FLOODPLAINS FOR THE FUTURE
PUYALLUP, WHITE & CARBON RIVERS

Shared Monitoring Plan

Tracking Progress Toward Shared Goals for Integrated Floodplain Management in the Puyallup River Watershed

FEBRUARY 2018
UPDATED NOVEMBER 2021

PIERCE CONSERVATION DISTRICT
Conserving Pierce County's Natural Resources Since 1949

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Introduction

Floodplains for the Future

Collaborating for Multi-Benefit Floodplain Management

From the summit of Mount Rainier to the shores of Commencement Bay, the Puyallup River watershed covers a vast and diverse landscape home to a rapidly growing population, a rich history of agriculture, and numerous salmon runs. However, the floodplains of the Puyallup, White, and Carbon rivers at risk from increasing development pressure, heightened flood risk, and the loss of critical salmon habitat. In order to overcome the obstacles presented by these risks, Floodplains for the Future (FFTF) works to promote integrated floodplain management in the watershed by balancing the needs of flood risk reduction, agricultural viability, and salmon recovery through the implementation of multi-benefit projects and actions. Since 2013, FFTF partners have worked together, guided by a set of shared strategies and goals, to support, fund, and implement numerous projects in the watershed including levee setbacks, agricultural conservation easements, and the restoration of salmon habitat. To evaluate progress towards the goals and strategies of the program, FFTF partners have implemented a monitoring and adaptive management program comprised of a set of metrics that track financial investments, interactions between communities and land in the floodplain, and observed outcomes and benefits. This document is intended to share the goals and strategies of the Floodplains for the Future program, describe the metrics tracked through the Index of Floodplain Health, outline the reporting process, and detail the methods and protocols used to generate results data.

Bank Repair on Carbon River at RM 0.9

Floodplains by Design

• REDUCING RISK, RESTORING RIVERS •

FLOODPLAINS BY DESIGN

Floodplains by Design (FbD) is an ambitious public-private partnership, led by The Nature Conservancy, Department of Ecology and Puget Sound Partnership, focused on integrating and accelerating efforts to reduce flood risks and restore habitat across Puget Sound's major river corridors. By working together, state and federal investments can be coordinated with locally driven solutions that solve multiple floodplain management problems and serve a broad range of affected interests. The goal of FbD is to improve the resiliency of these floodplains for the protection and enhancement of human communities and the health of the ecosystem, while supporting values important in the region such as agriculture, clean water, a vibrant economy and outdoor recreation. FbD embraces a holistic and collaborative approach to decision-making that brings together multiple interests to find common agreement on local floodplain visions, strategies and actions.

www.floodplainsbydesign.org

FFTF Mission and Vision

FFTF Partners understand that a collaborative, holistic approach to floodplain management can deliver more benefits (and fewer risks) to more people and do so in a way that makes better use of limited public funding. FFTF Partners have developed and are taking direct action in advancing the following Vision and Mission Statements:

Our Vision

Restored connections between rivers and land improve habitat for salmon, protect communities and critical infrastructure from flooding, and provide new opportunities for recreational and cultural uses while preserving agricultural lands in the Puyallup River Watershed.

Our Mission

To encourage shared leadership in a trusting and transparent environment in order to plan, fund, and implement multi-benefit floodplain projects in the Puyallup, White, and Carbon River floodplains.

The Floodplains for the Future Integrated Management Group (IMG) is a group of stakeholder organizations with interest in the Puyallup River watershed. FFTF Partners include:

- American Rivers
- City of Orting
- City of Puyallup
- City of Sumner
- Floodplains by Design
- Forterra
- King-Pierce Farm Bureau
- Muckleshoot Indian Tribe
- Pierce Conservation District
- Pierce County
- Pierce County Agricultural Program
- Port of Tacoma
- Puget Sound Partnership
- Puyallup Tribe of Indians
- Strategic Conservation Partnership
- South Puget Sound Salmon Enhancement Group
- The Nature Conservancy
- UW Climate Impacts Group
- Washington Farmland Trust
- Washington State Dept. of Ecology
- WRIA 10/12 Lead Entity

FFTF Goals

FFTF Partners have identified a set of watershed-wide goals relevant to improving and maintaining floodplain health.

- Make communities more resilient to flooding and reduce flood risk and damage to private property
- Reduce flood risk and damage to public infrastructure
- Integrate agricultural interests into proposed large levee setback projects
- Protect/conserve agricultural lands
- Minimize conversion of agricultural lands to non-ag uses
- Maintain viable farming economy/critical mass of farmland and farm businesses
- Improve drainage on existing farms
- Reconnect floodplain to the river (at various flow levels)
- Protect existing functional salmon habitat
- Restore historic function for spawning, foraging, and rearing habitat
- Increase salmon abundance
- Provide more space for the river to migrate
- Improve water quality
- Increase integration and collaboration across FFTF members and interests (fish, farm, and flood)
- Increase the resilience of flood management infrastructure, the ecosystem, and agriculture as climate changes

FFTF Strategies

FFTF strategies guide the development of an integrated set of actions that move the partnership towards the goals and vision.

- Reconnect floodplain through levee setbacks and side channel reconstruction
- Remove structures at-risk of flooding through parcel acquisition and demolition
- Preserve agricultural land through conservation easements
- Restore habitat and watershed processes to support all salmon and trout species
- Identify agricultural resiliency opportunities and action plans
- Develop a strong, commonly understood collaborative structure and partnership

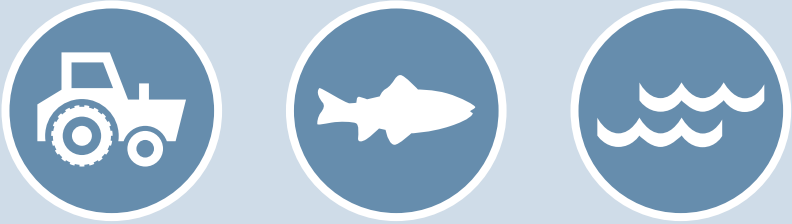
Intent of the Shared Monitoring Plan

The intent of this long-term monitoring plan is to help FFTF Partners ascertain progress relative to shared goals for integrated floodplain management. Additionally, the plan is used to gauge their continued support for implementation of an aggressive capital program to improve floodplain health in the Puyallup River watershed. This is a high-level monitoring plan for the purpose of tracking the collective work of FFTF Partners at a landscape scale; it is not a project-specific monitoring plan. Project-specific monitoring of the FFTF supported long-term capital projects or other restoration actions will occur as each project is implemented and as it relates to project goals.

