

March 2018

# Bear Creek Watershed Management Study

## Restoring Your Watershed



We invite you to learn about the health of your watershed and our recommendations on how best to restore and protect Bear Creek now and into the future. Development is occurring in the watershed—and more is likely in the rural areas that are home to a wide range of salmon and trout.

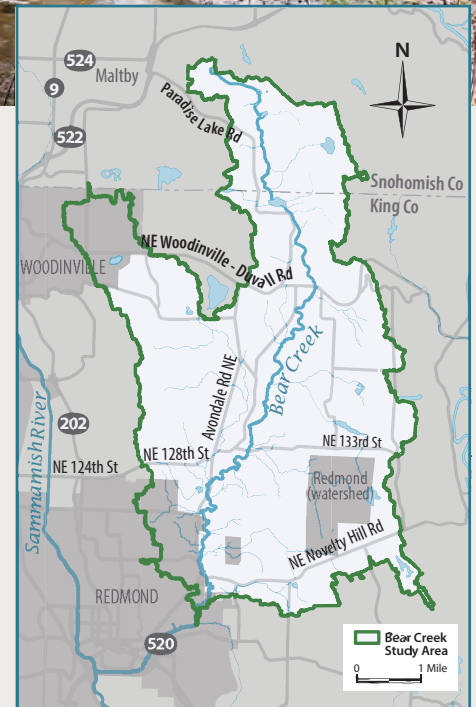
26<sup>mile<sup>2</sup></sup>  
study area

200  
miles of roads

10,000  
households

The Bear Creek Watershed Management Study was a stormwater permit requirement of state and federal clean water laws. What we do with the information is up to us. Containing detailed technical analysis of problems and an assessment of the types of actions needed to restore the watershed, the Study provides a long-term strategy for addressing water quality and habitat concerns. Though there have been past efforts slowing its decline, more time and resources are needed. Leveraging other complementary efforts, our proposed ten-year recommendations intend to “move the needle” in a more cost effective way and improve the health of the watershed.

King County, Snohomish County, Redmond, Woodinville, and Washington State Department of Transportation (the Partners) collaborated on this study to reduce stormwater pollution and restore and protect stream and wetland habitat.



# BEAR CREEK WATERSHED – LIVING ON THE LAND

Most rain and stormwater runoff flow untreated to a storm drain or ditch. Ultimately, it ends up in a stream, lake, wetland or groundwater. Polluted stormwater is the leading source of pollution to Bear Creek. Small amounts of pollution carried by runoff add up and threaten fish and wildlife.

Over 10,000 households in the Bear Creek study area contribute to the health of the stream and wetland habitat.



## After one inch of rainfall...

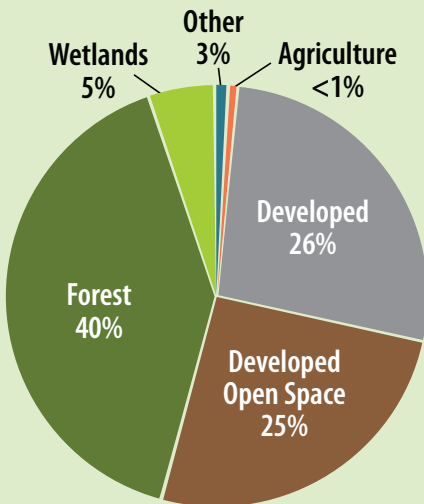
**748**  
gallons of  
stormwater  
runs off a 1,000  
square foot roof



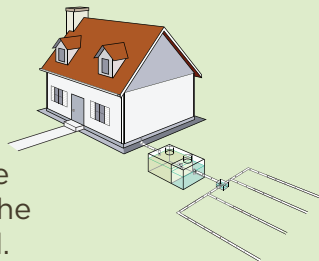
**27,000**  
gallons of stormwater  
runs off a 1-acre  
parking lot



