater pollution.

## What is Stormwater Pollution?

Stormwater is rain and snow melt runoff that travels over surfaces that are not permeable such as asphalt or concrete. It is called a non-point source of pollution because pollutants are deposited over a large area and carried to bodies of water through storm drains. Vehicles, people, construction sites, residential areas and industrial sites all contribute to pollution in urban streams and rivers. Many communities around the country have created stormwater mitigation programs and manuals to reduce the impact of these pollutants on water bodies.

Skagway, though small, is affected by stormwater pollution. Tourism traffic during the summer months and year-round residential, commercial, and municipal activities impact water quality. Pullen Creek is especially vulnerable because it is small and runs straight through the areas where these activities are concentrated. Residents enjoy the environmental and aesthetic aspects of Pullen Creek and believe its health is important, according to a survey conducted by TIWC in February 2012.

## Stormwater

### Pollutants Include:

- oil and grease
- fuel
- litter
- cigarette butts
- soaps
- pesticides and fertilizers
- fine sediments

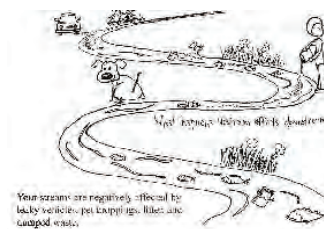
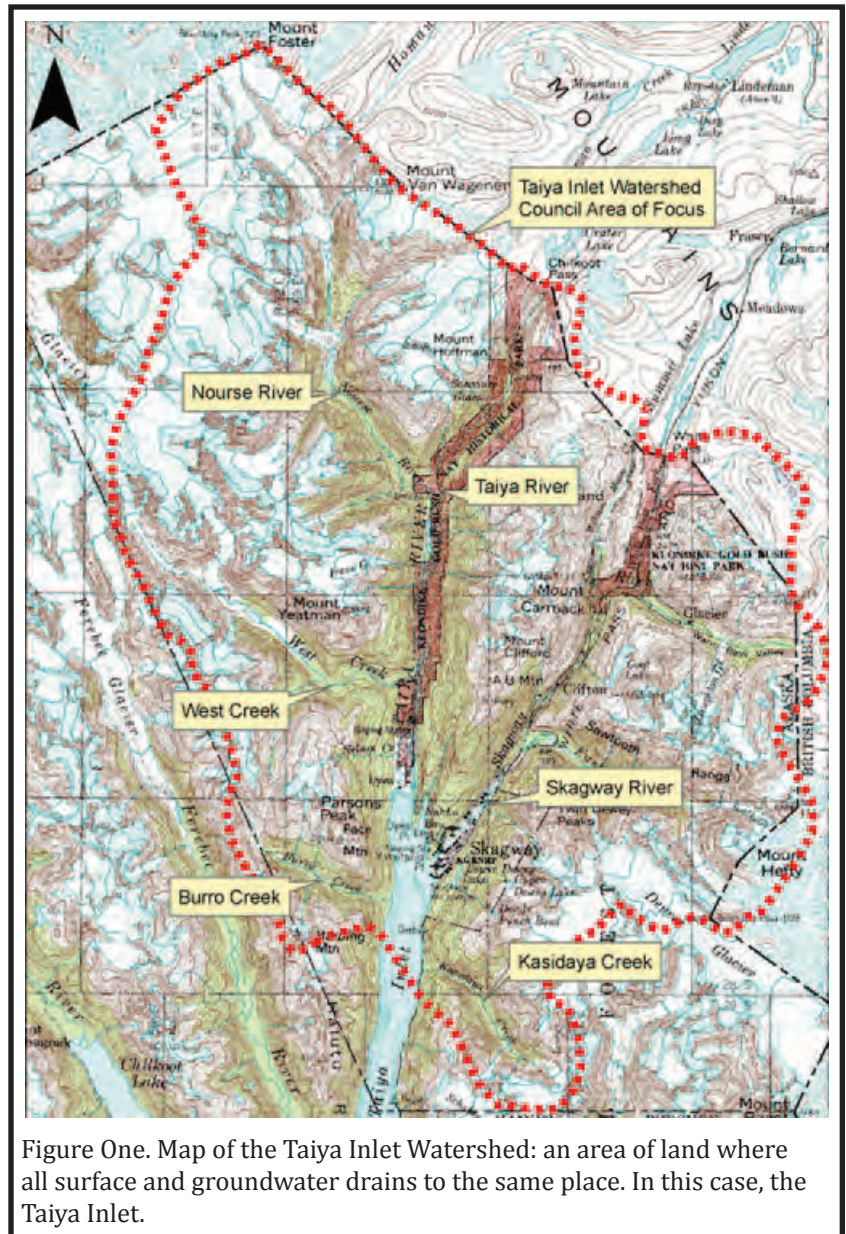


Figure Two. Outreach cartoon in the Skagway News. April 27, 2012.