The key to successful collaborative floodplain management is ensuring that integration of individual stakeholder issues and goals is occurring at both the project and watershed scales. In addition, it is necessary for partners to be able to observe progress toward goals. Partner support is critical to the success of FFTF, and specifically the monitoring plan. The work executed under the monitoring plan provide partners with an opportunity to reflect upon and assess their individual and collective actions which in turn helps foster and sustain collaborative relationships between individual FFTF partners and interest groups. Additionally, partners are instrumental in the implementation of the monitoring plan as much of the data used to generate results for the metrics in the Index of Floodplain Health is provided directly by FFTF partners.

INTEGRATED FLOODPLAIN MANAGEMENT

Integrated floodplain management seeks common agreement on visions, strategies, and actions. Integrated management can lead to multiple-benefit projects that meet the needs of more than one floodplain value in one place. Integrated solutions make better use of limited funding and lead to wiser capital investments.

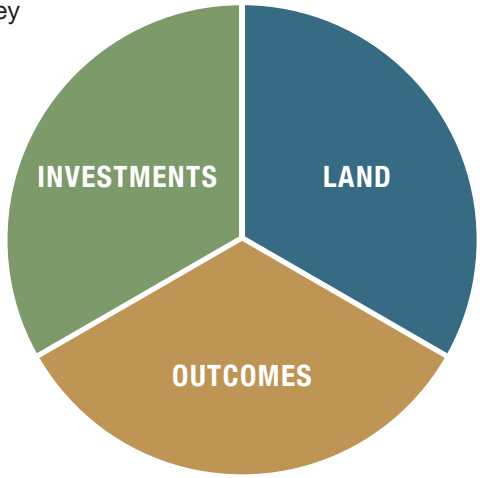


An Index of Floodplain Health

The Index of Floodplain Health presents a measurement for answering the key question asked by FFTF Partners: How are we improving floodplain health? There is no single answer to this question. Rather, the index is comprised of several individual and integrated metrics focused around three themes:

- We are making capital **investments** in integrated floodplain management and making progress toward our goals
- We are learning how our communities interact with **land** in the floodplain
- We are tracking **outcomes** and benefits in the floodplain

Using the metrics to track these themes will help understand whether or not capital and programmatic investments made within the Puyallup watershed are contributing substantially to achieving the goals identified by the FFTF Partners. This understanding will inform and direct future efforts of the FFTF Partners.



			
THEME	**We are making capital investments in integrated floodplain management and making progress toward our goals**	**We are learning how our communities interact with land in the floodplain**	**We are tracking outcomes and benefits in the floodplain**
DESCRIPTION	Group of metrics that tracks investments by FFTF partners along with progress toward goals identified by FFTF partners.	Group of metrics that tracks the cumulative impacts of policies, programs, and capital investments coming together in the floodplain.	Group of metrics that tracks trends in the quality and quantity of things we value (farm viability, salmon recovery, flood risk reduction) in the floodplain.
INTEGRATED METRIC	Combined Contributions by FFTF Partners	Built Environment in the Floodplain	Overall Floodplain Status
INDIVIDUAL METRICS	Floodplain Reconnection Projects At-Risk Structures Removed Conserved Farmland Agricultural Viability Use of Climate Projections Restored Habitat	Actively Farmed Land Connected/Natural Floodplain Weather and Climate Conditions Accessible Stream Miles	Farm Businesses Farm Revenue Farm Drainage FEMA Flood Claims Salmonids

INDEX OF FLOODPLAIN HEALTH

FFTF Partners have selected a set of high-level metrics for this purpose which can be easily tracked and clearly communicated to decision-makers and the public. The metrics are presented as the Index of Floodplain Health, a system for tracking floodplain improvement or degradation from the multi-benefit perspective established by FFTF stakeholders.

