

# Welcome

---

YOU ARE IN THE RIGHT SPOT. WE WILL START AT 9:00 AM.



# Proposed Indicators for Evaluating The Effectiveness of CAOs

---

MARCH 17, 2021

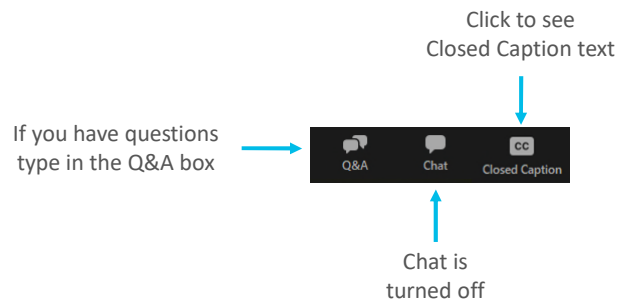


# 2021 Critical Areas and Shoreline Monitoring & Adaptive Management Online Workshops

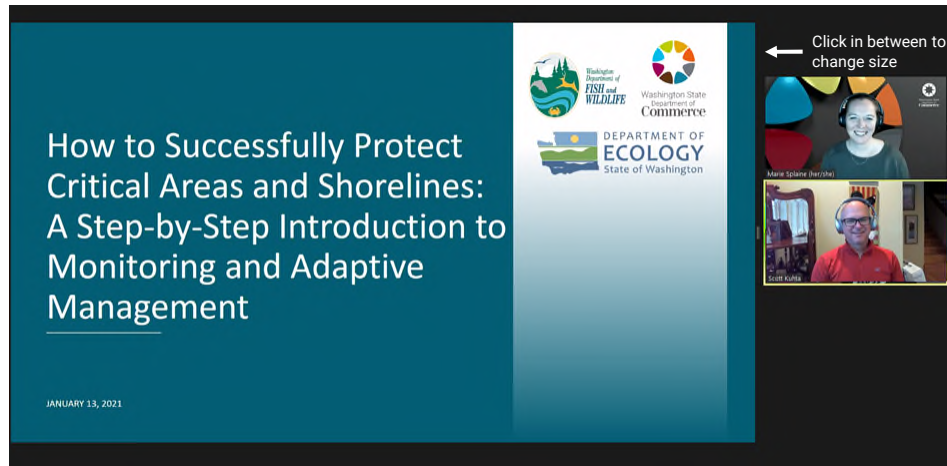


Welcome to  
Proposed Indicators for Evaluating The Effectiveness of CAOs

# 2021 Critical Areas and Shoreline Monitoring & Adaptive Management Online Workshops



## 2021 Critical Areas and Shoreline Monitoring & Adaptive Management Online Workshops



5

## Visit Project Website for More Information

[https://www.ezview.wa.gov/site/alias\\_1992/37576/overview.aspx](https://www.ezview.wa.gov/site/alias_1992/37576/overview.aspx)

The screenshot shows the EZview website page for "Critical Areas Adaptive Management Training Workshops". The page has a navigation bar with "Overview", "Contacts", "Events", "2021 Workshops", and "Library". The main content area is titled "2021 Workshops" and contains the following text:

Do you want to know if your critical areas and shoreline regulations are working as intended? Or how to effectively track special permit conditions and mitigation requirements?

Please join us for an in depth review of best practices, case studies, resources, and tools to enhance monitoring and adaptive management efforts for your critical areas and shorelines.

As a follow-up to our 2018 workshops, this 11-week webinar series features expert guest speakers, opportunities for peer-to-peer learning, information sharing, and individual technical assistance.

Earn AICP continuing education credits for your attendance!

Click on a link below to register. (Most sessions are 90 minutes. A couple sessions may go up to 2 hours.)