# Introduction, cont.

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Stormwater pollutants accumulate on Skagway's streets and are flushed into storm drains during rain and snow melt events. Some storm drains have oil-water separators, which capture toxic substances but others lead water directly to Pullen Creek or the Skagway River unfiltered. Many people are unaware that polluting is both an active and passive activity. Pollution includes:

- **Water from washing vehicles, tools, and equipment**
- **Spills and leaks from automobiles and storage areas**
- **Erosion from cleared land**
- **Pet wastes**

and is a concern on national, state, and local levels.

## 1972 Clean Water Act

The United States Environmental Protection Agency (EPA) 1972 Clean Water Act (CWA) was a response to public interest in protection of national lakes, rivers, and coastal areas. The CWA requires that states develop water quality standards for different types of water use. In Alaska these uses are written in Title 18, Chapter 70 of the Alaska Administrative Code. The uses are water supply, water recreation, growth and propagation of fish, shellfish, and other wildlife. Each use has its own set of standards that limit the amount of certain pollutants that may be present and/or discharged into a water body. Water bodies that do not meet the standards for their designated use are placed on the 303(d) list of impaired water bodies. Recovery from that list requires a Total Maximum Daily Load (TMDL) report that lists the allowable level of pollutants in the affected water body for compliance with water quality standards and lists suggestions for reducing pollutants to that level.

## Pullen Creek

In 1990, Pullen Creek was jointly listed with the Skagway Harbor on Alaska's 303(d) list of impaired water bodies. Each were thought to contain metal-laced sediments that would negatively affect aquatic life. Monitoring in 2004 and 2005 showed that metals did exist in sediments in the lower mile of Pullen Creek. The source is thought to be the historic transport of metal-laced ore to the Port of Skagway with uncovered rail and truck transport. Dust from these vehicles was deposited throughout Skagway and might still be transported into Pullen Creek via stormwater. The 2010 TMDL report

for the metals cadmium, copper, lead, and zinc identified stormwater as a major source of pollution to Pullen Creek. Another potential source of these metal is cruise ship exhaust fallout, discussed in an issue of the publication *Alaska Park Science* (Geiser et al. 2011).



Figure Three. Pullen Creek



# Introduction, cont.

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## Skagway Harbor

In 1990, when the Skagway Harbor was listed as an impaired water body, high concentrations of lead, zinc, cadmium, copper, and mercury were found by DEC in harbor sediments. These levels were too high to meet standards set for aquatic life in the harbor. In 2008, metals were found to be significantly lower and attention was turned to petroleum hydrocarbons as the source of aquatic impairment. Because the probable source of metals (ore transfer and transport) is no longer a concern, metals in sediments are expected to decline over time. Petroleum products, specifically polycyclic aromatic hydrocarbons (PAHs), however, remain in water bodies for many years and are likely to have a current as well as historic origin in the Skagway Harbor. A TMDL was prepared in 2011 for the Skagway Harbor that suggested several potential sources of petroleum: erosion from construction projects, historic and recent surface water spills, Pullen Creek, upland nonpoint sources (stormwater pollution), and harbor and vessel activities that include petroleum storage and transfer. According to DEC's Division of Spill Prevention and Response Contaminated Sites Program, seven sites in Skagway are currently contaminated with petroleum (as of July 2012). The Small Boat Harbor is not included in the Harbor's area of concern; testing has shown that it meets water quality standards.



Figure Four. Skagway Harbor

**Enacting Stormwater Best Management Practices could help recover Pullen Creek and the Skagway Harbor from the list of Impaired Water bodies**

# Federal, State, and Local Regulatory Requirements

National, state, and local laws that regulate discharges and dumping into U.S. waters support the goals of the CWA through permits and fines. In some communities, local laws include a set of Stormwater BMPs; in others, BMPs are voluntary actions that help uphold local laws that promote clean water.

## Local Ordinances

In Skagway, clean water standards are addressed through a municipal code that prohibits littering, washing contaminated water into storm drains, and neglecting to clean up vehicle fuel and oil spills on the streets. Table One shows the sections of the code that promote clean water and pollution control.

Title	Chapter	Section
8. Health and Safety	8.02 Litter Control	8.02.020 Litter in public places
		8.02.030 Sidewalks to be kept free of litter
		8.02.050 Vehicle loads causing litter
		8.02.060 Sweeping litter into gutters
		8.02.070 Municipality's removal of litter from private property
	8.04 Nuisances	8.04.040 Polluting water
10. Vehicles and Traffic	10.04 Damaging or Polluting Streets and Sidewalks	10.04.020 Spilling oil on streets and sidewalks

Table One. Table of Skagway Ordinances that pertain to clean water and pollution control.

## State and Federal Regulatory Requirements

Table Two below shows State and Federal Regulatory Programs. The Multi-Sector General Permit and Alaska Construction General Permit are part of APDES, which, along with the ACOE 404 permit helps to meet the goals of the Clean Water Act.

<b>Clean Water Act of 1972</b> Regulates discharges of pollutants in US Waters with a permitting system. Each facility discharging water directly to surface water must obtain a permit to ensure a limited amount of toxic substances in discharged water. Permitting programs are delegated partially to state programs.	<b>Alaska Pollutant Discharge Elimination System (APDES)</b> Handles permits from various facilities that regularly discharge water as part of operations i.e. wastewater treatment plants, mines, construction sites, fish hatcheries.	<b>Multi-Sector General Permit</b> Regulates discharges associated with industrial activities into storm water systems.
		<b>Alaska Construction General Permit</b> Regulates construction projects that disturb one or more acres either continuous or disjoint.
	<b>Army Corps of Engineers (ACOE) 404 Nationwide Permit</b> Regulates discharges of dredged and fill materials to U.S. Waters.	