- Fish & Habitat
- Flood Risk Reduction
- Agricultural Viability
- Climate

Monitoring Baselines

POINT IN TIME: FLOODPLAINS BY DESIGN GRANT FUNDING

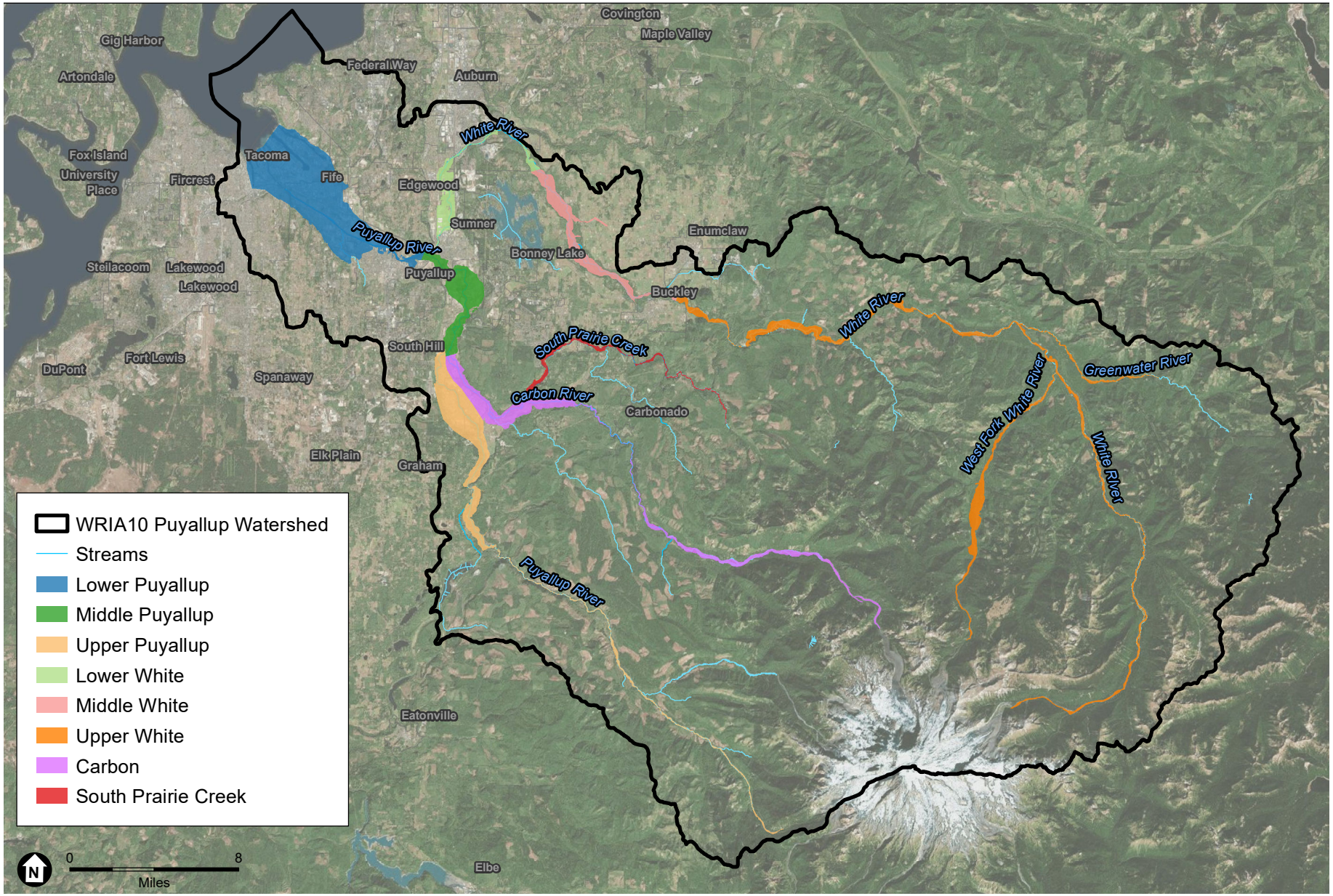
For the purposes of this Monitoring Plan, the baseline for tracking metrics related to FFTF Partner investments in integrated floodplain management will be the beginning of FbD grant funding. The first biennial funding cycle (Round 1) for the Puyallup River watershed began in Fiscal Year (FY) 2013. For simplicity purposes, January 1, 2013 will serve as the point in time for tracking investments.

EXTENT OF MONITORING AREA: FLOODPLAIN PLANNING AREA

For the purposes of this Monitoring Plan, the baseline for tracking metrics related to land use, farmland, habitat, and other inherently spatial metrics is the "Puyallup FFTF Floodplain Planning Area." The Floodplain Planning Area (FPA) refers to the low-lying areas in the Puyallup watershed that are adjacent to the largest river channels (Puyallup, White, and Carbon), and the estuarine embayment of Commencement Bay, that can be inundated by flood water or channel migration. This area is intended to capture areas of the historic floodplain that could potentially be restored and therefore includes floodplain areas within the channel migration zone and also behind levees. This area also includes the larger tributaries to the main river channel. The floodplain extent, or width, of the tributaries varies and can include a constrained channel.

The FPA will be used as a basis or baseline extent for tracking changes in spatial metrics as specified in the FFTF monitoring plan. The FPA baseline extent for entire Puyallup watershed includes 45,574 acres. The following table and graphic display the delineated FPA for the watershed and by individual reach.

REACH	EXTENT OF FPA (ACRES)
Lower Puyallup River	11,843
Middle Puyallup River	3,340
Upper Puyallup River	7,965
Lower White River	2,799
Middle White River	4,360
Upper White River	7,939
Carbon River	5,399
South Prairie Creek	1,929
TOTAL WATERSHED	**45,574**



Floodplain Planning Area – Puyallup River Watershed

Puyallup River at Kapowsin Creek

Implementation

Reporting Process and Timelines

This monitoring plan relies on the efforts of multiple entities and individuals to be responsible for tracking, compiling, and transmitting information to the Pierce Conservation District (PCD). As the lead of the monitoring plan component, PCD is not responsible for tracking all of the individual metrics but rather provides the synthesis of the information and ongoing administrative structure.

Depending on the metric, information and data will be summarized and provided each year, biennially, or every five years. While metric frequency is described in this document, frequency may vary, and the list of metrics to report on will be determined each year. Additional details about information specific to each metric that should be provided to PCD are described in the Protocols section of this plan.

REPORTING FREQUENCY – INTEGRATED AND INDIVIDUAL METRICS

ANNUAL	2 YEARS	5 YEARS
Combined Contributions by FFTF Partners	Floodplain Reconnection Projects	Farm Businesses
Conserved Farmland	Built Environment in the Floodplain (as new data becomes available)	Farm Revenue
Agricultural Viability	At-risk Structures Removed	
Weather and Climate Conditions	Use of Climate Projections	
Overall Floodplain Status	Connected/Natural Floodplain	
FEMA Flood Claims	Actively Farmed Land	
Salmonids	Accessible Stream Miles	
	Farm Drainage	
	Restored Habitat	

COMMUNICATION

PCD will be responsible for compiling information and working with metric leads to understand results. PCD will then distribute results per the tools and approaches identified in the FFTF Communication Strategy. This includes the following means:

- FFTF Monitoring Website
- Individual meetings with FFTF Interest Groups
- FFTF Results Summit
- Integrated Management Team meetings

Information that is uploaded to the website or in other communication materials will be reviewed and vetted by the IMG. PCD will ensure that information is brought forward for review prior to distribution.

South Fork Floodplain Restoration, Puyallup River

RESULTS SUMMIT

The Results Summit is an opportunity for FFTF partners to look across data from the individual metrics, review study results, and other information to draw insights into floodplain management and future FFTF priorities and investments. The purpose of the Results Summit is to provide a structured opportunity for the partners to review metric data, study results, big events, and project status. The outcome of the summit is a more robust understanding of the partnership and its progress towards the FFTF vision, and to provide guidance for the direction of actions. Attendees include, but are not limited to, current FFTF partners and members. Over time, the vision is for the Results Summit to provide an important opportunity to celebrate individual and collective successes, expand understanding of floodplain science, address shared challenges, and build partnerships. It is a central part of ensuring joint adaptive management of the shared monitoring approach.