## Land Use in Bear Creek

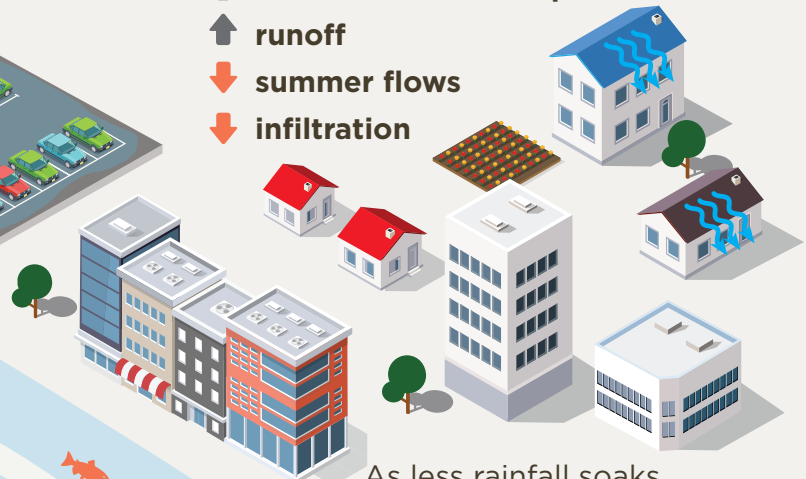


**Septic**  
32% of households are on septic systems in the Bear Creek watershed.



**Population** in the Bear Creek study area is expected to grow 20% by 2040.

- ↑ housing density
- ↑ pollution
- ↑ summer stream temps
- ↑ runoff
- ↓ summer flows
- ↓ infiltration



As less rainfall soaks into the ground due to development, there is more potential for impacts to the stream system and the health of fish and aquatic insects.

## Salmon and Trout

The streams, lakes, and wetlands in the Bear Creek watershed support several salmon and trout species including chinook, sockeye, coho, kokanee, coastal cutthroat, and steelhead.

## WHAT WE FOUND IN YOUR WATERSHED

King County assessed the historic and existing conditions of the Bear Creek Watershed.

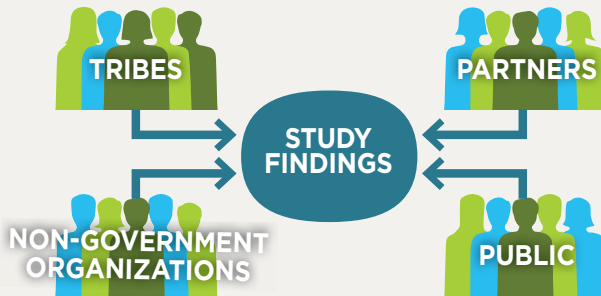
Conditions include:

- 💧 rainfall,
- 💧 streamflows,
- 💧 water quality,
- 💧 existing infrastructure,
- 💧 health of salmon and aquatic insects,
- 💧 wetland, riparian, and in-stream habitats,
- 💧 land use and population.



### Sharing the Science

Presentations were given at webinars, public meetings, and workshops where experts and other interested parties reviewed and commented on every aspect of the project. Many suggestions were incorporated into the Study.



We used future population and land use projections in stormwater computer models to inform and identify recommended strategies to achieve established goals.



Bear Creek Public Meeting, 2016

### HEALTH STATUS Bear Creek Watershed

+	Fewer nutrients that can cause toxic algae blooms
+	Few instances of toxic levels of metals
—	Bacteria levels do not meet water quality standards
—	Streams are becoming warmer and less oxygenated – worse for fish such as salmon
—	In-stream salmon habitat diversity and connectivity has been degraded in some areas
—	Increased flashy stream flows – rapidly rising and causing scour in stream beds
—	Loss of riparian areas from 1972 to 2015
—	Many existing stormwater facilities are aging or outdated structures, providing inadequate flow control and little to no water quality treatment
—	Loss of wetlands

Check out our project at [www.kingcounty.gov/bearcreekstudy](http://www.kingcounty.gov/bearcreekstudy)

# FOUR WAYS TO RESTORE AND PROTECT THE BEAR CREEK WATERSHED

The Bear Creek Watershed Study recommends:

- 1 updating and building new stormwater infrastructure on public land,
- 2 providing incentives for installing rain gardens, cisterns, and permeable pavement on private land,
- 3 restoring habitat along streams and wetlands, and
- 4 supporting the success of the Study.