Table Two. Table of State and Federal Regulatory programs. For contact information, see Appendix A.

# Stormwater Pollution: The Basics

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Stormwater pollutants collect on surfaces that are hard and do not absorb liquids. Rather than soaking into dirt and soils, stormwater can travel for long distances and collect pollutants along the way. This traveling water is called runoff. There are two characteristics of stormwater pollution. The first is amount of runoff; the second is amount of pollution in runoff.

## Amount of Runoff

Stormwater runoff increases in urban areas as land is converted from natural conditions to urban surfaces. An increase in runoff causes erosion, stream channel widening, and streamside vegetation loss. Hard surfaces collect pollutants and allow runoff to transport them into streams and stormwater drains.

## Pollutants

Stormwater pollutants affect the plants and animals that live in and around streams. This includes humans. Many of these pollutants have been shown to affect the health of children and adults when they are present in community water bodies. The following is a list of pollutants that are known to travel over streets and into stormwater systems that dump water into urban streams.

### OILS, GREASES, FUELS:

Petroleum- and food-based oils, greases, and fuels are found on roads, parking lots, driveways, and storage areas. They can hurt fish by coating their gills and reducing their oxygen intake. They can contain harmful chemicals and clog stormwater drains and pipes, which increases maintenance costs.

### METALS:

The most common metals found in stormwater runoff are lead, copper, zinc, and cadmium. Contamination of both water and stream bottom sediments can kill off organisms or impair their ability to take up nutrients and reproduce. Some metals also bioaccumulate, meaning that animals eating other animals store all these metals that their prey had consumed. Humans are affected by bioaccumulation.

### SEDIMENTS:

Too many sediments in streams can smother trout and salmon eggs, decrease available habitat, affect spawning areas, and cloud water. Cloudy water limits fish health and plant growth. A characteristic of healthy, productive streams are rocky bottoms with spaces that trap oxygen for animal and fish use and provide protection for aquatic insects. Fine sediments can fill those spaces. Pollutants also bind to sediments and are washed into urban water bodies. The sources of sediments include construction sites, sand application to icy roads, dirt from vehicles, parking lots, driveways, and sidewalks. In any area where soil is unstable, such as areas where vegetation has been removed or exposed, or foundations are dug during a construction project, protective measures must be taken to avoid sediment transport into streams.

### NUTRIENTS:

Phosphorus and nitrogen are both very important for plant processes. However, too much of either of



# Stormwater Pollution: The Basics, cont.

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these nutrients will cause plants and algae to overgrow. The results include surface scum and reduced oxygen. When these plants decay, the bacteria that breaks them down uses up oxygen that would otherwise be available for fish and insects. The most well-known sources of nutrients are fertilizers used in lawn care and agriculture. Other sources include animal wastes, septic systems, detergents, road de-icing salts, vehicle emissions, eroded soils, and lawn debris (grass clippings and leaves).

## **TOXIC ORGANIC COMPOUNDS:**

Insecticides, herbicides, fungicides, and rodenticides all contain toxic organic compounds (TOC) that are very toxic. TOCs kill or impair fish and aquatic plants, insects, and animals.

## **FECAL COLIFORM BACTERIA:**

Several studies have shown that bacteria such as *e. coli* binds to sediments and remains in streambeds and lake bottoms over time (Labelle et al. 1980, Schillinger and Gannon 1985). When the sediments are stirred up, bacteria are released back into the water, which can lead to ingestion by humans and animals. One source of bacteria is pet waste. The University of Wisconsin published a list of diseases and parasites that affect humans through contact with pet waste in water bodies. These include *Campylobacteriosis*, *Cryptosporidium*, *Toxocariasis*, and *Toxoplasmosis*. All cause flu-like symptoms that can