South Fork Floodplain Restoration Overview, Puyallup River

Lower White River (Photo credit: Ron Clausen)

Protocols

Overview

The following section describes protocols for tracking progress toward shared goals of the FFTF collaboration. Each integrated and individual metric is listed with a description of the metric, the unit of measure, the scale at which information will be summarized, the frequency of reporting, data sources, the metric lead, and a description of the methods for reporting the information to PCD. The metrics are grouped by the three themes identified for improving floodplain health: investments, land, and outcomes.

South Prairie Creek

Investments

We are making capital investments in integrated floodplain management and making progress toward our goals

Integrated Metric

COMBINED CONTRIBUTIONS BY FFTF PARTNERS

METRIC

Amount of FFTF investments in integrated floodplain management

DESCRIPTION

This metric tracks the combined financial investments in multi-benefit floodplain projects made by FFTF Partners for flood risk reduction, fish and fish habitat, and agricultural viability.

UNIT	SCALE	FREQUENCY
Dollars	Watershed	Annual

DATA SOURCE

Multiple; compiled in "FFTF Financial Investment Tracking Spreadsheet". Includes, but is not limited to: Pierce County Planning & Public Works (PPW); Pierce County Flood Control Zone; Pierce County Real Estate Excise Tax (REET); Salmon Recovery Funding Board (SRFB); Estuary and Salmon Restoration Program (ESRP); Puget Sound Acquisition and Restoration Fund (PSAR); Regional Conservation Partnership Program (RCPP); Pierce County Conservation Futures; Pierce County Transfer of Development Rights Program (TDR); WRIA 10 Lead Entity; Private Foundations; Floodplains by Design; and, other sources as applicable

METRIC LEAD

Pierce Conservation District with support from the Floodplains for the Future Coordinator

METHOD

The FFTF Coordinator and PCD will work together to acquire investment information from the following partners: Pierce County SWM, Pierce County Lead Entity Coordinator, and the Strategic Conservation Partnership Coordinator. Investments will be summarized by winter each year. The PCD lead is responsible for compiling the information into the FFTF Financial Investment Tracking Sheet with consultation from the FFTF Coordinator. It is expected that additional funding sources will be discovered as staff support additional activities. Refinements to the spreadsheet will focus on keeping the information as simple as possible so that it can be summarized for communication purposes. The information should be summarized to the extent possible, then provided to FFTF component leads and/ or partners for review during IMG meetings or other meetings. The spreadsheet will be updated based on partner input and finalized after vetting by the IMG.

BASELINE

2013 (First year of Floodplains by Design funding)

Individual Metrics

FLOODPLAIN RECONNECTION PROJECTS

METRIC
Number, size, and status of projects related to reconnection or restoration of floodplain. Categories: a) proposed; b) completed; and c) in process

DESCRIPTION
This metric tracks the number of acres of floodplain reconnection projects as a measure of progress toward multiple FFTF goals. It is expected that the bulk of the projects tracked under this metric will be Pierce County projects included in the Rivers Flood Hazard Management Plan. Projects from other local jurisdictions (King County, City of Sumner, City of Puyallup, City of Orting) will also be reported as they occur.

UNIT	SCALE	FREQUENCY
Acre	Reach	Two years

DATA SOURCE
Pierce County Rivers Flood Hazard Management Plan & Flood Control Zone District Comprehensive plan of Development (2013)

METRIC LEAD
Pierce County Planning and Public Works, King County, City of Sumner, City of Puyallup, City of Orting

METHOD
Pierce County Planning & Public Works and other public agencies or entities will provide metric information to the PCD in the winter of even years (2018, 2020...). Information will be supplied in tabular format and will include the following: Project Name, status, and description of activity in past year. Projects by other local jurisdictions (i.e., King County, City of Sumner, City of Puyallup, City of Orting) where Pierce County is not a partner are expected to be minimal. Therefore, the PCD will be responsible for contacting other local jurisdictions to gather information on additional projects not included in Pierce County adopted plans. The area of the floodplain reconnection projects that falls within the Floodplain Connectivity Feature layer in the new Levee Setback Feasibility Analysis update will be reported as a submetric.

BASELINE
2013 (First year of Floodplains by Design funding)

AT-RISK STRUCTURES REMOVED

METRIC
Number of “at-risk” structures that have been removed from within the regulated floodplain. The definition of “at-risk” is the definition used by Pierce County Planning & Public Works

DESCRIPTION
This metrics tracks the number of at-risk structures that have been removed from the floodplain to provide a measure of progress toward reducing the overall risk to people and property in the floodplain. Properties include those identified in adopted flood management plans or repetitive loss plans of local jurisdictions.

UNIT	SCALE	FREQUENCY
Individual structure	Reach	Two years

DATA SOURCE
Pierce County Rivers Flood Hazard Management Plan (2013); King County Flood Hazard Management Plan (2006) and Update (2013); City of Puyallup Hazard Mitigation Plan Update (2017)

METRIC LEAD
Pierce County Planning & Public Works, King County, City of Sumner, City of Puyallup, City of Orting

METHOD
Pierce County Planning & Public Works and other public agencies or entities will provide metric information to the PCD in the winter of even years. Information will be supplied in tabular format and will include the following: Property Name, description of at-risk status, and description of activity in past year.

BASELINE
2013 (First year of Floodplains by Design funding)

CONSERVED FARMLAND

METRIC
Number of acres of conserved farmland

DESCRIPTION
This metric tracks the amount of conserved farmland to provide a measure of progress toward Strategic Conservation Partnership goal of limiting the conversion of agricultural lands including those identified through the SCP's GIS-based prioritization of farmlands in Pierce County.

UNIT
Acres

SCALE
Watershed

FREQUENCY
Reported in years when conservation projects are closed

DATA SOURCE
Strategic Conservation Partnership

METRIC LEAD
Coordinator of Strategic Conservation Partnership

METHOD
The Strategic Conservation Partnership Coordinator will provide metric information to the PCD by winter following years in which conservation projects are closed. Information will be supplied in tabular format and will include the following: Parcel Name/ Number, location, area (size), status, description of activity in past two years, and status of conservation goals.