- Adaptive Management Workshop 1 – How to Successfully Protect Critical Areas and Shorelines: A Step-by-Step Introduction to Monitoring and Adaptive Management
- Adaptive Management Workshop 2 – Setting the Stage: Successful adaptive management and critical areas monitoring opportunities
- Adaptive Management Workshop 3 – Wetlands
- Adaptive Management Workshop 4 – Geologically Hazardous
- Adaptive Management Workshop 5 – Fish and Wildlife Habitat Conservation Areas
- Adaptive Management Workshop 6 – Frequently Flooded Areas
- Adaptive Management Workshop 7 – Critical Aquifer Recharge Areas (CARAs)
- Adaptive Management Workshop 8 – Shoreline
- Adaptive Management Workshop 9 – Permit Implementation Monitoring Tools
- Adaptive Management Workshop 10 – CAO Performance Indicators
- Adaptive Management Workshop 11 – Adaptive Management Interactive Workshop

6

# 2021 Critical Areas and Shoreline Monitoring & Adaptive Management Online Workshops



This project has been funded wholly or in part by the United States Environmental Protection Agency under assistance agreement PC-01J2230116-05251 through the Washington Department of Fish and Wildlife.

The contents of this document do not necessarily reflect the views and policies of the Environmental Protection Agency or the Washington Department of Fish and Wildlife, nor does mention of trade names or commercial products constitute endorsement or recommendation for use.

## Workshop Wednesday Series Lineup

Register using Zoom.



**January 13 - 9:00 a.m. - 11:00 a.m.**  
How to Successfully Protect Critical Areas and Shorelines: A Step-by-Step Introduction to Monitoring and Adaptive Management



**February 24 - 9:00 a.m. - 11:00 a.m.**  
Critical Aquifer Recharge Areas (CARAs)



**January 20 - 9:00 a.m. - 11:00 a.m.**  
Setting the Stage: Successful adaptive management and critical areas monitoring program basics



**March 3 - 9:00 a.m. - 11:00 a.m.**  
Shorelines



**January 27 - 9:00 a.m. - 11:00 a.m.**  
Wetlands



**March 10 - 9:00 a.m. - 11:00 a.m.**  
Permit Implementation Monitoring Tools



**February 3 - 9:00 a.m. - 11:00 a.m.**  
Geologically Hazardous Areas



**March 17 - 9:00 a.m. - 11:00 a.m.**  
CAO Performance Indicators



**February 10 - 9:00 a.m. - 11:00 a.m.**  
Fish and Wildlife Habitat Conservation Areas



**March 24 - 9:00 a.m. - 11:00 a.m.**  
Adaptive Management Interactive Workshop



**February 17 - 9:00 a.m. - 11:00 a.m.**  
Frequently Flooded Areas

Note: Workshop names may change but topic will stay the same.

# American Planning Association Education Credit

GO TO: [HTTPS://PLANNING.ORG/EVENTS/EVENTMULTI/9210027/](https://planning.org/events/eventmulti/9210027/)

The screenshot shows the American Planning Association (APA) website. The header includes the APA logo, the tagline 'Creating Great Communities for All', and navigation links for 'About APA', 'Join', and 'Log In'. A search bar is located below the header. The main navigation menu includes 'Membership', 'Knowledge Center', 'Education and Events', 'AICP', 'Policy and Advocacy', 'Career Center', 'In Your Community', 'Connect with APA', and 'APA Foundation'. The left sidebar lists 'Education and Events' with sub-links for 'Online Education', 'Educational Events', 'National Planning Conference', 'Policy and Advocacy Conference', 'Speaker Directory', 'Burnham Forum', and 'Calendar of Events'. The main content area displays the event title '2021 Critical Areas and Shorelines Monitoring and Adaptive Management Online Workshops' and identifies it as an 'APA Washington Chapter' event. The event details include the ID #9210027 and dates: Wednesday, February 3, 2021, 9 a.m. and Wednesday, March 24, 2021, 11 a.m. PDT in Olympia, WA, United States. An 'OVERVIEW' section describes the event as an 11-week webinar series in partnership with the Washington State Department of Ecology and the Washington State Department of Fish and Wildlife, aimed at providing technical assistance to local government planners.

