Ecology's Effectiveness Monitoring Program

2022 National Training Workshop on Water Quality Data, Assessment, and Plans

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DEPARTMENT OF ECOLOGY
State of Washington

Agenda

- Overview
- Examples
- Challenges
- Future

TMDL Program Overview

Structure

Water Quality Program (20 FTEs)
- Headquarters (Policy)
- Regions (TMDL development, STI and Implementation)
  - Southwest
  - Northwest
  - Central
  - Eastern

Environmental Assessment Program (Scientists) (20 FTEs)
- Westside
- Eastside

TMDL production

2000	01	02	03	04	05	06	07	08	09	10
6	7	7	7	6	7	8	10	6	3	3
11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**
9	2	2	0	1	3	0	1	0	1	4

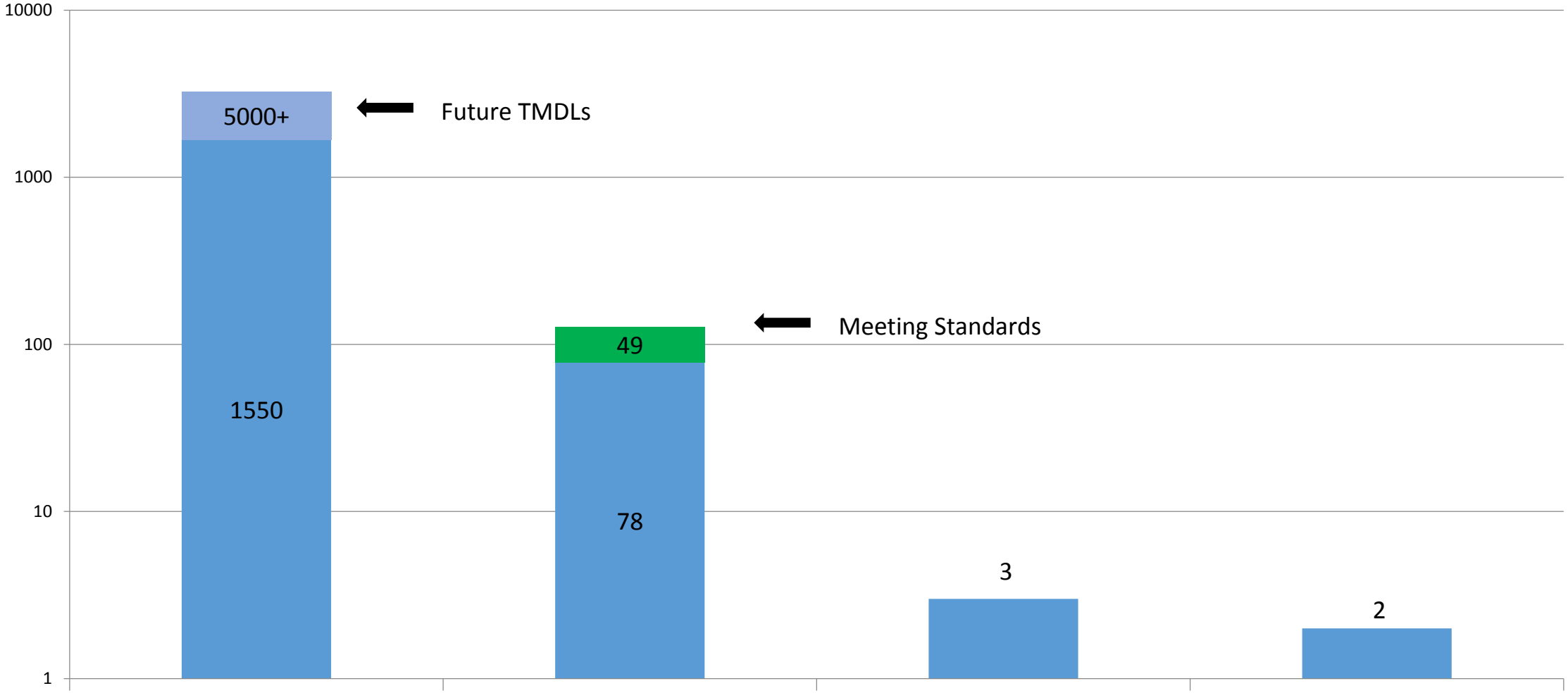
93 projects/Over 1550 listings

REGION	High Projects /Cat5	Medium Projects /Cat5	MedLow Projects/ Cat5	Low Projects Cat5	TOTAL Projects/Cat5	PROJECT TYPE
SWRO	5/ 143	5/165	9/ 236	91/ 1383	Projects = 110 Cat5 = 1927	TMDLs = 88 ARP/STI = 22
NWRO	7/ 135	9/ 169	12/ 234	194/ 1187	Projects = 255 Cat5 = 1725	TMDL = 195 ARP/ Verify = 60
CRO	3/ 102	6/ 252	7/ 68	48/ 199	Projects = 64 Cat5 = 621	TMDLs = 27 ARP/STI = 37
ERO	5/ 69	4/ 110	18/ 253	41/ 378	Projects = 65 Cat5 = 810	TMDLs = 46 ARP/STI = 22
STATEWIDE Totals	H = 20/ Cat 5 = 449	M = 24/ Cat5 = 696	ML = 79/ Cat5 = 866	L = 374 Cat5 =3072	Projects = 494 Cat5 = 5083	TMDLs = 356 ARP/STI = 141

Annual Project Planning

(mid/late) Projects (TMDLs and other EAP project requests) approved to move forward by WQ PMT are presented/submitted to EAP	January
EAP evaluation of project list submitted to them starts	February
-Extended Scoping starts for Extended Project Planning (EPP) projects that WQ PMT decided would move forward -WQP/EAP prioritize project list (Eastside/Westside/HQ individually prioritize with appropriate WQ Unit Sups and EAP Management -EAP Carryover estimates	March
EAP preliminary work plan decisions distributed with resource estimates	April
EAP and WQ meet to discuss draft work plan	May
New Fiscal Year project list is finalized	June
New Fiscal Year begins	July
WQ and EAP staff create extended scoping documents for projects that require EPP (EAP/WQ review scope options) and submit for peer review	August
early-Extended scoping document review w/comments (WQP staff-TMDL Unit Sups), then appropriate project specific staff address the comments and make changes to scoping document as needed **mid**-Extended scoping review w/comments (EAP staff), then appropriate project specific staff address the comments and make changes to scoping document as needed **late**-WQP Section managers write memo summarizing how the scoping comments were dealt with. THESE MEMOS ARE BROUGHT TO FALL A-TEAM MEETING FOR DISCUSSION PRE-WQP SOIREE	September
-Fall A-Team meeting to compare and discuss memos and peer review comments on the extended project plans -Final EPP project scopes completed -TMDL PRIORITIZATION PUBLIC WEBINAR -Prep for Soiree, prepare Project proposal presentations for all EAP project requests that your section will be requesting. This includes: The EPP that was just reviewed, new EPP that you want to work on, all new EAP project requests that your section has	October
WQP Section managers present all EAP project proposals at WQP Soiree-WQP PMT. At Soiree there will be further discussion and possible additional assignments to better scope projects that are not ready to go to EAP. GOAL-manage the number of projects we submit to EAP and have all projects be critical for Business Plan work.	November
Gather/synthesize feedback from Soiree to bring back to WQP PMT in early January	December

Are TMDLs (STIs/Other Restoration Projects) Effective? Good Question



Ecology's TMDL Effectiveness Monitoring Program

❖In 2002, Ecology began developing a strategy to evaluate the effectiveness of TMDLs that have been implemented in WA State. The original intent of the strategy was to inform the adaptive management process by providing:

1. a measure of progress toward implementation of recommendations (i.e., how much watershed restoration has been achieved, how much more effort is required?);
2. feedback mechanism for adapting or refining , models, best management practices, nonpoint source plans, and permits (i.e., adaptive management).