BASELINE
2013 (First year of Floodplains by Design funding)

AGIRCULTURAL VIABILITY

METRIC
Agricultural Viability

DESCRIPTION
This metric will track the financial investments made towards improving agricultural viability throughout the Puyallup watershed.

UNIT
Dollars

SCALE
Watershed

FREQUENCY
Annual

DATA SOURCE
Multiple; compiled as part of the "FFTF Financial Investment Tracking Spreadsheet". Includes, but is not limited to: Regional Conservation Partnership Program (RCPP); Pierce County Conservation Futures; Pierce County Transfer of Development Rights Program (TDR); Floodplains by Design; and other sources as applicable.

METRIC LEAD
Pierce Conservation District (PCD)

METHOD
PCD or a PCD Contractor will share the preliminary information in the FFTF Financial Investment Tracking Spreadsheet with FFTF partners focused on agricultural viability. The FFTF partners will identify and discuss other financial investments that should be included.

BASELINE
2013 (First year of Floodplains by Design funding)

USE OF CLIMATE PROJECTIONS

METRIC
Use of Climate Projections

DESCRIPTION
This metric will track the use of climate projections in the design and implementation of capital projects and in studies/modeling efforts relating to FFTF actions.

UNIT	SCALE	FREQUENCY
Percentage	Watershed	Two years

DATA SOURCE
Multiple; included as part of the "FFTF Financial Investment Tracking Spreadsheet"

METRIC LEAD
Pierce Conservation District

METHOD
Annually, PCD will identify whether the activities in the FFTF Financial Investment Tracking Spreadsheet incorporated climate projections in project design or in studies/modeling. This will be done with existing information or by contacting the activity lead. The metric will be represented as a percentage of total activities.

BASELINE
2020 (first year of tracking)

RESTORED HABITAT

METRIC
Amount of restored habitat

DESCRIPTION
This metric tracks the amount of restored habitat to provide a measure of progress toward improved floodplain health.

UNIT	SCALE	FREQUENCY
Number of projects	Reach	Two years

DATA SOURCE
Habitat Work Schedule

METRIC LEAD
Pierce County Lead Entity Coordinator with support from Planning & Public Works staff and project sponsors

METHOD
The Pierce County Lead Entity Coordinator will provide metric information to the PCD in the winter of each year. Information will be supplied in tabular format and will include the following: Project Name, number of acres (or square feet) of habitat restoration, type of habitat restoration (i.e., estuary, riparian, etc.) and description of activity in the past 2 years.

BASELINE
2013 (First year of Floodplains by Design funding)

Land

We are learning how our communities interact with land in the floodplain

Integrated Metric

BUILT ENVIRONMENT IN THE FLOODPLAIN

METRIC

Built Environment in the Floodplain

DESCRIPTION

This metric tracks changes in land-use in the floodplain using the Washington Department of Fish and Wildlife's High Resolution Change Detection (HRCD) data. This dataset quantifies canopy loss, tracks changes in the amount of impervious and semi-impervious surfaces and provides information as to the likely cause of change, allowing FFTF partners to better understand interactions between communities and land in the floodplain. HRCD data is highly accurate and able to detect changes as small as 1/20th of an acre.

UNIT	SCALE	FREQUENCY
Acres	Reach	As HRCD is updated

DATA SOURCE

Washington Department of Fish and Wildlife, High Resolution Change Detection data

METRIC LEAD

Pierce Conservation District

METHOD

PCD or PCD contractor will download the HRCD data from the WDFW website and track changes in land-use cover. This process will be repeated as the HRCD data is updated by WDFW.

BASELINE

2013 (First year of Floodplains by Design funding)

Individual Metrics

ACTIVELY FARMED LAND

METRIC
Actively Farmed Land

DESCRIPTION
This metric tracks the amount of actively farmed land in the Puyallup watershed using Washington State Department of Agriculture land use mapping data merged with Current Use Agriculture parcels from the Pierce County Assessor.

UNIT	SCALE	FREQUENCY
Acres	Reach	Two years

DATA SOURCE
Washington State Department of Agriculture, land use mapping data. Pierce County Assessor, Current Use Agriculture parcels

METRIC LEAD
Pierce Conservation District

METHOD
PCD or PCD contractor will download the land use mapping data from WSDA and provide metric information by February 15th on odd numbered years. PCD or PCD contractor will obtain the parcels in the Current Use Agriculture designation from the Pierce County Assessor and merge them with the WSDA data.

BASELINE
2013 (First year of Floodplains by Design funding)

CONNECTED/NATURAL FLOODPLAIN

METRIC
Connected Floodplain with Natural Land Cover

DESCRIPTION
This metric tracks floodplain areas that are connected to the river or a tributary (i.e. do not have a levee, road, or other barrier between the floodplain and the river) and have natural land cover.

UNIT	SCALE	FREQUENCY
Acre	Reach	As HRCD is updated

DATA SOURCE
Multiple; Baseline is FPA Category A

METRIC LEAD
Pierce Conservation District

METHOD
The baseline results for this metric were established for the year 2013 as part of an exercise to map and characterize a Floodplain Planning Area (FPA) for the Puyallup watershed. This exercise classified floodplain areas into four categories, one of which was Category A: Connected/Natural Floodplain. The amount of connected natural floodplain from the initial FPA exercise constitutes the 2013 baseline results for the Connected/Natural Floodplain metric. Acres of reconnected as well High Resolution Changed Detection (HRCD) data from the Built Environment in the Floodplain metric was used to calculate results for 2015 and 2017. To calculate results for 2015, the acres of reconnected floodplain between 2013 and 2015 were added to the 2013 connected natural floodplain result. The acres of new built environment between 2013 and 2015 on lands previously classified as connected natural floodplain were then subtracted from that value to produce the total acres of connected natural floodplain for 2015. The same process was followed to generate results for 2017.