9

# Land Acknowledgment

Discover which tribal lands you reside on text your zip code to (855) 917-5263.



10

## Poll



?

What size jurisdiction do you work with?

?

What is your role?

?

How long have you worked on critical areas?

11

## Meet Your Presenters



Keith Folkerts is currently leading WDFW's efforts to convey agency information about Priority Habitats and Species (PHS) to local governments in support of their regulatory efforts under the Growth Management Act and Shoreline Management Act. During his 7 years at WDFW, he has worked on PHS riparian management recommendations and High Resolution Change Detection, served as a member of the Voluntary Stewardship Program Technical Panel, and has been the project manager for several grants with the Puget Sound Partnership. Prior to working for WDFW, Keith worked for Kitsap County in the Department of Community Development, Public Works Department, and Commissioners Office in positions that included Watershed Planner, Stream Team Coordinator, and Natural Resources Coordinator.

Prior to working for Kitsap County, Keith served as Surface Warfare Officer, including deployments to the Arabian Gulf during the Gulf War. Keith has BA in political science from the US Naval Academy in Annapolis, Maryland. Outside of work, Keith enjoys backpacking, kayaking, gardening, and trying to keep up with his three daughters and marathon-running wife.

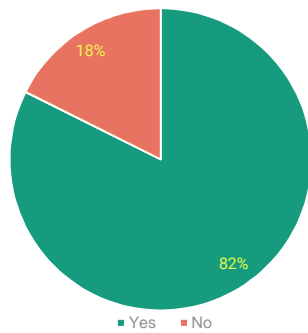
12

# Welcome to Webinar #10 of 11!

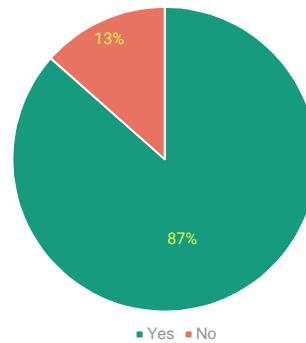
Proposed indicators for evaluating the effectiveness of CAOs

## Use of PHS Maps and Getting Advice from Habitat Biologists is Common

Does your jurisdiction **use PHS data** to flag possible presence of a FWHCA?  
(51 responses)

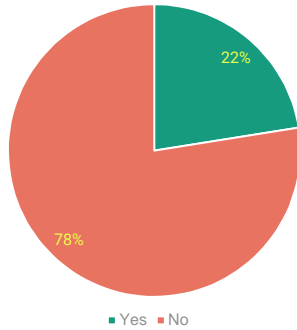


Does your jurisdiction get **advice from WDFW Habitat Biologists**?  
(52 responses)

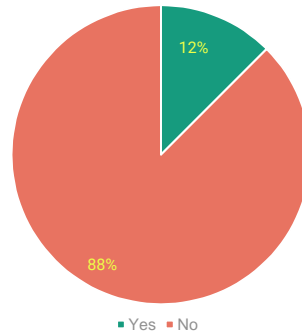


# Tracking Change and Using it to Evaluate CAO Effectiveness is Not Common (Yet!)

Does your jurisdiction **track tree canopy loss in impervious surface gains** within FWHCAs?  
(40 responses)



Does your jurisdiction **utilize HRCD to evaluate CAO effectiveness**?  
(32 responses)