Data Driven Adaptive Management

❖The adaptive management process was to be informed through development of monitoring design that was to be implemented over the life of the TMDL to determine if:

1. water quality standards and targets are being met;
2. progress is being made towards meeting standards and targets;
3. water quality improvements are linked to water cleanup activities, and;
4. the current implementation strategy is sufficient.

Effectiveness Monitoring Strategy

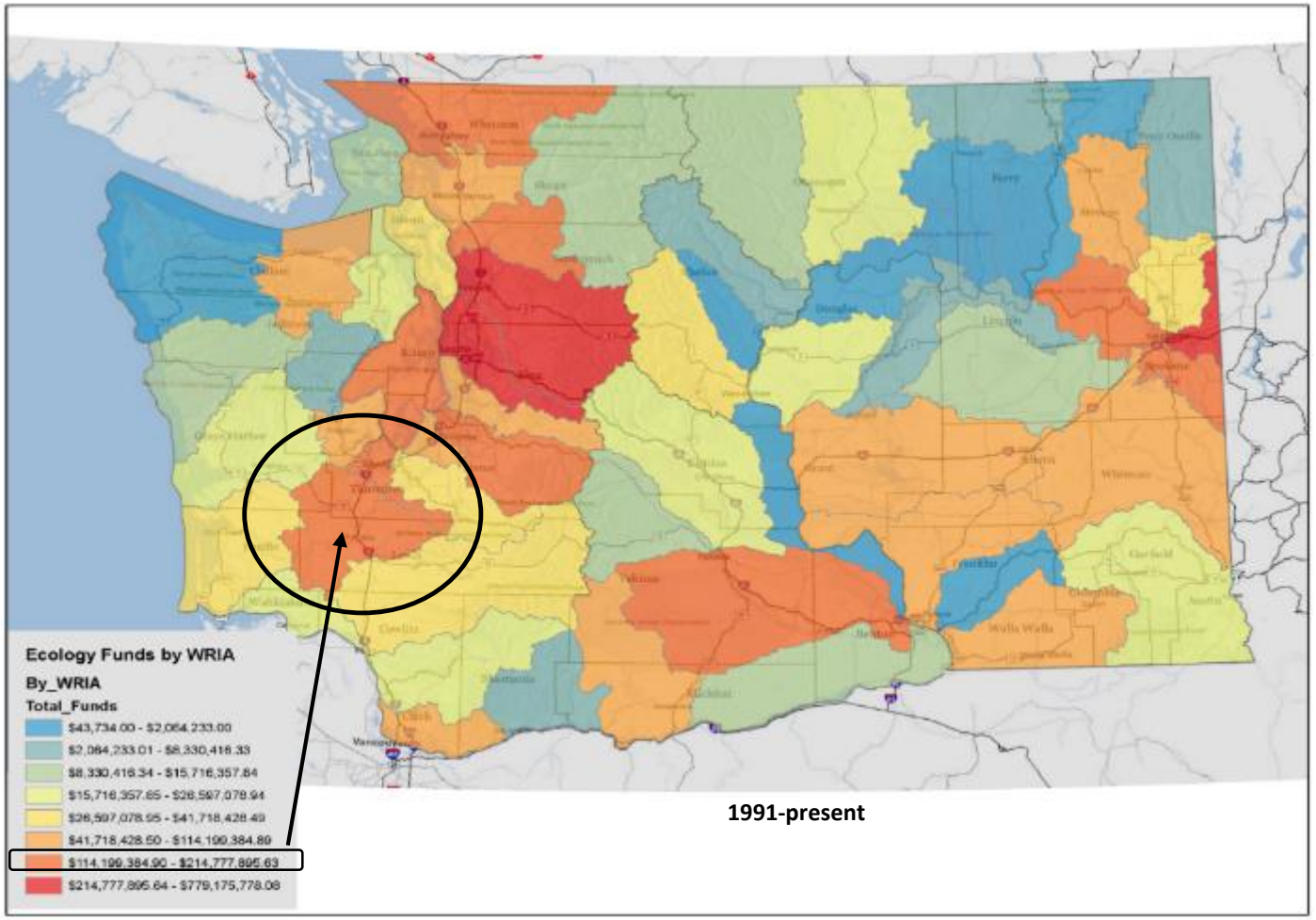
❖**Study design - data analysis - Monitoring Types:**

- **Compliance** : Are WQ standards being meet?
- **Validation** : Is data still representative?
- **Status:** What is the overall status of water in the watershed?
- **Trends:** Are conditions changing over time?
- **Source Identification:** Are additional source controls needed?
- **Implementation** : Were activities carried out as planned?

Why is approach insufficient for determining effectiveness?

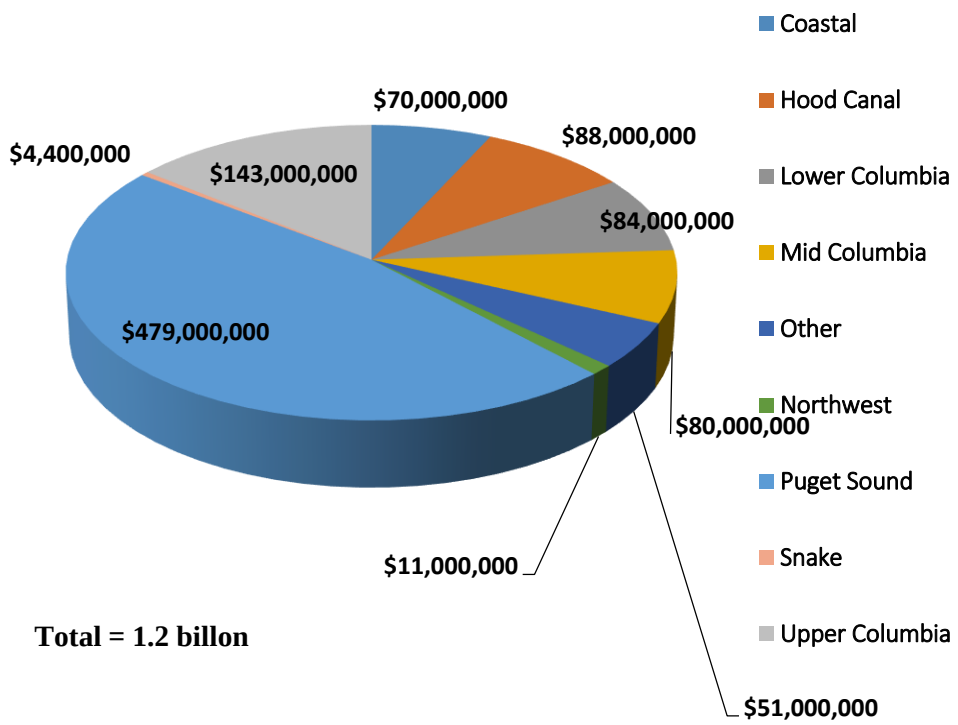
1. **Insufficient data to assess if conditions are improving**
   - Effectiveness monitoring is not considered until the end of the process.
   - "Post TMDL monitoring" is either not conducted or is disconnected from effectiveness monitoring goals and objectives.
   - Effects of covariate data not taken into account.
2. **No clear adaptive management strategy in TMDL/EM process**
   - In order for effectiveness studies to provide useful feedback for the adaptive management process, all goals of an effectiveness monitoring study must be met.
3. **A lack of implementation data**
   - No effective mechanism for tracking implementation of water quality improvement projects.