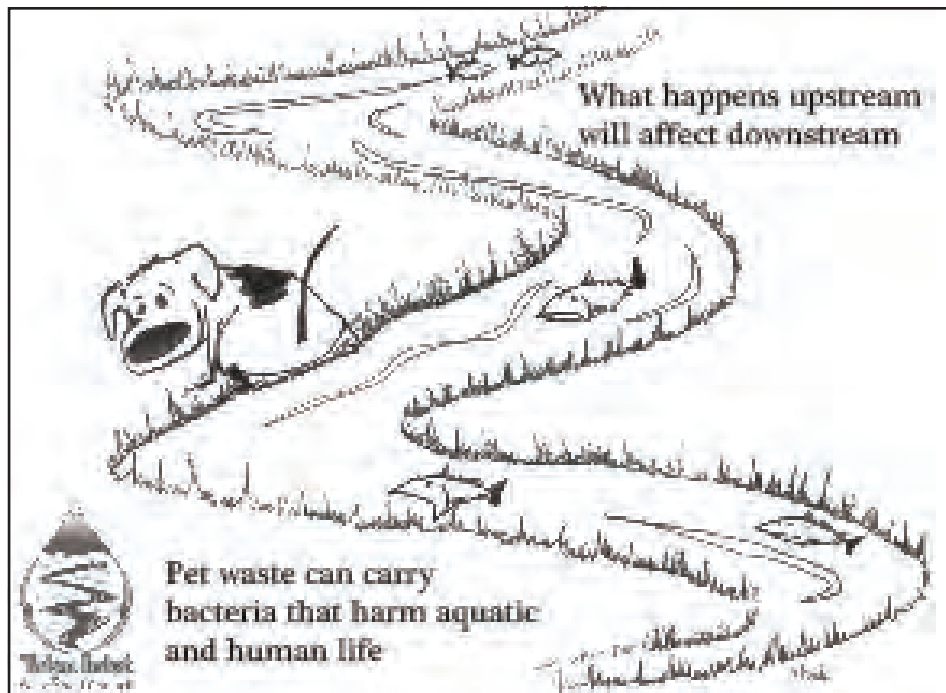


Figure Five. Outreach cartoon in the Skagway News. May 11, 2012.

# Skagway's Stormwater Infrastructure



Knowledge about Pullen Creek's contaminants and sensitivity to stormwater pollution has been building for several years. In 2004, the Skagway Traditional Council (STC) tested for metals in and around Pullen Creek. The final report contains data collected from soil and water samples highlighting samples that exceeded state standards. In 2006, TIWC published a series of maps showing the location of storm drains across Skagway, outfalls into Pullen Creek, and where possible, pipes connecting drains to outfalls. These maps show how stormdrains are connected to streams. The mapping process included notes on drains and outfalls that were clogged with sediments, leaves, or other debris. Currently this drainage system is maintained by Publics Works, a Municipal department.





# Best Management Practices

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Best Management Practices (BMPs) are a list of actions that people in different sectors of a city or community that will reduce pollution to urban rivers, lakes, and streams. BMPs capture stormwater runoff and limit pollutants that collect on hard, urban surfaces. There are two types of BMPs:

## (1) Source Control

These BMPs prevent contaminants from collecting on hard surfaces. A source control example is repairing vehicles to prevent fuel and oil leaks.

## (2) Treatment

Treatments remove pollutants from stormwater. An example is a riparian (streamside) buffer, which slows the flow of stormwater near the edge of a stream or creek. A slower flow allows pollutants to filter through soils and absorb into plants.

One way communities are using BMPs is through Low Impact Development (LID). LID happens when buildings, parking lots, streets, and sidewalks are designed to reduce runoff. Choice of materials in development projects can improve infiltration of water where it lands as rain or snow. An example of this is a Green Roof, which substitutes soils and aesthetic plants for traditional compact roofing material.

BMPs can be at a scale as large as LID, where entire buildings are constructed as part of a stormwater reduction strategy, or as small as fixing a leaking vehicle.

This manual is broken into sections that let residents, municipal workers, individuals in commercial activities and those who use the harbor know how they can do their part to reduce pollution to Pullen Creek.



Figure Eight. Construction of a Green Roof on Juneau's Downtown Transportation Center. Juneau Empire, 2010.



# Residential BMPs

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Residential BMPs are often small actions that, when taken by many people, increase clean water and good habitat for insects and fish. Many residents in Skagway would like Pullen Creek to stay a healthy anadromous fish stream. These are some ways to do so.

## Vehicles

Oils and greases from residential vehicles collect on driveways and streets where they are washed into storm drains.

- **Check for and fix vehicle leaks regularly**
- **Use drip pans to collect liquids during maintenance**
- **Dispose of liquids in the proper place: The Skagway Small Boat Harbor collects used oil, antifreeze, and batteries and disposes of them without damaging ground or surface water**
- **Be prepared to clean up after leaks when they do occur. Cat litter will soak up liquids. The litter can then be disposed of in the garbage**

Vehicle washing on hard, compact surfaces increases runoff on the streets. Detergents can contain toxic substances and wash water is full of soaps, oils, greases, and particles from vehicle emissions.

- **Wash cars and boats over permeable surfaces such as lawns or aerated soils**
- **Use soaps that do not contain phosphorus: this nutrient causes overgrowth of algae**
- **Avoid washing underneath the car over compact surfaces. This is the site of oil, grease, and fuel buildups**

## Toxic Household Materials

- **Never dump products labeled *poisonous, corrosive, caustic, flammable, inflammable, volatile, explosive danger, warning, caution, or dangerous outdoors* into stormwater drains, sinks, or toilets. Oils antifreeze, and used car batteries can be taken to the Small Boat Harbor. Other hazardous materials are collected by Public Works on a designated day in the summer. Call Public Works for information: (907) 983-2449**

# Residential BMPs, cont.

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## Lawn care and Landscaping

Pullen Creek runs through many private properties. Lawn care can reduce to stormwater pollution if it provides an area where water running off sidewalks and roofs can be soaked up. Lawn care can also increase stormwater pollution through the overuse of fertilizers and pesticides, which contain toxic chemicals harmful to aquatic plants and animals at even low levels. According to the EPA, residential lawns produce significant amounts of runoff that often contain pesticides and fertilizers. This runoff can be contained in the lawn area with some BMPs.