Department of Fish and Wildlife

## Our CAO performance indicators rely on HRCD. ~~What~~ Who is HRCD?



Ken Pierce



Jeanne



Rachel



Robyn



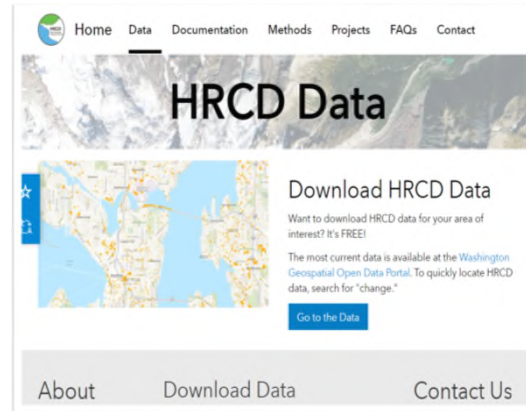
Syler





## Our CAO performance indicators rely on HRCD. What is HRCD?

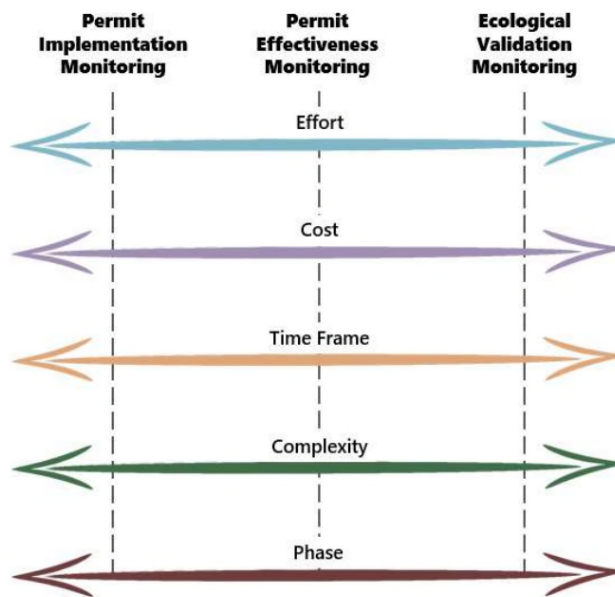
- Compares aerial images (2 time periods)
- Computer IDs places that have changed
- Person confirms & IDs cause of change
  - **Development, tree removal**, forestry, other (stream meanders, landslides, fires...)
- Results: Change polygons
  - Canopy cover loss, new imperviousness...
  - As small as 1 large tree; 3 small trees
- All of Puget Sound; Five time periods for
  - First: 2006-09; Most recent: 2015-17
- \$Millions to produce; free to you



## Levels of Monitoring

The previous webinars have focused primarily on the left side.

HRCD allows you to look at outcomes – which is more to the right.



Source: Chapter 7 of Commerce's CAO Handbook

Levels of Monitoring

## Today's Discussion

- **CAO Effectiveness**
  - What is an "effective" CAO?
  - What are performance indicators?
  - 4 proposed CAO Effectiveness Performance Indicators
- **Getting WDFW datasets**
  - HRCD, Tree Canopy, Visible Surface Water

### Q&A #1

- **Calculating your performance indicators**
  - Demo with fictitious jurisdictions

### Q&A #2



## Why is WDFW doing this?

- **WDFW's stake: For many species direct habitat loss is the largest threat**
  - WDFW investing millions to better understand the threat
- **Our success depends upon your success**



# What is an “Effective” CAO?

## What is an Effective CAO Performance Indicator?

The CAO’s Job

The Performance Indicators’ Job

Characteristics of an effective CAO Performance Indicator



### What is the job of the CAO?

1. **Designate** Critical Areas
2. **Protect** ecosystem functions and values of Critical Areas
  - **No net loss of ecological function** of affected ecosystems and components via mitigation sequencing
  - **Support viable populations;** avoid creating isolated sub-populations of species

## What is the job of the CAO?






- **Avoid, minimize, offset harmful activities within Critical Areas**
  - **Avoid** = Shift activity out of Critical Area
  - **Minimize** = Do as little of the harmful activities as possible
  - **Offset** = Make improvements in proportion to the un-avoided harm
  - “Harmful activities”
    - Adding imperviousness
    - Removing trees
    - Adding pollutants; fragmenting habitats, introducing invasive species, hardening stream banks...