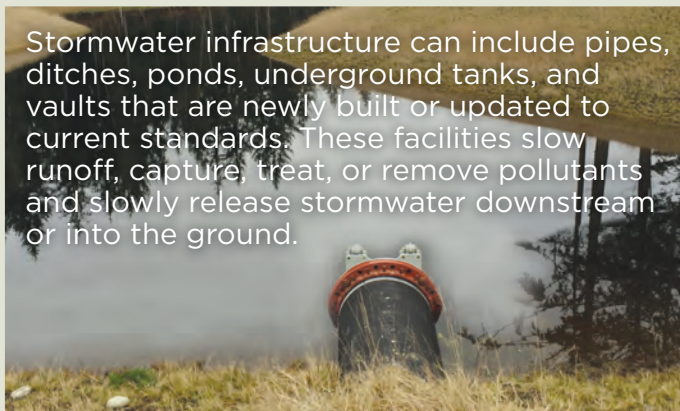
The Study recommends a ten-year effort to improve water quality and stream flows in five high-priority areas and begin to restore habitat throughout the watershed.

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## UPGRADE AND BUILD NEW INFRASTRUCTURE

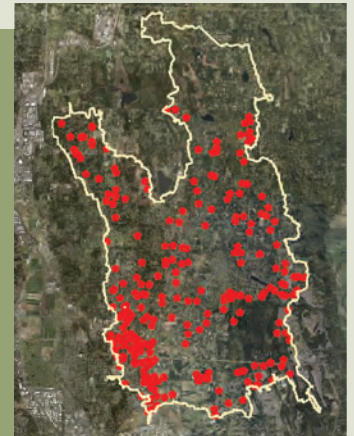
### What's the problem?

- More than 80% of the stormwater infrastructure in the study area are built using designs that are greater than 20 years old.
- Stormwater is not controlled in two-thirds of the developed areas of the watershed.
- Over time, design standards have improved.



Stormwater infrastructure can include pipes, ditches, ponds, underground tanks, and vaults that are newly built or updated to current standards. These facilities slow runoff, capture, treat, or remove pollutants and slowly release stormwater downstream or into the ground.

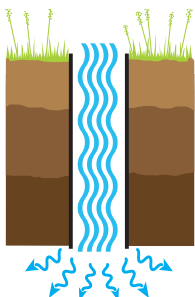
There is wide-spread distribution of older stormwater facilities that need to be updated throughout the watershed.



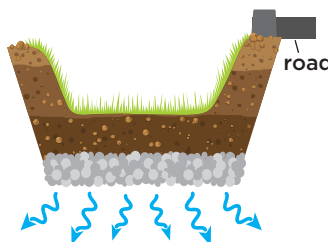
### THE STUDY RECOMMENDS

The #1 recommendation is to upgrade existing infrastructure for highly developed areas and build additional stormwater infrastructure. Types of strategies on public lands include:

#### GRAVITY WELLS treating 2 acres of runoff each



#### ROADSIDE BIORETENTION DITCHES treating 1,000 sq ft of runoff each



#### INFILTRATION, WET, DETENTION PONDS treating 2 acres of runoff each



#### Programs

**Flow Transfer Feasibility Study** – studies whether flow credit transfer between watersheds would be effective.

**Existing Pond Optimization Program** – evaluates existing infrastructure to provide improvements.

#### Complementary Efforts

- Upgrade and build new and repair and maintenance of current infrastructure
- Catch basin cleaning, street sweeping, and improvement to roadside drainage