BASELINE
2013

WEATHER AND CLIMATE CONDITIONS

METRIC
Weather and Climate Conditions

DESCRIPTION
This metric will track seven aspects of climate (air temperature, heavy rainfall events, snowpack, streamflow, water temperature, air quality, and drought) using existing gauges with historical records.

UNIT	SCALE	FREQUENCY
Multiple	Watershed	Annual

DATA SOURCE
Multiple: Washington State University AgWeatherNet Puyallup Gauge, USDA Burnt Mountain and Huckleberry SNOTEL Gauges, USGS Station 12101500, USGS Station 12100490, Puget Sound Clean Air Agency, and NOAA Climate Prediction Center

METRIC LEAD
Pierce Conservation District

METHOD
Annually, PCD or PCD Contractor will compile data from the gauges and stations identified to track results for this metric. For specific details regarding each submetric, please see Appendix B.

BASELINE
2013

ACCESSIBLE STREAM MILES

METRIC
Number of miles of accessible streams, uninterrupted by barriers like culverts, roads, or dams

DESCRIPTION
The amount of accessible stream miles is critical to the health of salmonids in the Puyallup watershed. Barriers, such as culverts, can significantly restrict the amount of available habitat for salmon to spawn and feed. This metric will track the amount of stream impediments and quantify the amount of accessible stream miles in the watershed.

UNIT	SCALE	FREQUENCY
Miles	Watershed	Two years

DATA SOURCE
Washington Department of Fish and Wildlife, Fish Passage and Diversion Screening Inventory

METRIC LEAD
Pierce Conservation District

METHOD
PCD or PCD Contractor will download the fish passage GIS dataset from WDFW website and use the location of barriers in the Puyallup watershed to calculate the amount of downstream, accessible stream miles. PCD or PCD Contractor will provide updates to this information every two years.

BASELINE
2013

Outcomes

We are tracking outcomes and benefits in the floodplain

Integrated Metric

OVERALL FLOODPLAIN STATUS

METRIC

Overall Floodplain Status

DESCRIPTION

This metric will report on an agreed upon summary of conditions in the floodplain as agreed to by FFTF partners collectively.

UNIT	SCALE	FREQUENCY
Summary paragraph	Watershed	Annual

DATA SOURCE

FFTF Partners

METRIC LEAD

Pierce Conservation District

METHOD

Input will be solicited from FFTF partners during the Results Summit. Based upon input received, the Monitoring and Adaptive Management Team will draft a paragraph and vet with partners including FFTF Leads. Afterwards, a version of the paragraph will be presented at an IMG meeting for input and approval.

BASELINE

2022 (not yet reported)

Individual Metrics

FARM BUSINESSES

METRIC
Number of farm businesses

DESCRIPTION
This metric tracks the number of individual farms to provide an indication of increase, decrease, or maintenance of farming activity.

UNIT	SCALE	FREQUENCY
Individual farm	Pierce County (Note: USDA information is summarized at the County scale, not the watershed scale)	Five years (with Agriculture Census reporting)

DATA SOURCE
US Department of Agriculture (USDA) Census of Agriculture by National Agricultural Statistics Service (NASS)

METRIC LEAD
Pierce Conservation District

METHOD
PCD will download census data for Pierce County from the USDA NASS website. The NASS provides summarized data at the County level with each publication, called County Profile. PCD will compile information on the total number of farms in Pierce County.

BASELINE
2012 Census

FARM REVENUE

METRIC
Total market value of agricultural products sold

DESCRIPTION
This metric tracks the total market value of agricultural products sold to provide an indication of an increase, decrease, or maintenance of farming activity.

UNIT	SCALE	FREQUENCY
Individual farm	Pierce County (Note: USDA information is summarized at the County scale, not the watershed scale)	Five years (with Agriculture Census reporting)

DATA SOURCE
US Department of Agriculture (USDA) Census of Agriculture by National Agricultural Statistics Service (NASS)

METRIC LEAD
Pierce Conservation District

METHOD
PCD will download census data for Pierce County from the USDA NASS website. The NASS provides summarized data at the County level with each publication, called County Profile. PCD will record information on the total market value of agricultural products sold and the market value of crops.

BASELINE
2012 Census

FARM DRAINAGE

METRIC
Results of Farming Information Survey

DESCRIPTION
This metric tracks changes in responses from farmers to questions about drainage and constraints on farm production to provide an indication of drainage (improvement or degradation) generally.

UNIT	SCALE	FREQUENCY
N/A	Watershed	Two years

DATA SOURCE
Survey (responses)

METRIC LEAD
Pierce Conservation District

METHOD
A digital survey will be developed and distributed electronically to farmers in the watershed. Survey questions and list of farmers will be generated by PCD and agricultural stakeholders in the watershed. Surveys will be distributed in spring (late April). Once results are received, a summary memorandum will be developed with information for each question in the survey.

BASELINE
2019 (first year of survey)

FEMA FLOOD CLAIMS

METRIC
Cost (dollars) of flood damages

DESCRIPTION
This metric reports on the value of FEMA claims filed for flood events. These claims do not include damages to infrastructure; they only represent damage to structures with an active FEMA insurance policy. Values compiled for this metric only represent the amount FEMA pays on the policies which is not always equivalent to the total damage incurred. Additionally, property owners may experience flooding and choose not to file a claim.

UNIT	SCALE	FREQUENCY
Dollars	Watershed	Annual

DATA SOURCE
Pierce County

METRIC LEAD
Pierce Conservation District

METHOD
Pierce County provides information to PCD in tabular format including the year, number of claims filed, and total value of the claims. Other costs will not be able to be tracked such as the loss of economic productivity during and after a storm event, expenses incurred by private parties, and the costs of first responders and emergency help.

BASELINE
2013

SALMONIDS

METRIC
Status and trends in abundance of ESA-listed and non-listed salmonids

DESCRIPTION
This metric tracks total Chinook outmigration in the Puyallup River, percent freshwater survival, the number of adult Puyallup River Fall Chinook of natural origin, and the number of adult White River Chinook of natural origin.