Implementation Databases



1991-present

Source: http://www.rco.wa.gov/prism_app/about_prism.shtml

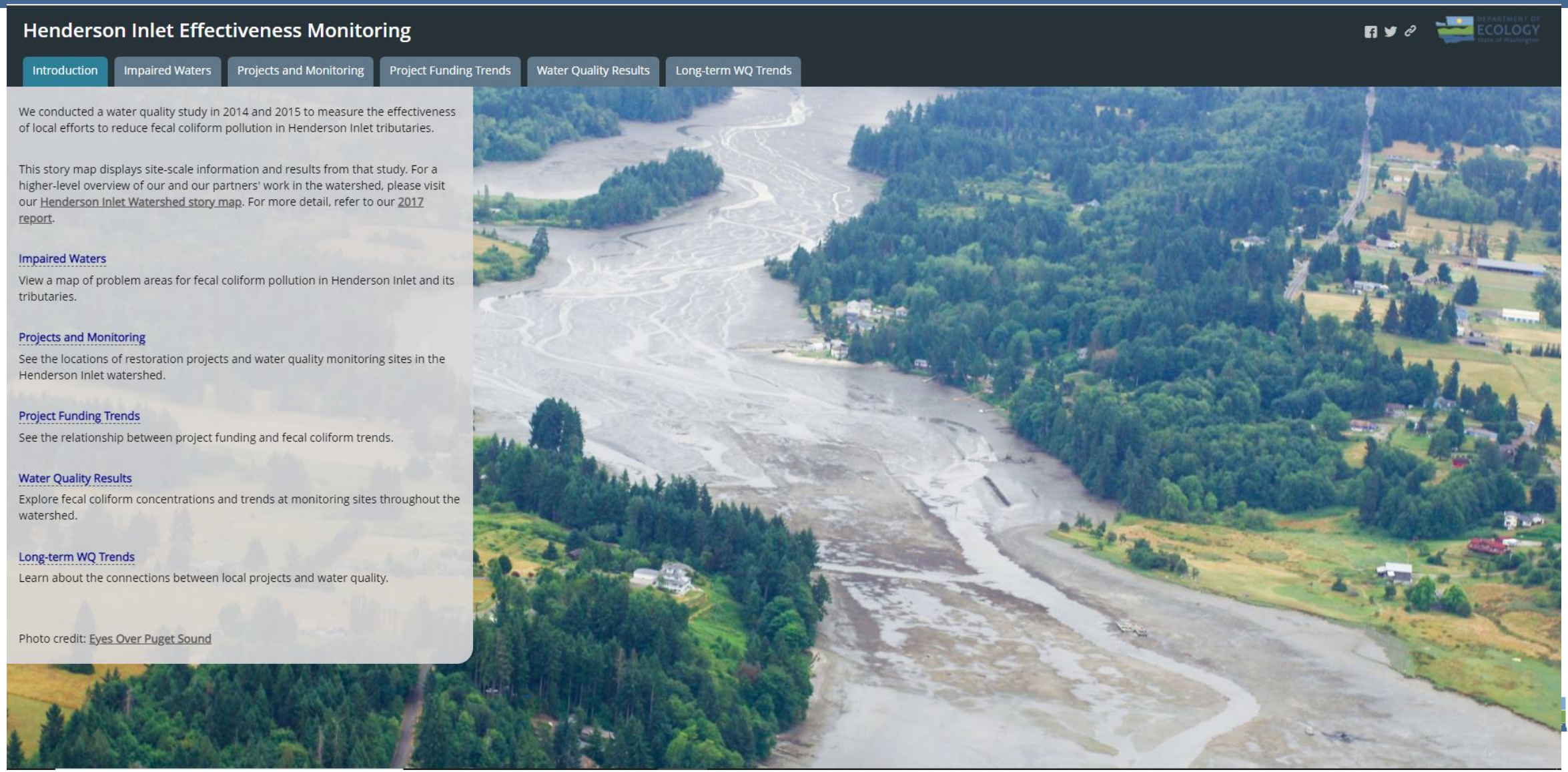


Total = 1.2 billon

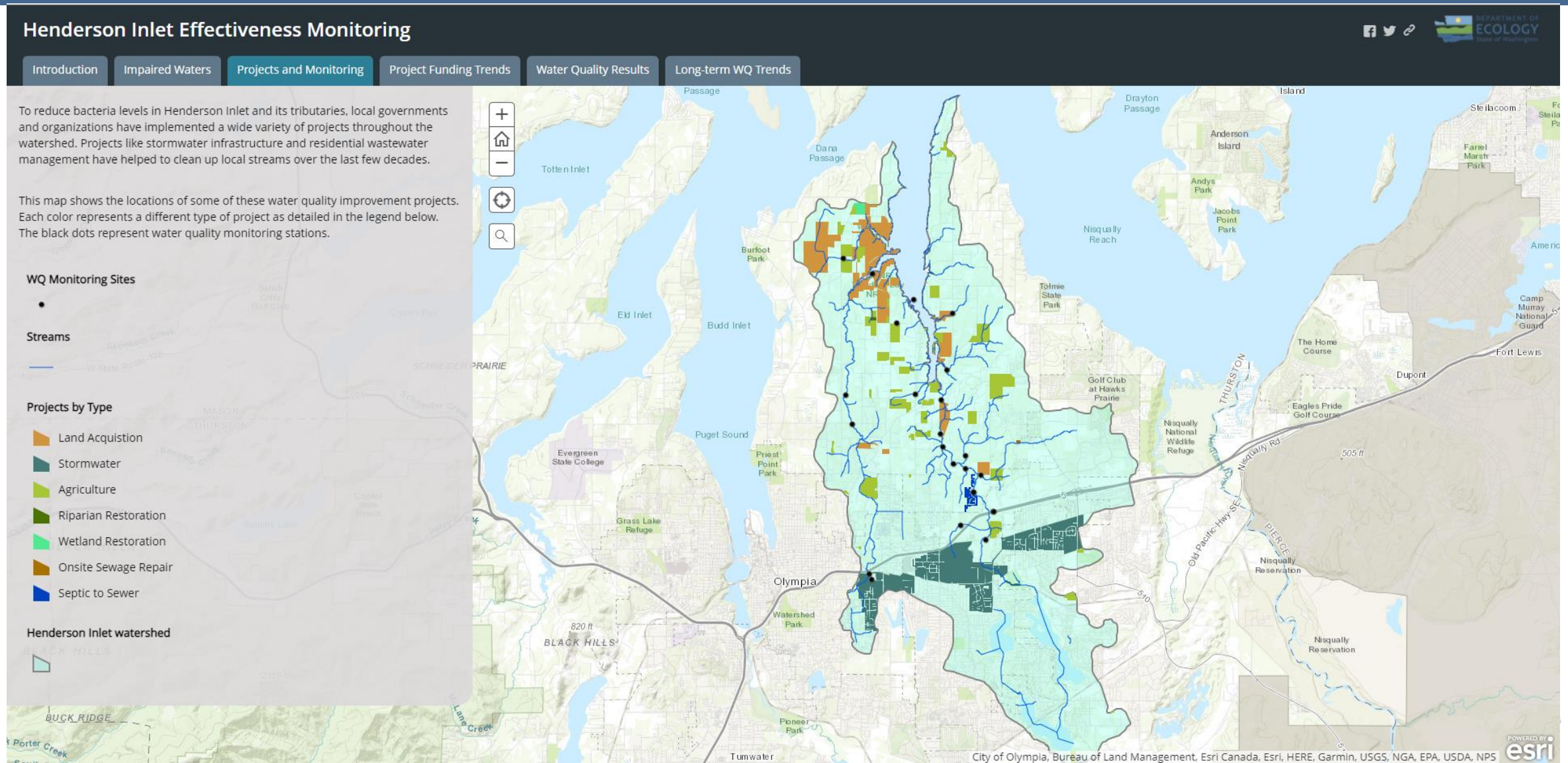
Examples

- **Henderson Inlet Bacteria TMDL:** Before/After monitoring
- **Chehalis River Multi - parameter TMDL:** Select long-term monitoring
- **Railroad Creek Acid Mine clean up:** Long-term Holistic (WQ, Biological)
- **Palouse River Multi-parameter TMDL:** Partnership. Paired watershed study.