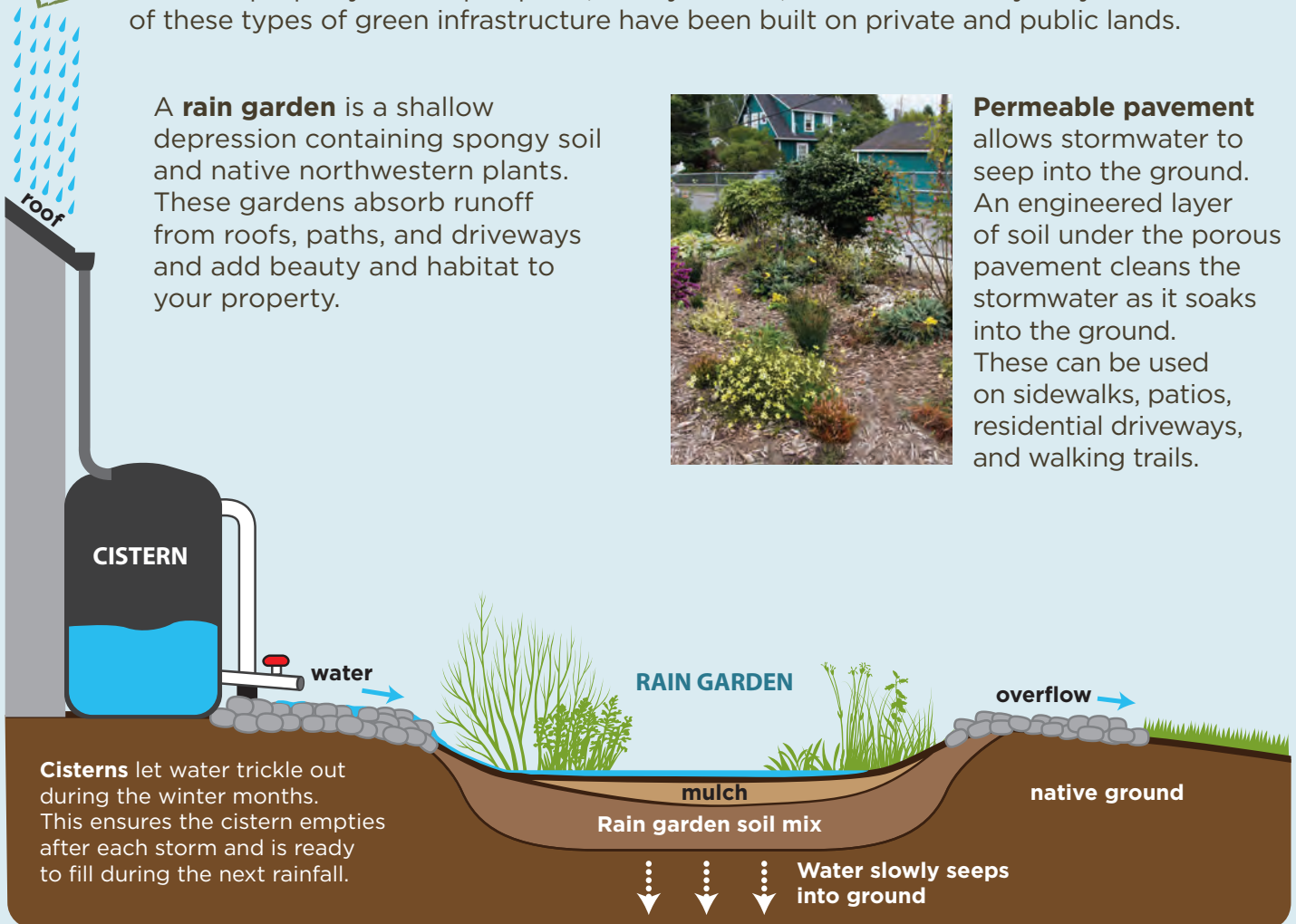
**PRIVATE LAND**

During big storms, stormwater can carry pollutants and erode hill slopes and stream banks. Rain gardens, cisterns, and permeable pavement on your property can help capture, slowly release, or filter water to your yard. Hundreds of these types of green infrastructure have been built on private and public lands.

A **rain garden** is a shallow depression containing spongy soil and native northwestern plants. These gardens absorb runoff from roofs, paths, and driveways and add beauty and habitat to your property.



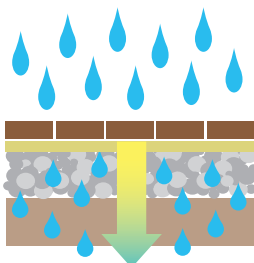
**Permeable pavement** allows stormwater to seep into the ground. An engineered layer of soil under the porous pavement cleans the stormwater as it soaks into the ground. These can be used on sidewalks, patios, residential driveways, and walking trails.