UNIT	SCALE	FREQUENCY
Number of fish, percentage freshwater survival	Watershed	Annual

DATA SOURCE
Puyallup Tribe Fisheries Department and Washington Department of Fish and Wildlife

METRIC LEAD
Pierce Conservation District

METHOD
Data and information collected through the Puyallup Tribe's ongoing annual escapement monitoring will be used for this metric. Additional data will be collected from the Washington Department of Fish and Wildlife and compiled to generate metric results.

BASELINE
2013

Appendix A:

FFTF Commonly Used Terms

Baseline year - For the purposes of the monitoring plan, 2013 will serve as the baseline year for the FPA, which is the first year of Floodplain by Design funding for the Floodplains for the Future collaboration. Changes in monitoring program metrics related to land use, farmland, habitat and other attributes of the floodplain are tracked over time from this baseline year.

Floodplain conditions assessment – As a proxy for floodplain function, the condition of a floodplain is assessed by its connectivity to active river channel (i.e., connected or disconnected), its land cover (i.e. natural or not natural), and its land use. The conditions assessment divides the floodplain into four categories.

Floodplain extent – The approximate historic extent of floodplains that existed prior to the placement of barriers such as roads, railroads, and levees/dikes (also referred to as the geomorphic floodplain). Recent flood events have reached this extent, but future events may extend even further.

Floodplain health – The condition of multiple elements that when considered together contribute to a functioning floodplain, including the natural physical processes and biological factors that support salmon populations; the long-term viability of agricultural lands; and the risk of flooding.

Floodplain planning area (FPA) – The mapped floodplain area used for tracking changes in spatial metrics in the monitoring program. Covers low-lying areas in the Puyallup River Watershed that are adjacent to the largest river and tributary channels that can be inundated by flood water or channel migration. The FPA represents the historic floodplain that could potentially be restored (including areas within the channel migration zone and also behind levees).

Index of floodplain health – A composite of metrics selected for tracking progress toward shared goals for the Puyallup River Watershed arranged around three categories: investments, land, and outcomes.

Integrated floodplain management – A planning strategy that seeks common agreement on visions, strategies, and actions intended to maximize the benefits that floodplains provide and reduce risks facing property and life. Integrated management can lead to suites of actions that encourage collaboration between partners and meet the needs of farm, fish, and flood risk. Integrated solutions make better use of limited funding and staffing and lead to wiser capital investments.

Learning Cycle – Portion of the year when FFTF partners and the monitoring team use metric results (for a given year) to make connections to and between strategies and actions, take steps to adaptively manage the monitoring program, and/or take steps to adaptively manage the activities of the FFTF partners.

Long-term agricultural viability – The ability of a farmer or a group of farmers to productively farm on a given piece of land or in a specific area; maintain an economically viable farm business; keep the land in agricultural use long-term; and steward the land so it will remain productive in the future.

Results Cycle – Portion of the year when the FFTF monitoring team issues a call for monitoring data from metric leads, receives and assembles the data for review and discussion by FFTF partners, and presents the information at the Results Summit. The Results Cycle concludes with publishing of results in an Annual Report and on the FFTF website.

Results Summit – An annual meeting of FFTF partners to review results from monitoring metrics and discuss implications.

Appendix B:

Weather and Climate Conditions Metric Protocols

Air Temperature

- Data Source: Washington State University AgWeatherNet, Puyallup Gauge
- Data Collected: Daily maximum temperatures recorded at the Puyallup gauge from June 1st through September 30th of each year.
- Data Reported: Number of days above 85˚F, 90˚F, and 100˚F recorded each year.
- Methodology
  - Data is accessed from the AgWeatherNet website, under “Weather Data”, “Daily”: http://weather.wsu.edu/?p=93050&desktop
  - Station is changed to “Puyallup” and relevant dates are selected.
  - Data is pulled from the “Max ˚F” column under “Air Temperature” and compiled in an Excel document.
  - Results are sorted to determine the number of days with maximum temperatures over 85˚F, 90˚F, and 100˚F.

Heavy Rainfall Events

- Data Source: Washington State University AgWeatherNet, Puyallup Gauge
- Data Collected: Daily precipitation totals recorded at the Puyallup gauge from January 1st through December 31st of each year.
- Data Reported: Number of days with precipitation totals greater than 1 inch.
- Methodology
  - Data is accessed from the AgWeatherNet website, under “Weather Data”, “Daily”: http://weather.wsu.edu/?p=93050&desktop
  - Station is changed to “Puyallup” and relevant dates are selected.
  - Data is pulled from the “Tot Prec in” column and compiled in an Excel document.
  - Results are sorted to determine the number of days with precipitation totals greater than 1 inch.

Snowpack

April 1 Snow Water Equivalent (SWE)

- Data Source: U.S. Department of Agriculture SNOTEL, Burnt Mountain Gauge
- Data Collected: Snow Water Equivalent (SWE) on April 1st of each year.
- Data Reported: Snow Water Equivalent (SWE) on April 1st of each year.
- Methodology
  - Data is accessed from the U.S. Department of Agriculture Natural Resources Conservation Service National Water and Climate Center using this link: https://wcc.sc.egov.usda.gov/reportGenerator/edit/customSingleStationReport/daily/start_of_period/942:WA:SNTL%7Cid=%22%22%7Cname/-324,0/WTEQ::value,SNWD::value,PREC::value,TOBS::value,TMAX::value,TMIN::value,TAVG::value?fitToScreen=false
  - Confirm that station #942, Burnt Mountain, is listed under “Selected Stations”
  - At the bottom of the page, under “Select Time Period, Layout, and Units”, select the “Custom Begin Date” and “Custom End Date” to be April 1st of the relevant year.
  - Click “View Report”
  - Report the value listed under the column “Snow Water Equivalent (in)”.