TMDL: Henderson Inlet-Bacteria

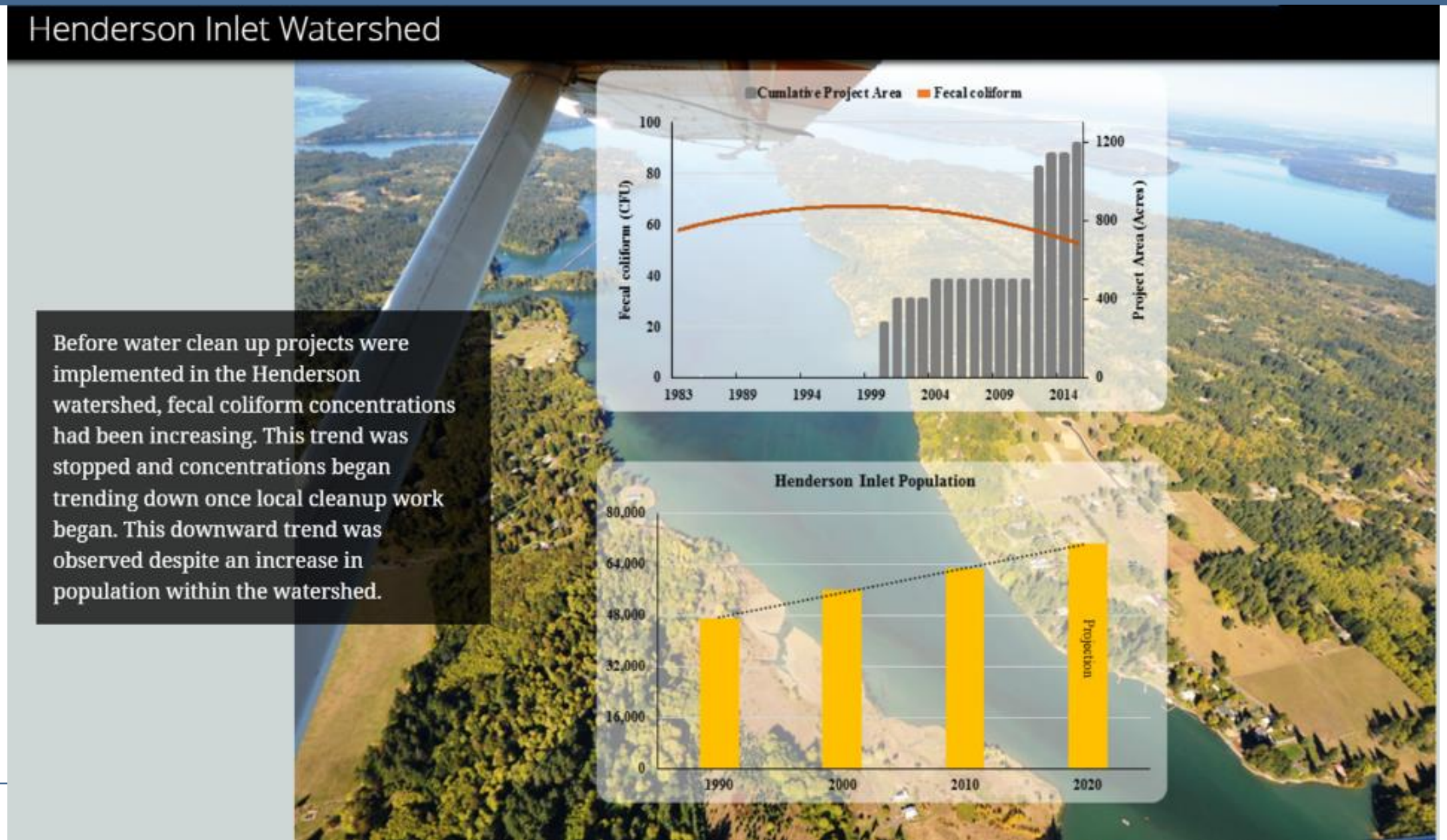


TMDL Henderson Inlet-Bacteria



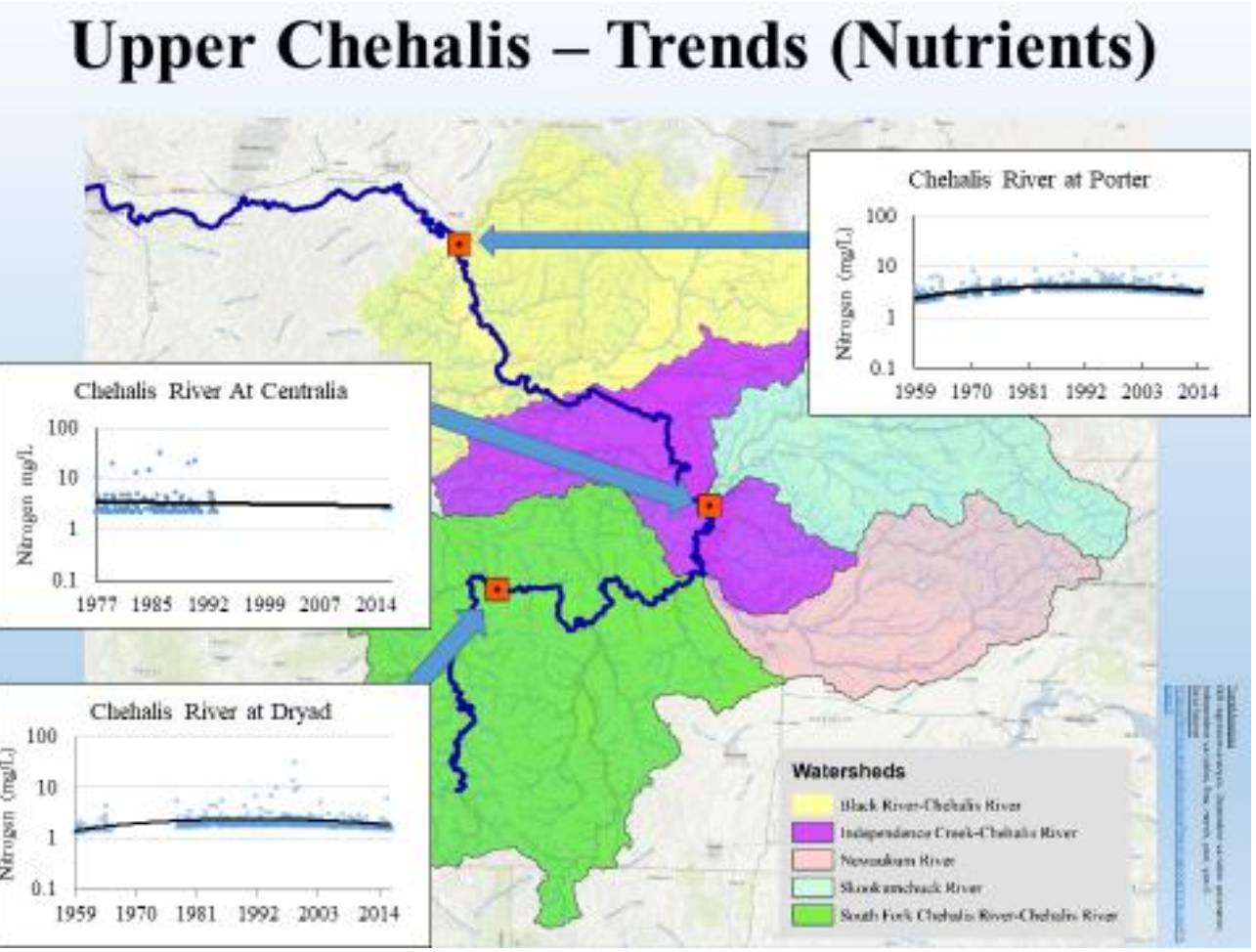
TMDL Henderson Inlet-Bacteria

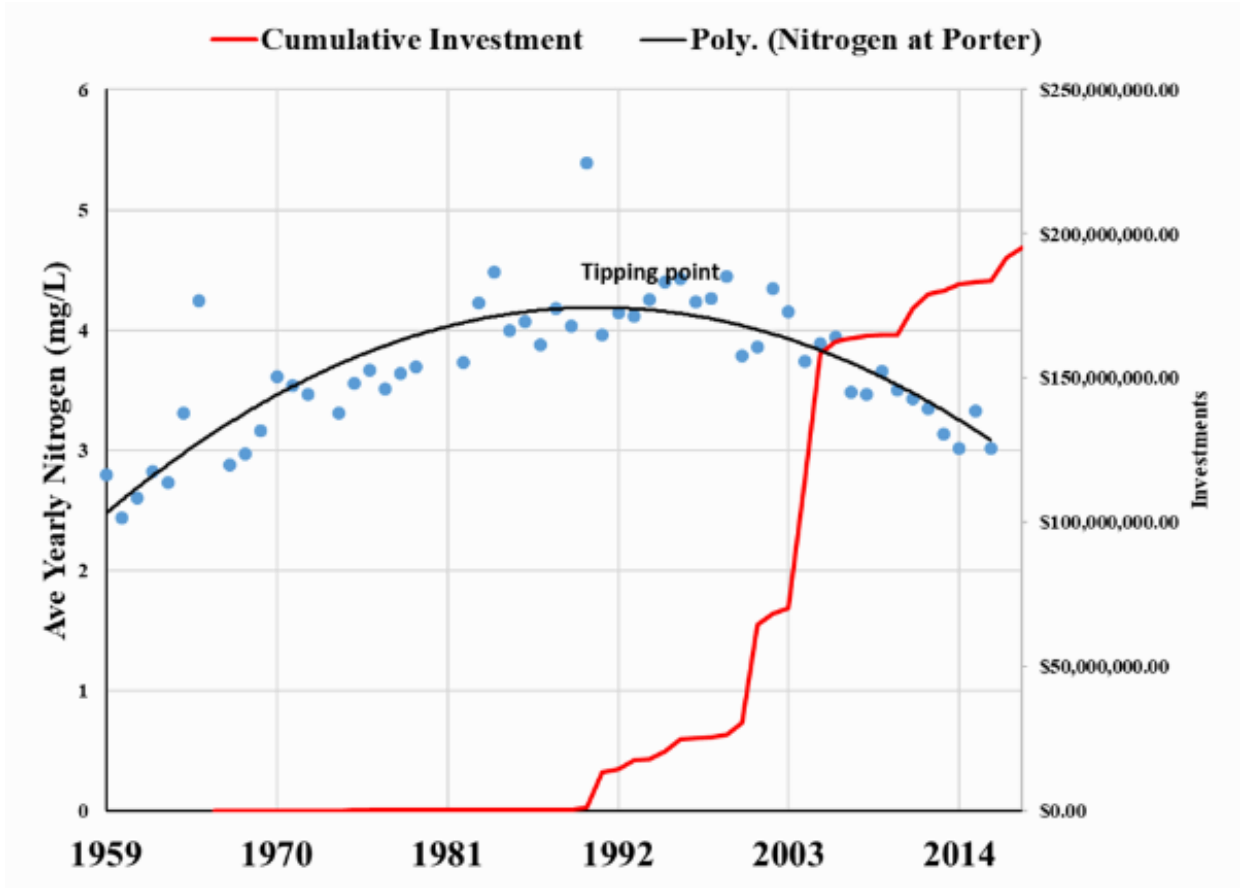
Henderson Inlet Watershed



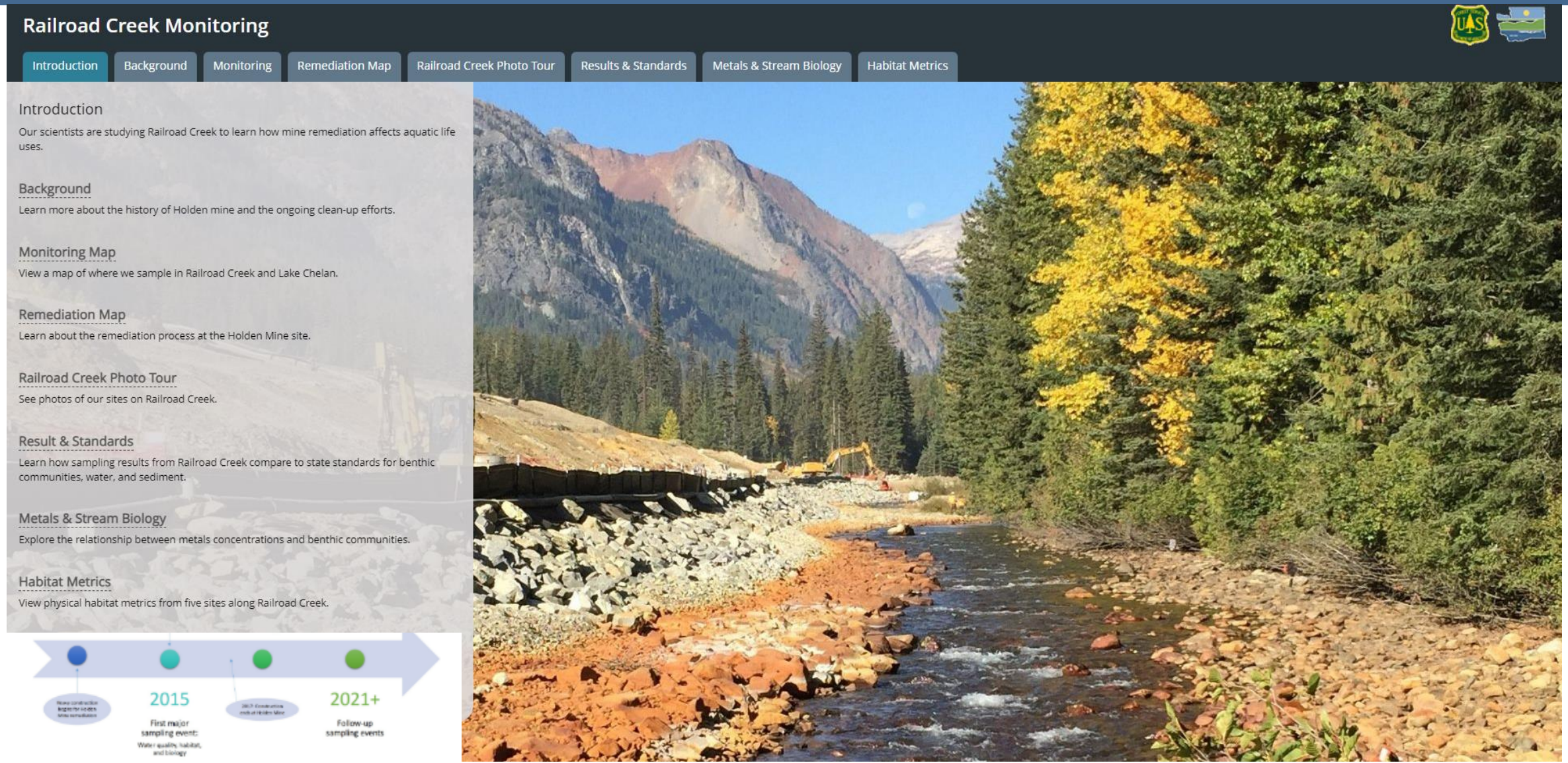
Before water clean up projects were implemented in the Henderson watershed, fecal coliform concentrations had been increasing. This trend was stopped and concentrations began trending down once local cleanup work began. This downward trend was observed despite an increase in population within the watershed.