## An “effective” CAO

- **Avoids adverse changes to critical areas**
  - By shifting development
- **Minimizes adverse change within critical areas.**
- **Ensures offsets for unavoidable harm sufficient to achieve no net loss of ecological functions.**



		
	<h3>An Ideal Performance Indicator...</h3> <ul style="list-style-type: none"> <li>• <b>Provides insights for making good decisions</b> <ul style="list-style-type: none"> <li>• Informs a meaningful decision</li> <li>• Or at least points to where to dig deeper</li> </ul> </li> <li>• <b>Provides useful information</b> <ul style="list-style-type: none"> <li>• Affordable</li> <li>• Reliable: Precise (quantitative), accurate</li> <li>• Timely</li> </ul> </li> <li>• <b>Be widely used; provides context</b> <ul style="list-style-type: none"> <li>• What is "normal," "important"?</li> <li>• How urgent/good/bad is our situation?</li> </ul> </li> </ul>	
		

	<h3>Interpreting Performance Indicators</h3> <ul style="list-style-type: none"> <li>• <b>Benchmarks (or targets)</b> <ul style="list-style-type: none"> <li>• How good is good enough? What results do we want?</li> <li>• By when should the results be accomplished?</li> <li>• Value judgments set by policy makers</li> <li>• Necessity of benchmarks for CAO adaptive management discussed in State Supreme Court's <i>Swinomish</i> Case</li> </ul> </li> </ul>
---	---

## An “Effective” CAO

- Avoids adverse changes to critical areas by shifting development
- Minimizes adverse change within critical areas.
- Ensures offsets for unavoidable harm sufficient to achieve no net loss of ecological functions.

## An Ideal CAO Performance Indicator



Provides context and insights

What is “normal”?  
How urgent, important is this?  
Where to dig deeper?

27

## An “Effective” CAO

- Avoids adverse changes to critical areas by shifting development
- Minimizes adverse change within critical areas.
- Ensures offsets for unavoidable harm sufficient to achieve no net loss of ecological functions.

## An Ideal CAO Performance Indicator



Provides context and insights

What is “normal”?  
How urgent, important is this?  
Where to dig deeper?



Quantifies extent to which development is **shifted** out of critical areas

28

## An “Effective” CAO

- Avoids adverse changes to critical areas by shifting development
- Minimizes adverse change within critical areas.
- Ensures offsets for unavoidable harm sufficient to achieve no net loss of ecological functions.

## An Ideal CAO Performance Indicator

**Provides context and insights**

What is “normal”?  
How urgent, important is this?  
Where to dig deeper?

Quantifies extent to which development is **shifted** out of critical areas

Quantifies extent to which change occurs in critical areas

29

## An “Effective” CAO

- Avoids adverse changes to critical areas by shifting development
- Minimizes adverse change within critical areas.
- Ensures offsets for unavoidable harm sufficient to achieve no net loss of ecological functions.

## An Ideal CAO Performance Indicator

**Provides context and insights**

What is “normal”?  
How urgent, important is this?  
Where to dig deeper?

Quantifies extent to which development is **shifted** out of critical areas

Quantifies extent to which change occurs in critical areas

Quantifies lift provide by offsets

30

## An “Effective” CAO

- Avoids adverse changes to critical areas by shifting development
- Minimizes adverse change within critical areas.
- Ensures offsets for unavoidable harm sufficient to achieve no net loss of ecological functions.

## An Ideal CAO Performance Indicator

Provides context and insights

What is “normal”?  
How urgent, important is this?  
Where to dig deeper?

Quantifies extent to which development is **shifted** out of critical areas

Quantifies extent to which change occurs in critical areas

Quantifies lift provide by offsets

Is, reliable, timely, affordable, and widely used

31

## An “Effective” CAO

- Avoids adverse changes to critical areas by shifting development
- Minimizes adverse change within critical areas.
- Ensures offsets for unavoidable harm sufficient to achieve no net loss of ecological functions.

## An Ideal CAO Performance Indicator

Provides context and insights

What is “normal”?  
How urgent, important is this?  
Where to dig deeper?