- **Avoid the use of pesticides, insecticides, fungicides, and rodenticides. If used, follow the directions carefully and do not over-apply**
- **Turn over compacted soils in areas of high runoff to aerate them and create pore spaces for water to soak into. Gardens have soils with large pore spaces and add visually to lawns**
- **Dispose of yard wastes in the proper place: the area of Seven Pastures has a site for leaves, branches, and grass clippings**

Riparian buffers are a treatment BMP that provide a protective barrier to the creek. A riparian buffer is an area of native vegetation between a stream, creek or other water body and any type of development. These vegetative structures are very important for healthy streams: they act as a filter for pollutants, create habitat for insects and wildlife, regulate stream temperature, and are a source of food for aquatic insects (Liu et al. 2008). A 10 to 20 foot buffer of native grasses and trees (see page 11) can greatly decrease pollutants entering a stream or creek (Zhang et al. 2009). Other treatment BMPs that residents can place on their own properties include rain barrels and rain gardens. Rain barrels collect roof runoff and saves it for later use (watering plants, washing cars, etc.). Rain gardens are constructed basins that hold permeable soils and attractive plants.



Figure Nine. Riparian buffer of grasses along Pullen Creek.  
TIWC, 2011.

- **On properties that contain Pullen Creek, maintain or create a riparian buffer of 10 to 20 feet made of native plants, trees, and grasses**
- **Install a rain barrel in an area that collects roof runoff**
- **Create a rain garden next to a compact surface and direct stormwater into it**

# Residential BMPs, cont.

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## Plants Native to Southeast Alaska

Help keep Southeast Alaskan vegetation native by planting stream sides with these trees, shrubs, and grasses

### Small Trees and Shrubs

- Sitka Willow
- Alder
- High Bush Cranberry

### Large Trees

- Black Cottonwood
- Sitka Spruce
- Western Hemlock

### Grasses and Sedges

- Bluejoint Reedgrass

## Pet Waste

- Carry a bag on walks and adventures with your pet, pick up droppings, and dispose of them in the garbage
- Keep pet waste in your yard under control and be especially mindful about areas around storm drains and gutters

# Municipal BMPs

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## Roads

In Skagway, a large source of sediments to Pullen Creek is sand and salt added to icy winter streets. When the snow melts, the sediment is transported to storm drains.

- Sweep up sand after melts quickly and avoid washing sediment into storm drains
- Install oil-water separators or sediment traps into storm drains and regularly maintain them

Snow removal is also a source of stormwater pollution. Snow can contain pollutants such as salt, sand, gravel, oil, grease, antifreeze, heavy metals, and trace elements from engine emissions. Within Skagway, snow is picked up from 1st to 7th along Broadway and transported to the southeast corner of the boat yard near the Small Boat Harbor. Otherwise, snow is pushed to the side of the road and left to melt. There is no direct dumping of snow into aquatic environments, fresh or marine.

- Evaluate placement of removed snow and where the runoff will go when the snow melts. If possible, place snow in areas where melt will not affect Pullen Creek

## Stormwater Outfalls

Outfall pipe and site design can destroy stream habitat if the pipe diameter is too small. Water velocity will be high and cause soils to erode. Fast flowing waters out of an outfall also discourages fish spawning and rearing. With a good design, outfall discharge sites can reduce the energy of fast flowing water and improve surrounding fish habitat.



# Municipal BMPs, cont.

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- **Build new outfall structures or modify existing ones to minimize impacts to aquatic fish and insects and their habitats by maintaining a maximum flow velocity of less than 10 feet per second**
- **Pair outfalls with a rock splash pad when flow velocities are less than 10 feet per second**
- **For higher flow velocities, consider other engineered structures:**
  - Tightline System:** A pipe that takes flows down a steep slope with a structure to dissipate energy at the outfall discharge site*
  - Flow Dispersal Trench:** A trench dug specifically for receiving high volumes of fast flowing water*
  - Gabion Outfall:** Constructed area where water can pool up, reducing erosion that occurs due to fast moving water*
- **Outfalls can also be paired with a widened stream at the discharge site, resulting in an area for fish to use as shelter during high flow velocities**

## Vegetation

On municipal lands that contain parts of Pullen Creek, riparian buffers should be created. Several riparian enhancement projects along Pullen Creek have been completed with the result of improved streamside habitat. In the future, planted areas should contain only native seeds as stream banks have experienced overgrowth of invasive species, which crowd out native species (see Page 11). TIWC, USFWS, SAGA (a service program), the Municipality of Skagway and White Pass have been partners in these projects.