TMDL: Chehalis River





Railroad Creek Study-Biological Sampling



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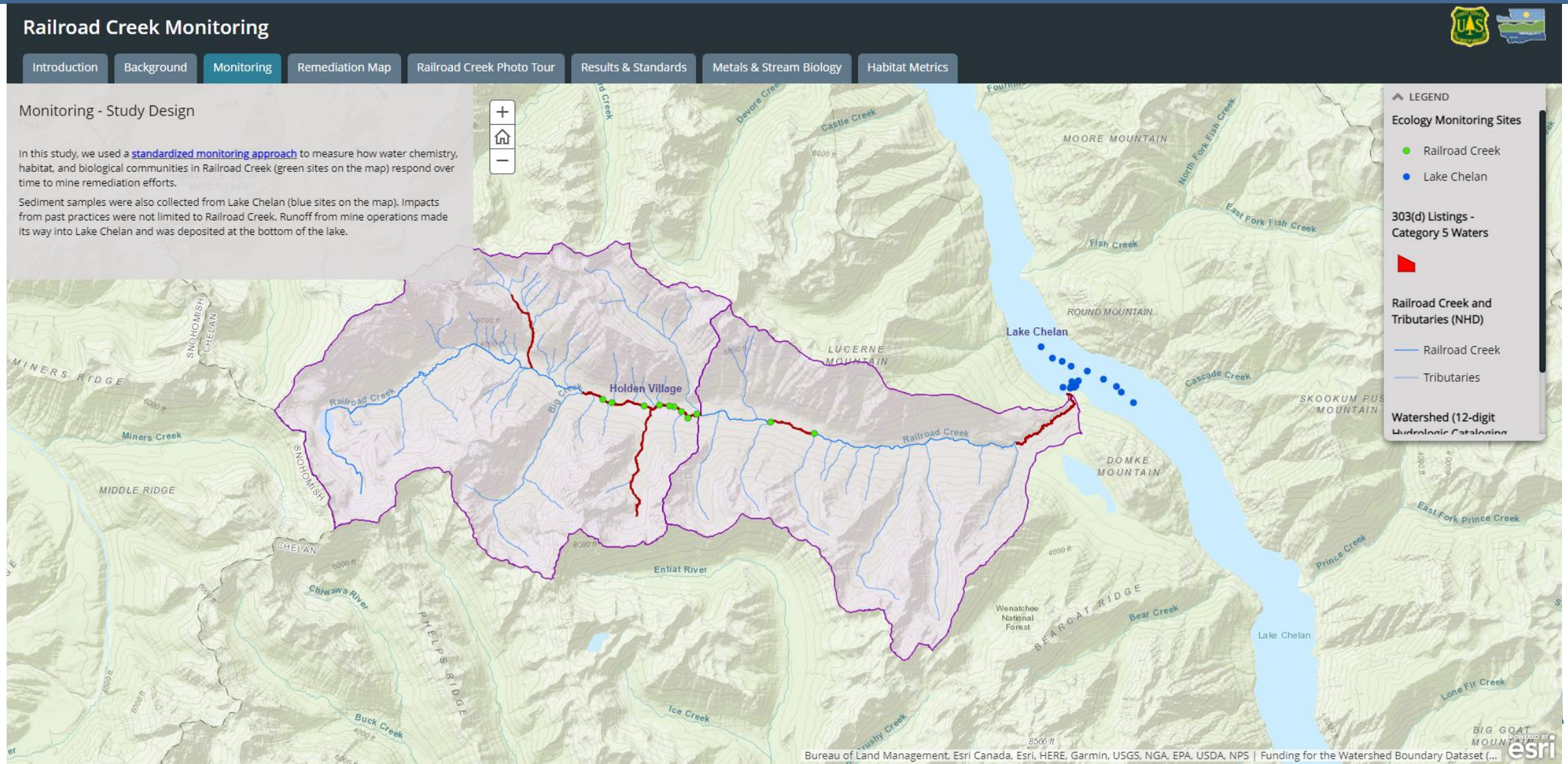

Railroad Creek Study-Biological Sampling

Railroad Creek Monitoring

Introduction | Background | Monitoring | Remediation Map | Railroad Creek Photo Tour | Results & Standards | Metals & Stream Biology | Habitat Metrics

Results & Standards

The water quality assessment is our process of collecting data and assessing the quality of surface waters in the state. The federal Clean Water Act requires that all states restore their waters to be "fishable and swimmable." Section 303(d) of the Clean Water Act establishes a process to identify and clean up polluted waters.

Use these buttons to explore how sampling results from Railroad Creek compare to state standards:

Macroinvertebrates / BIBI

Based on state thresholds for Benthic Index of Biotic Integrity (B-IBI) scores, stream biological health remained consistently strong upstream of the mine, but varied more near the mine and downstream. On average, stream biological health improved from 2015 to 2018.

Metals in Water

Metals concentrations in stream water at Railroad Creek generally met water quality criteria. A number of samples downstream of the mine had high concentrations for copper, iron, and zinc. However, conditions continue to improve.

Metals in Sediment

Metals concentrations in sediment generally met state sediment cleanup criteria. Some samples exceeded criteria levels for arsenic and nickel downstream of the mine in Railroad Creek and Lake Chelan.

Disclaimer: This story map includes provisional data for informational purposes only. For full metadata, view or download our study results.

BIBI Scores

Railroad Creek Study-Biological Sampling

Railroad Creek Monitoring

Introduction | Background | Monitoring | Remediation Map | Railroad Creek Photo Tour | Results & Standards | Metals & Stream Biology | Habitat Metrics

Metals & Stream Biology

We are studying whether metals in Railroad Creek impact the creek's biological communities, including periphyton and macroinvertebrate communities. Use the buttons below to learn more.

Map of copper concentrations in periphyton

This map shows hotspots for copper concentrations in periphyton in 2018. Higher concentrations are shown in red and orange.

Metals in periphyton tissue

Use this interactive chart to see metal concentrations in periphyton by parameter, site, and year.

Metals & BIBI scores

This chart lets you explore the relationships between BIBI scores and metals concentrations in periphyton tissue.

BIBI scores indicate the health of a stream's macroinvertebrate community. We are studying how BIBI scores relate to metals levels in periphyton. Periphyton metals results can represent the stream's water quality over time better than individual water samples, because periphyton tissue accumulates metals from stream water over time. So, studying this relationship gives us insight into whether high metals in the stream are impacting the stream's biological health.

For example, we have seen degraded macroinvertebrate communities at sites with high zinc levels in periphyton tissue.

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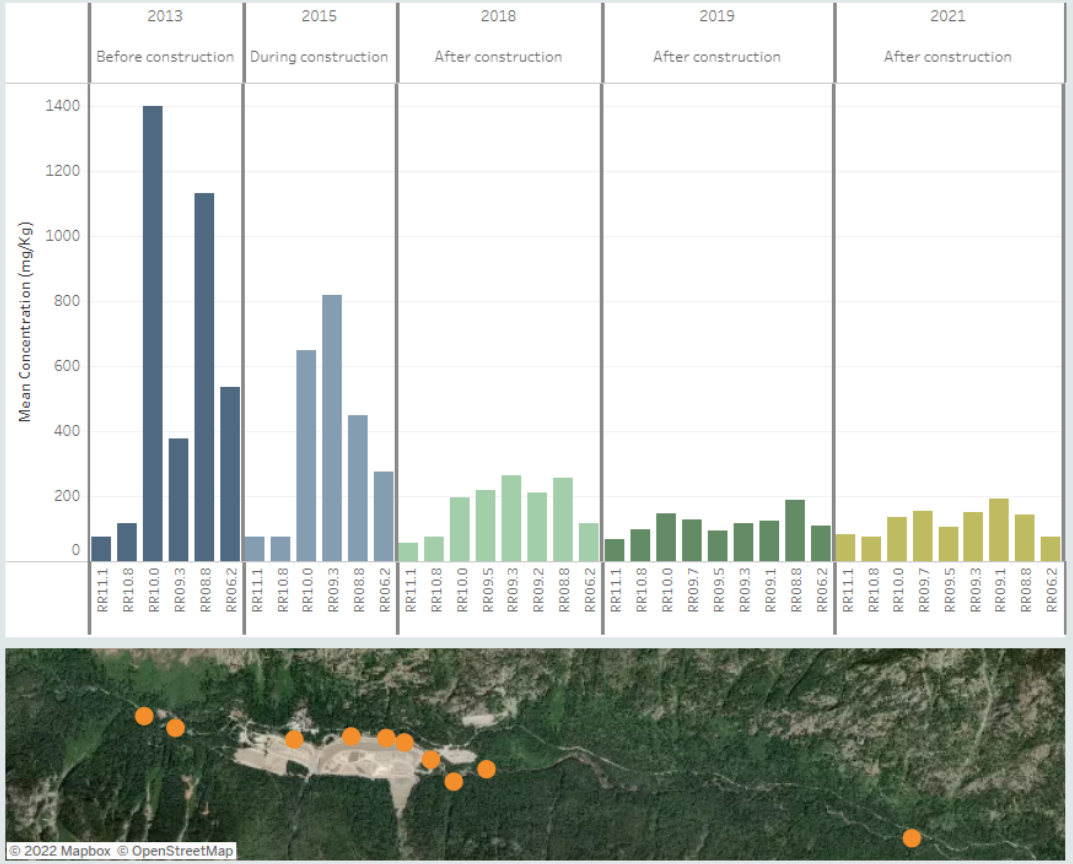
Copper in Periphyton Tissue