Lower Elevation SWE

- Data Source: U.S. Department of Agriculture SNOTEL, Huckleberry Creek Gauge
- Data Collected: Daily SWE from January 1st through December 31st of each year.
- Data Reported: Maximum SWE value and date on which it occurred.
- Methodology:
  - Data is accessed from the U.S. Department of Agriculture Natural Resources Conservation Service National Water and Climate Center using this link: https://wcc.sc.egov.usda.gov/reportGenerator/edit/customSingleStationReport/daily/start_of_period/928:WA:SNTL%7Cid=%22%22%7Cname/-324,0/WTEQ::value,SNWD::value,PREC::value,TOBS::value,TMAX::value,TMIN::value,TAVG::value?fitToScreen=false
  - Confirm that station #928, Huckleberry Creek, is listed under “Selected Stations”
  - At the bottom of the page, under “Select Time Period, Layout, and Units”, select the “Custom Begin Date” and “Custom End Date” to be January 1st and December 31st, respectively, of the relevant year.
  - Click “View Report”
  - Compile the values listed under the column “Snow Water Equivalent (in)” into an Excel spreadsheet and sort to determine the maximum SWE value and the date on which it occurred.

Streamflow

Peak Streamflow

- Data Source: U.S. Geological Survey, Puyallup River Gauge 12101500
- Data Collected: Annual maximum streamflow value and date on which it occurred.
- Data Reported: Annual maximum streamflow value and date on which it occurred.
- Methodology:
  - Data is accessed from the Puyallup Gauge through the U.S. Geological Survey National Water Information System using this link: https://waterdata.usgs.gov/nwis/inventory/?site_no=12101500&agency_cd=USGS
  - Select "Peak Streamflow"
  - Under "Output Formats", select table.
  - Scroll to the relevant year and capture the annual maximum streamflow and the date on which it occurred.

2-Year Streamflow

- Data Source: U.S. Geological Survey, Puyallup River Gauge 12101500
- Data Collected: 15-minute discharge value and date on which it occurred
- Data Reported: Number of days where streamflow exceeded the 2-year flood threshold (21,500 CFS) and dates on which that occurred.
- Methodology
  - If the relevant annual maximum streamflow value is below the 2-year flood threshold (21,500 CFS), this submetric does not need to be calculated.
  - Data is accessed from the Puyallup Gauge through the U.S. Geological Survey National Water Information System using this link: https://nwis.waterdata.usgs.gov/usa/nwis/uv/?cb_00060=on&format=html&site_no=12101500&period=&begin_date=2013-01-01&end_date=2013-12-31
  - Under "Available Parameters" make sure that "Discharge" is selected, and under "Output Format", select "Table".
  - Enter the relevant dates (January 1st through December 31st) under "Begin date" and "End date"
  - Click "Go"
  - Copy the data generated in the table into an Excel spreadsheet
  - Sort the data by streamflow (CFS) from highest to lowest.
  - Delete all values with a CFS below the 2-year flood threshold (21,500 CFS)
  - Record the dates on which the 2-year flood level was exceeded.
  - For each of those days, recorded the highest CFS level.

Low Streamflow

- Data Source: U.S. Geological Survey, Puyallup River Gauge 12101500
- Data Collected: Daily maximum streamflow values.
- Data Reported: Annual lowest 7-day average streamflow value.
- Methodology:
  - Data is accessed from the Puyallup Gauge through the U.S. Geological Survey National Water Information System using this link: https://waterdata.usgs.gov/nwis/dvstat?referred_module=sw&search_site_no=12101500&format=sites_selection_links
  - Select "Discharge, cubic feet per second"
  - Under "Choose Output Format", enter the relevant dates, and select "table of…" and choose "Maximum" from the drop down menu.
  - Click "Submit"
  - Copy values from August 1st through October 31st into an Excel spreadsheet.
  - Calculate the 7-day average for the relevant data.
  - Sort the column with the 7-day average to determine the lowest 7-day average streamflow value, and record the date range on which it occurred.

Water Temperature

- Data Source: U.S. Geological Survey, White River Gauge 12100490
- Data Collected: Daily maximum water temperature.
- Data Reported: Highest 7-day average maximum water temperature.
- Methodology:
  - Data is accessed from the White River Gauge through the U.S. Geological Survey National Water Information System using this link: https://waterdata.usgs.gov/nwis/dv?cb_00010=on&format=html&site_no=12100490&referred_module=qw&period=&begin_date=2013-01-01&end_date=2013-12-31
  - Under "Available Parameters" select "Temperature, water" and "Table" under "Output format"
  - Enter the relevant dates (January 1st through December 31st) under "Begin date" and "End date"
- Click "GO"
- Record the date and maximum water temperature in an Excel spreadsheet.
- Calculate the 7-day average for the relevant data.
- Sort the column with the 7-day average to determine the highest 7-day average water temperature, and record the date range on which it occurred.

Air Quality

- Data Source: Puget Sound Clean Air Agency, Tacoma Tideflats
- Data Collected: Daily average PM 2.5µg/m3 .
- Data Reported: Daily average PM 2.5µg/m3.
- Methodology:
  - Data is accessed using this link: https://secure.pscleanair.org/airgraphing
  - Enter the relevant dates (January 1st through December 31st)
  - Underneath the orange box select the “Tacoma Tideflats” station from the first drop down menu.
  - Confirm that “Pm2.5 Nephelometer” is selected from the second drop down menu.
  - For the third drop down menu, select “Daily Average v(7)”
  - Click “GO” in the orange box
  - On the right side of the screen, under “Data Downloads”, click “CSV”
  - Sort data by “Pm2.5 Nephelometer” and identify the dates where the daily average values exceeded 55.5µg/m3 (Unhealthy for All Groups)

Drought

- Data Source: National Oceanic and Atmospheric Administration National Centers for Environmental Information
- Data Collected: Weekly Palmer Drought Severity Index, Washington State Climate Division 3
- Data Reported: Number of weeks of moderate drought, severe drought, and extreme drought
- Methodology:
  - Data is accessed using this link: https://www.ncdc.noaa.gov/temp-and-precip/drought/weekly-palmers/time-series
  - Under “State”, select “Washington” and under “Division”, select “3. Puget Sound Lowlands”.
  - Click “Plot”
  - Underneath the first graph, next to “Download Palmer Drought Index”, click the small Excel icon.
  - Copy the data into an Excel spreadsheet and isolate data for the relevant date range.
  - Sort data by the Palmer Drought Severity Index value from smallest to largest.
  - Record the number of weeks of extreme drought (-4 or less), severe drought (-3 to -3.9), and moderate drought (-2 to -2.9)