Quantifies extent to which development is **shifted** out of critical areas

Quantifies extent to which change occurs in critical areas

Quantifies lift provide by offsets

Is, reliable, timely, affordable and widely used

Is the subject of locally created benchmarks

32



## How to Measure “Avoidance”?

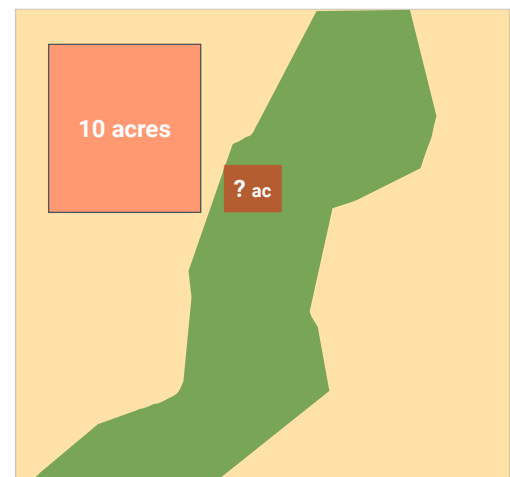
- To measure “avoidance”, we need to know the difference in the rate of change *within* Critical Areas vs the rate of change *outside of* Critical Areas
  - If a CAO is supposed to avoid development within Critical Areas (shifting it into Non-Critical Areas), to know its effectiveness we need to know both.
  - Knowing the rate of change outside of Critical Areas also adds context



33

## Conveying the Idea of “Shift”

1. “For every 10 acres of change outside of critical areas, how much change happened within Critical Areas?”



34

## Conveying the Idea of “Shift”

1. “For every 10 acres of change outside of critical areas, how much change happened within Critical Areas?”
2. “For every acre of change within a critical area, how many acres of change happened outside of critical areas?”

### Both of these questions

- Provide an easy way to simultaneously consider the two rates
- Self-adjust for the community’s overall growth rate



35

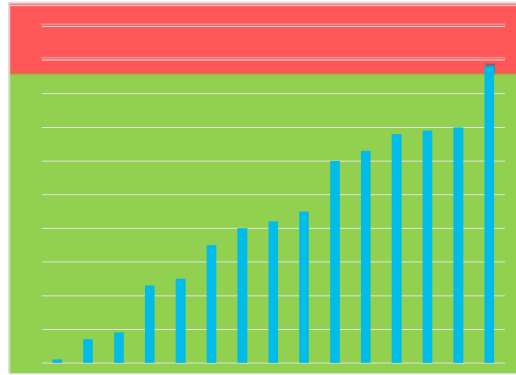
## Things we Kept in Mind when Developing CAO Performance Indicators

- Only count what is under the jurisdiction’s control
  - No lumping cities and counties
  - No holding local jurisdiction to account for federal, tribal, or state actions
  - No penalizing the jurisdiction when a river, wildfire or landslide takes out some tree
- Exclude all surface water from the calculations



## Things we Kept in Mind when Developing CAO Performance Indicators

- You decide your benchmarks
- How much development in your critical areas is acceptable?
- We can help you figure out ways to measure indicators, but you have the authority establish local goals



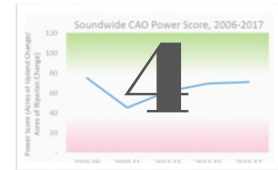
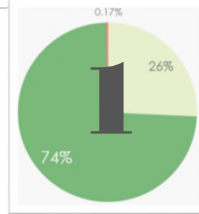
37

# CAO Performance Indicators

Four Performance Indicators

## CAO Effectiveness Performance Indicators

- **Four basic indicators**
  - Primarily related to Fish and Wildlife Habitat Conservation Areas
  - Can be used to assess change in any geography that you can map
- Each indicator leverages HRCD and associated high-resolution **tree maps and surface water maps**