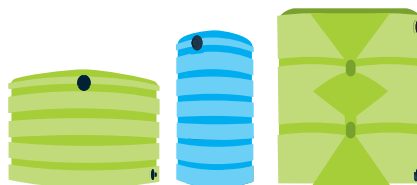
## THE STUDY RECOMMENDS

The Study recommends providing incentives to support installing rain gardens, cisterns, and gravity wells on private land to increase infiltration in the watershed.

**PERMEABLE PAVEMENT**  
treating 2,000 sq ft of runoff each



**CISTERNS**  
treating 1,742 sq ft of runoff each



**RAINGARDENS**  
treating 1,000 sq ft of runoff each



## Programs

**Flow Control Incentives** – provide assistance to private land owners to install rain gardens and cisterns.

**In-lieu Fee Program** – allows those proposing development to pay for mitigation when it is infeasible to provide mitigation.

## Complementary Efforts

- Build new infrastructure

Salmon depend on various **instream habitats** throughout their lifespan. As salmon grow, they use a variety of habitats at different times of the year. Healthy instream habitats have well-functioning river, floodplain, and riparian conditions.



**Wetlands** filter and trap out sediment and pollutants from slow-moving water. Wetlands soak up large amounts of water and help prevent downstream flooding. Wetlands help keep streams from going dry in the summer, recharge groundwater aquifers, and provide important fish and wildlife habitat.



**Riparian corridors** are the strips of land along the length of a river or stream. Healthy riparian areas are vegetated with native trees and shrubs. These areas can promote a wide range of valuable functions, such as to:

- ✓ filter water for improved water quality,
- ✓ reduce streambank erosion,
- ✓ cool water through increased shade from trees,
- ✓ protect salmon from predators using large wood, and to
- ✓ promote overhanging vegetation food source for salmonids.

## THE STUDY RECOMMENDS

Protection and restoration strategies will promote the variety of habitats needed by salmon, will assist in repairing and improving natural functions of degraded wetlands, and will promote improved essential conditions for healthier riparian habitat.

### IN-STREAM HABITATS

Complete restoration projects using strategies that:

- Connect floodplains and wetlands,
- Add woody debris,
- Create and connect channels,
- Improve tributaries, and
- Improve road and bridge crossings.

### WETLAND HABITATS

- Restore degraded wetlands by planting trees, and
- Preserve and/or acquire wetlands.

### RIPIARIAN CORRIDORS

- Plant trees within a 165ft buffer of degraded riparian corridors, and
- Preserve and/or acquire riparian areas for conservation (e.g., Land Conservation Initiative).

### Programs

**Fish Passage Study & Mitigation Plan** – locate and remove in-stream barriers preventing fish migration.

**Tree Planting Programs** – (e.g. City of Redmond, King County's 1 Million Trees campaign) – plant trees on public land and incentivize property owners to plant trees.

**Mitigation Banking** – sell credits to developers.

### Complementary Efforts

- WRIA 8 Salmon Recovery Plan acquisition projects
- King County Land Conservation efforts



It will take more than these recommendations to restore Bear Creek to a healthy watershed. You, your family, and your neighbors are our partners.

Your support will be crucial to our success. These actions, such

as stream corridor planting and construction of rain gardens, cisterns, and permeable pavement rely on property owners too.



## What you can do now

These actions can reduce the amount of pollutants running into the streams. Changing your everyday behaviors can result in small changes that add up to big gains.

- ✓ Maintain your vehicle and repair leaks,
- ✓ Wash your car at a commercial car wash,
- ✓ Reduce use of outdoor chemicals,
- ✓ Plant native vegetation/trees in your yard,
- ✓ Annual septic system check-up,
- ✓ Pick up after your pets and keep animals out of streams,
- ✓ Add a rain garden or cistern to your home,
- ✓ Clean out street drains before and after storms, and
- ✓ Volunteer for stream restoration projects.

## THE STUDY RECOMMENDS

Public involvement, support, and cooperation will be crucial to the success of water quality and habitat restoration efforts in the Bear Creek watershed. Some strategies like tree planting along streams and wetlands and installing rain gardens are expected to occur on private lands.