- **Set aside a 10 to 20 foot strip of native vegetation to protect the creek from pollutants, erosion, and sediments from runoff**
- **Stabilize banks with rocks, netting or other materials to prevent erosion in steep areas**
- **Consider a riparian buffer ordinance that makes a streamside protective strip of vegetation mandatory throughout Skagway. This would ensure that residents would be careful to not build on or destroy existing streamside vegetation**

A biofiltration swale is another vegetated BMP. These are bowl-like channels of native plants that slow water flowing off compact surfaces or out of storm drain outfalls. Dry swales are planted with grasses and are found along streets, parking lots, and next to buildings. Wet swales are wetland plants and found in areas that are typically water-logged. Swales are constructed with soils such as sandy loam, loamy sand, or loam. The plants must withstand fast-flowing water and be planted in soils well before high flows are expected so they can firmly establish themselves. Swales should be two feet from

# Municipal BMPs, cont.

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property lines and 10 feet from building foundations.

- **Create a depressed area to intercept high amounts of runoff. Plant this with native grasses and soils that can withstand water flows and sediment quantities expected at the site. Monitor and maintain them regularly**

An infiltration basin, like a swale, is a bowl-like area that collects stormwater off a compact surface often through a pipe or channel. Unlike a swale, an infiltration basin will store the stormwater until it soaks into the soil. Some basins have pipes beneath them to drain water out of the area. This BMP works best in small areas with low levels of sediments in the runoff: fine sediments will lower water absorption rates.

- **Construct an infiltration basin to soak surface runoff into the ground. The basin will also store water and filter out pollutants**

***Plant only native plants (See Page 11)! Efforts all over the state of Alaska are made to control the spread of invasive weeds. In Skagway, there are several invasives that the community is working to eradicate.***

## Litter

Litter is a large source of pollution to streams. It disturbs insects and fish habitat, takes away from the natural beauty of the area, and can let off toxins as it decomposes.

- **Increase the number and visibility of garbage cans in high pedestrian areas around Pullen Creek**
- **Create signs that remind visitors and residents to be responsible with their garbage. Use several language to communicate with visitors from around the world**

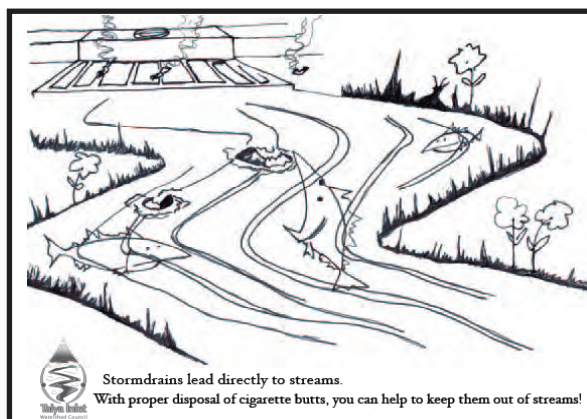


Figure Ten. Outreach cartoon in Skagway News. June 8, 2012.

# Commercial BMPs

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## Vehicles

Tourism is Skagway's greatest source of revenue and also its greatest source of pollution. On rainy days streaks of fuel and oil on the streets are very noticable. Puddles of leaked oil can be seen on all of Skagway's streets.

- **Regularly perform checks and maintenance to prevent leaks and spills. Hold vehicle drivers responsible for these tasks and for cleaning up leaks and spills if they do happen**
- **Make clean-up materials available and easy to find. Create a spill clean-up plan and train vehicle drivers to follow it**
- **Require responsible fueling. Many fuel leaks on roads may be from overfilling tanks**

## Vehicle Washing

- **Set aside a commercial vehicle washing area containing filtration systems for pollutants**
- **Use soaps that are phosphorus free**

## Construction

In many communities, Stormwater Pollution Prevention Plans (SWPPP) are a required in the construction process. SWPPP are site-specific documents outlining steps for reducing stormwater pollution caused by construction activities that clear plants off land. Some general BMPs been identified for use in SWPPP plans. These are listed below.

- ***Minimize Clearing and Grading.* Analyze sites for areas where clearing and grading can be avoided. Aquatic areas are especially dependent on stream buffers, forest conservation areas, wetlands, and springs. Avoid disturbing these areas, if possible, or clear them only when necessary.**
- ***Protect Waterways.* When waterways are a part of a construction site, streamside vegetation should not be cleared. Install a silt fence or earthen dike to protect the stream from excess sediments.**



Figure Eleven. Oily sheen in Skagway gutter. TIWC, 2012.



## Commercial BMPs, cont.

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- ***Stabilize Drainage Ways.*** A map of the existing and expected drainage patterns can inform the construction team about which way sediments will be heading. These drainage ways can be protected from erosion and sediment erosion with netting, erosion control blankets, grass plantings, dikes, or silt fences.
- ***Implement Phase Construction.*** Grade areas only when needed to reduce the time that soils are exposed and at risk to erosion.
- ***Stabilize Loose Soils Quickly.*** Plant a native grass cover or place a mulch cover onto uncovered soils. If completed within two weeks, this BMP can reduce sediment erosion into local streams by 600 percent.
- ***Protect Steep Slopes.*** Erosion risk is highest along steep slopes. The best practice is to avoid clearing any slopes and to divert runoff around slopes. If water cannot be diverted, then a silt fence to catch sediments at the foot of the slope may prevent sediments from moving into water bodies. Erosion control blankets also work well for stabilizing slopes.
- ***Create Perimeter Controls.*** Silt fences or earth dikes help keep sediments within the construction site.
- ***Construct Advanced Settling Devices.*** Construct drainage systems for storm events where basins are used to collect sediments that wash off the site in the rain.
- ***Certify Contractors to Implement BMPs:*** Carrying out of a plan of BMPs like a SWPP should be a job for a contractor who is trained in installing and maintenance of BMPs.
- ***Adjust BMPs for Field Conditions.*** BMPs should be adjusted to characteristics of the site.
- ***Assess BMPs after Storms.*** Carefully inspect stormwater prevention measures after each storm event for needed repairs or reinforcements.