Partnerships

DEPARTMENT OF ECOLOGY
State of Washington

CONSERVATION DISTRICTS
OF WASHINGTON STATE
your window to healthy lands

Palouse Regional Conservation Partnership

Jennifer Boie, Director, Palouse CD
Dan Harwood, District Coordinator, Palouse-Rock Lake CD
Ryan Boylan, Research & Monitoring Coord. Palouse CD
Scott Collyard, Environmental Assessment Dept. of Ecology

Ecology Executive Leadership Team Meeting
February 6, 2018

Paired Watershed Study – Sediment Load

Kamiache and Thorn Creek Paired Watershed Study

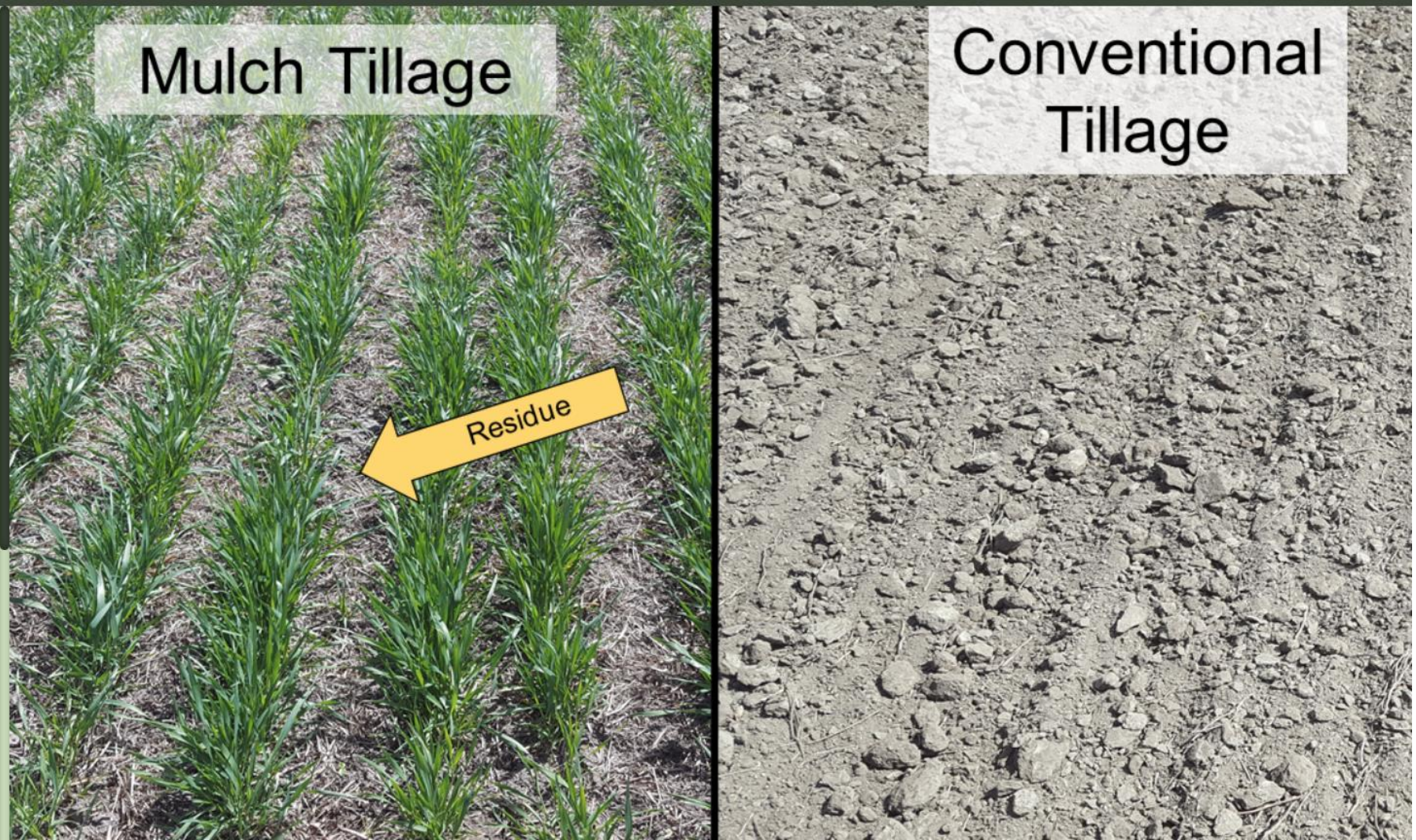
PALOUSE CONSERVATION DISTRICT

1 Introduction

What is the Kamiache and Thorn Creek Paired Watershed Study?

The Palouse River and its tributaries are impaired by sediment entering surface waters from surrounding agricultural landuse practices. Recently, the Palouse River Watershed Regional Conservation Partnership (RCPP) has been working to install best management practices (BMP) that reduce agricultural soil losses to surface waters; these BMPs include mulch tillage and riparian buffers specific to dryland wheat farming

It is estimated that 80% of the agricultural land in the Kamiache Creek watershed, a sub-watershed near St. John, WA, has been converted to mulch tillage. On the contrary, the adjacent Thorn Creek watershed has considerably less of the agricultural land (20%) in conservation tillage, thus serving as a control in this study.