- ✓ **Involve the community and provide training and technical assistance.**
- ✓ **Implementing a monitoring program to track strategy effectiveness, to be used in adaptively managing the Study.**
- ✓ **Complete program review at ten-year and adapt strategies for moving forward.**

### Programs

**Monitoring and Assessment Management Program** – collects data to assess effectiveness, tracks actions, outcomes, and makes modifications.

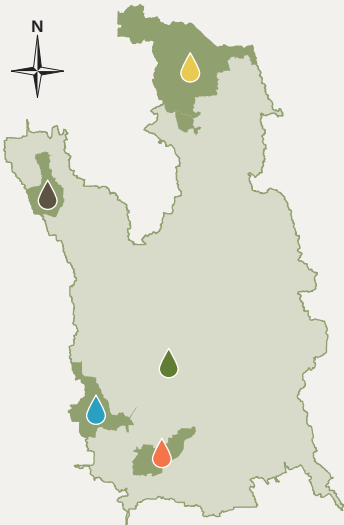
**Preservation and Acquisition** – of high priority open space.

### Complementary Efforts

- King County's Neighborhood Drainage Assistance Program
- Puget Sound Starts Here
- Fecal Bacteria Source Tracking Study
- Bear Creek/Sammamish Community Service Area

## MOVING FORWARD

The Bear Creek Watershed Management Study presents a set of strategies to achieve clean water and healthy habitat over the long term. While there are some strategies identified for watershed-wide implementation, the emphasis is on near-term, high-priority areas. These strategies include investments in land acquisitions, stormwater infrastructure projects, habitat restoration and programs/studies in select smaller areas of the Bear Creek watershed.



### Near-term, High-Priority Areas

Five areas are recommended for focused stormwater management actions over the next ten years:

- Upper Bear Creek (in unincorporated King County),
- Along Lower Mackey Creek (in unincorporated King County),
- Monticello Creek (in city of Redmond),
- Upper Cold Creek (in city of Woodinville), and
- Upstream of Paradise Lake (in unincorporated Snohomish County).

Focusing our work in smaller geographic areas increases the likelihood of achieving measurable improvements earlier, compared to more diffuse efforts throughout the watershed. Besides demonstrating results, these efforts, if implemented, provide timely, useful feedback on the strategies so that they can be modified, to ensure maximum effectiveness.

### Complementary Efforts

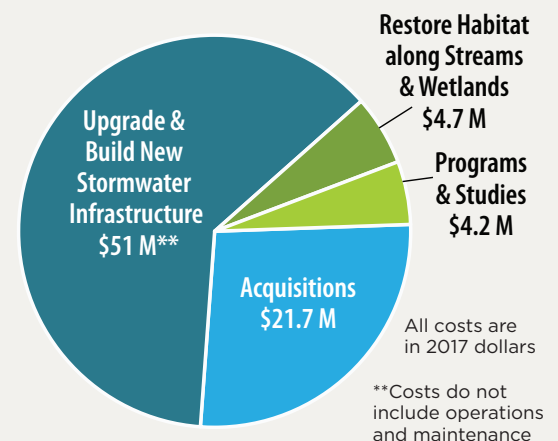
There are many existing and proposed natural resource management efforts that directly benefit the Bear Creek Watershed that would offset a portion of the cost estimate.

King County Land Conservation  
King County Stormwater Services  
King County Road Services  
WRIA 8 Salmon Recovery Plan

### Estimated\* up to \$40 million (M) contribution in the next ten-years

\*Assuming current funding levels stay the same, there are other influencing factors including jurisdictional priorities, emergencies, and availability of grants and other funding opportunities that will influence available funding.

### Estimated Public Costs of Proposed Strategies for the Next Ten-Years



If you have questions about this watershed study, contact your local jurisdiction partner:

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Learn more at  
[www.kingcounty.gov/bearcreekstudy](http://www.kingcounty.gov/bearcreekstudy)



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This Bear Creek Watershed Management Study was developed in accordance with Special Condition S5.C.5.c of the 2013-2018 National Pollutant Discharge Elimination System (NPDES) Phase I Municipal Stormwater Permit

### Alternate Formats Available

206-477-4700 TTY Relay: 711