# Harbor BMPs

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Skagway's Small Boat Harbor already has BMPs in place that help reduce pollution to local waters. Some of these include:

- **Fuel and oil spill clean-up plans: The harbor master attends annual SEAPRO (Southeast Alaska Petroleum Resource Organization) training to prepare for oil spill response**
- **Materials for clean-up are readily available at the fueling station**
- **Materials for larger spills are accessible for harbor staff and other SEAPRO responders in Skagway**

The voluntary, non-regulatory Clean Harbors Program was created by the Cook Inletkeeper, a non-profit community-based organization that works to protect Cook Inlet in South-Central Alaska. This program encourages harbors to reduce wastes and meet regulatory environmental requirements. Certified Clean Harbors are those that comply with a list of best management practices and promote Alaskan fisheries, culture, and tourism by keeping pollutants like hydrocarbons out of watersheds. Harbors need not be certified to take action for marine environmental health. Some Harbor BMPs follow.

- **Complete major repairs and cleaning out of water**
- **Collect and dispose refuse and waste materials from minor repairs and cleaning on-shore. Title 9 of the Skagway Municipal Code defines refuse of all kinds as unlawful nuisances. This includes paint, oil, and dock sweepings**
- **Avoid topping off fuel tanks. This practice often leads to spills. Keep absorbent pads available for cleaning up spills**
- **Maintain engines and other mechanics to prevent leaks into the bilge**
- **Carefully dispose of any bilge water. Soak up oil with pads or pillows (keep these on board all vessels). Do not mix soaps with oily bilge: this mixture is more toxic than oily water aloneaaa**

**For more information on the Alaska Clean Harbors program, visit [alaskacleanharbors.org](http://alaskacleanharbors.org) or contact Rachel Lord at 907.235.4068 ext. 29.**

# Appendix A: Permit Contacts

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## Multi-Sector General Permit

William Ashton, Storm Water and Wetlands Engineer  
Division of Water - Alaska Department of Environmental  
Conservation  
555 Cordova Street  
Anchorage, AK 99501  
Telephone: 907-269-6283  
e-mail: [william.ashton@alaska.gov](mailto:william.ashton@alaska.gov)  
[dec.alaska.gov/water/wnpspc/stormwater/MultiSector.htm](http://dec.alaska.gov/water/wnpspc/stormwater/MultiSector.htm)

## Alaska Construction General Permit

Jim Rypkema, Storm Water Coordinator  
Division of Water - Alaska Department of Environmental  
Conservation  
555 Cordova Street  
Anchorage, AK 99501  
Telephone: 907-334-2288  
e-mail: [jim.rypkema@alaska.gov](mailto:jim.rypkema@alaska.gov)  
[dec.alaska.gov/water/wnpspc/stormwater/index.htm](http://dec.alaska.gov/water/wnpspc/stormwater/index.htm)

## Army Corps of Engineers 404 Nationwide Permit

US Army Corps of Engineers, Alaska District  
Main Office  
PO Box 6898  
JBER, Alaska 99506-0898  
Telephone: 907-753-2712  
[www.poa.usace.army.mil/reg/](http://www.poa.usace.army.mil/reg/)

Also listed as a permit under the Alaska Pollutant Discharge Elimination System is the *Municipal Separate Storm Sewer Systems Permit (MS4s)*, which regulate discharges from large, medium, and regulated small municipal separate storm sewer systems. The following definitions apply:

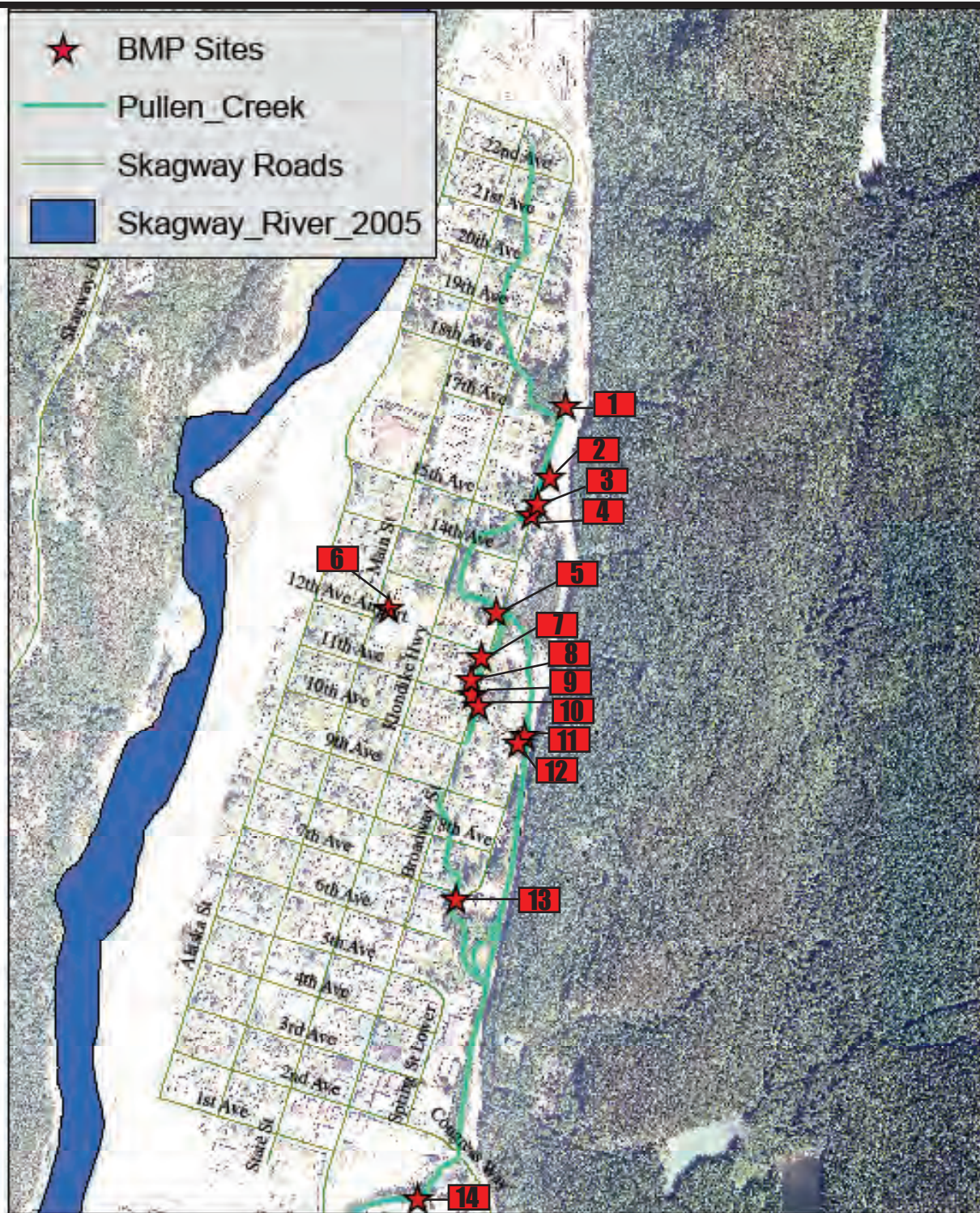
A large MS4 is located in an area with a population of 250,000 or more

A medium MS4 is located in an area with a population between 100,000 and 249,999

A regulated small MS4 are generally all small MS4s located in “urbanized areas” defined by the Bureau of the Census. In Alaska, only Anchorage and Fairbanks are recognized by the Bureau of the Census as urbanized areas; therefore, Skagway is not required to obtain this permit.



## Appendix B: Potential BMP Sites



**Potential Stormwater Best Management Practices Sites**

July 2012





# Appendix B: Potential BMP Sites

From North to South on Map on Previous Page



In 2011, a SAGA crew worked with TIWC to plant a riparian buffer. It has since been trampled and then mown down. Constructing a fence would protect the area.



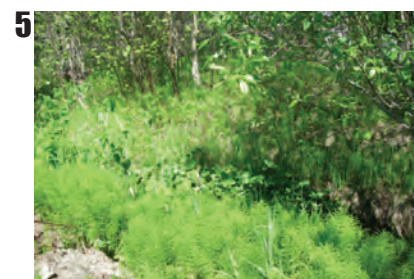
The road is encroaching on the riparian zone. This access road is used by White Pass throughout the year, but this wide part is likely unnecessary. Convert this back to riparian plants.



The riparian zone is very small here due to residential parking and trampling. Replant and encourage people to stay off the area with a fence.



Where Broadway Ave. turns to a dirt road, this piece of asphalt is likely unnecessary. It could be converted back to riparian vegetation.



A good example of a riparian zone that is keeping sediments out of the creek.



The parking lot for the Recreation Center could be a great site for a rain garden. Water comes off the roof and down the gutter pipes, into the parking lot, which slopes into the street.



Potential site for a rain garden. This site lies directly next to the road.



This wetland next to the old clinic building is a great example of a bioswale-type feature. It should be protected.



This outfall could be shortened and a swale planted in front of it.

## Appendix B: Potential BMP Sites

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This outfall could be shortened and a swale planted in front of it.



This wetland lies north of 10.5 Ave and could be used as a place to convey stormwater should construction take place in the area.



This wetland lies south of 10.5 Ave and could be used as a place to convey stormwater should construction take place in the area.



This outfall just south of 7th Ave has a long concrete channel that can be shortened or removed, giving more surface area for infiltration.



Just south of the footbridge, which is south of Pullen Pond, this outfall lets water run across a relatively steep, compact slope. This could be planted for extra infiltration area.

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