Paired Watershed Study – Sediment Load

Kamiache and Thorn Creek Paired Watershed Study

PALOUSE CONSERVATION DISTRICT

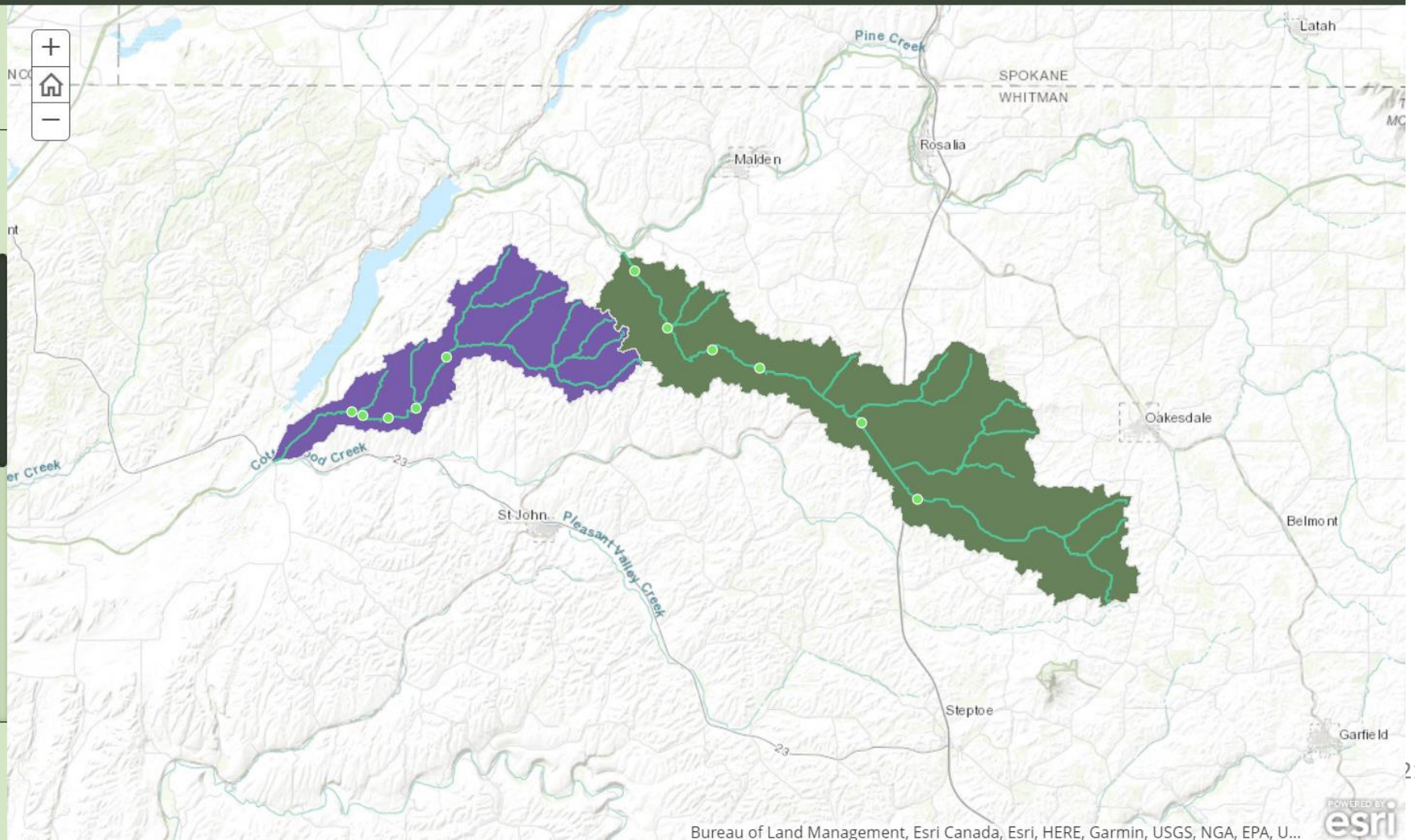
1 Introduction

2 Kamiache & Thorn Creek Paired Watershed Study

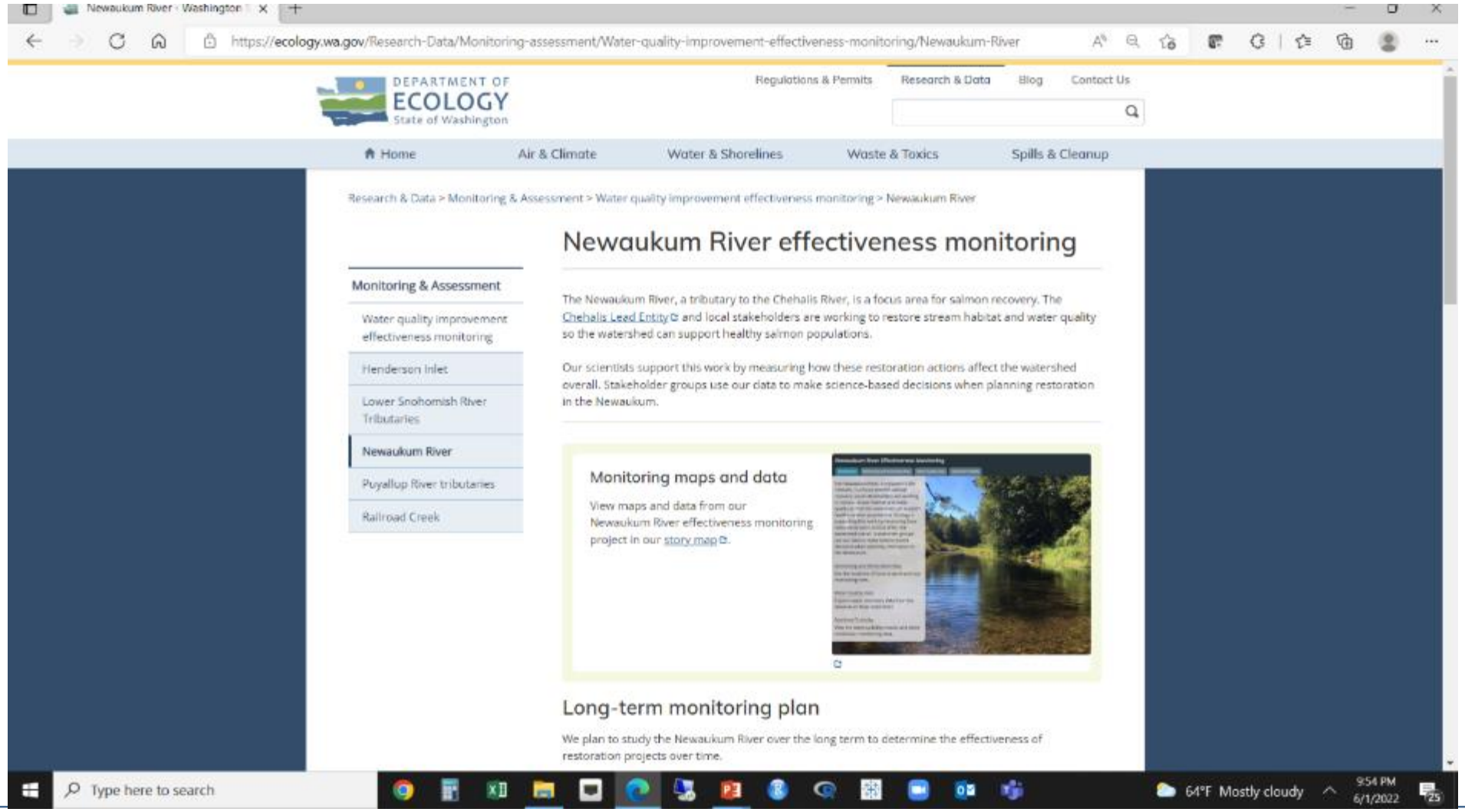
The Palouse Conservation District has established 10 in-stream monitoring stations in the Kamiache and Thorn Creek Watersheds to collect samples to measure water quality criteria such as nitrogen, phosphorus, carbon, and fecal coliforms. These locations can been seen on the map to the right.

The first year of data collection indicates that Kamiache Creek is generating 5.5 times less sediment than Thorn Creek. Annual sediment loads from water year 2017 in Kamiache Creek were 220 tons (0.02 tons/acre) compared to 2,447 tons (0.1 tons/acre) from Thorn Creek. Another way

3 Water Quality



Real-time Reporting



Ecology's Effective Monitoring Team

Scott Collyard
Jenny Wolfe
Niamh O'Rourke

Challenges

Monitoring:

- Most monitoring scenarios make it difficult to adaptively manage over time
- Monitoring is seldom robust enough to measure significant change over time.
- Gaps in implementation Data in Agricultural areas.
- Long-term monitoring design is resource intensive. No guarantees.

Other Challenges:

- Pressure on TMDL production time
- Lack of Resources to support EM.

Planning Challenges:

- Upfront Planning for Eventual EM
- Figuring out where a critical mass of implementation will occur.

Links

- Water quality improvement effectiveness monitoring - Washington State Department of Ecology
- Henderson Inlet - Washington State Department of Ecology
- Railroad Creek - Washington State Department of Ecology
- Research & Monitoring | palousecd

Questions