## 5 Indicators to Measure CAO Effectiveness

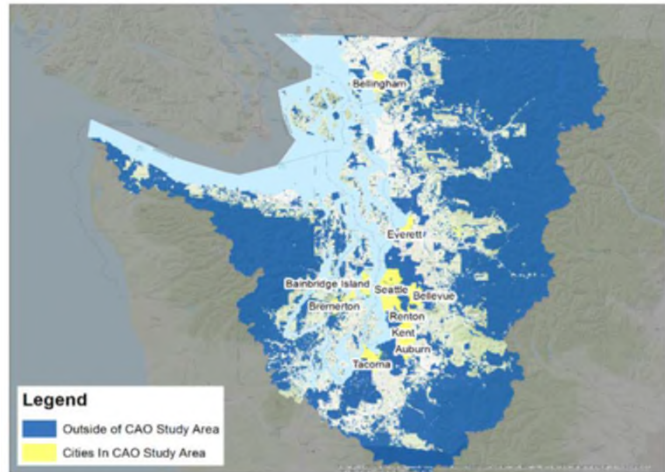
One looks at the <b>current</b> state (2017)	
Two indicators look at <b>rates of change</b> and <b>trends since 2006</b>	
One <b>looks ahead</b> a decade, showing results of recent trends continuing	
One reports on the <b>shifting</b> of development	
One reports <b>how much change</b> occurred within critical areas	

Results are provided as absolute numbers and normalized

## Indicator Examples Use Soundwide Results

To explain these indicators, we use actual results from our analysis of change within urban and rural CAO-defined stream buffers

- All 12 Puget Sound Counties, 10 cities
- Averages for all UGAs and all rural (non-UGA) areas
- More on the specific geography in the demo
- NTA's final report has more details

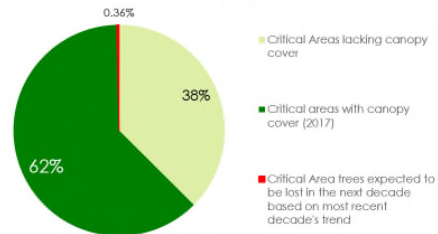


## Indicator #1

- Portion of Critical Areas that have trees (blue slice)
- Soundwide riparian averages:
  - Urban areas: 62%
  - Rural areas: 74%

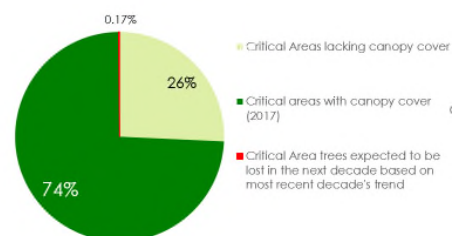
Urban

Critical Areas with Trees (2017) and Expected Critical Area Tree Loss in Next Decade based on Previous Decade's Tree Loss



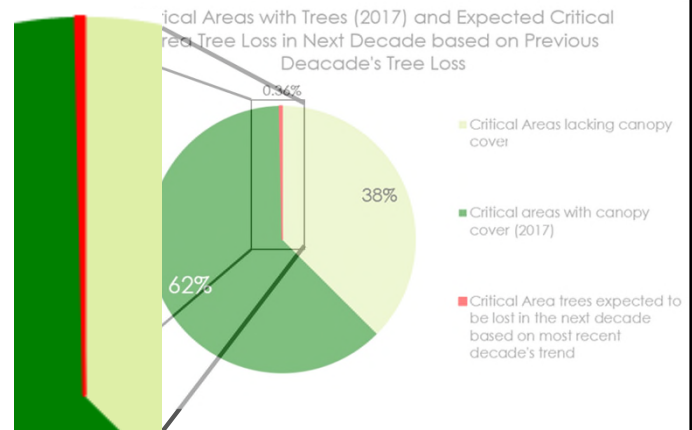
Rural

Critical Areas with Trees (2017) and Expected Critical Area Tree Loss in Next Decade based on Previous Decade's Tree Loss



## Indicator #2

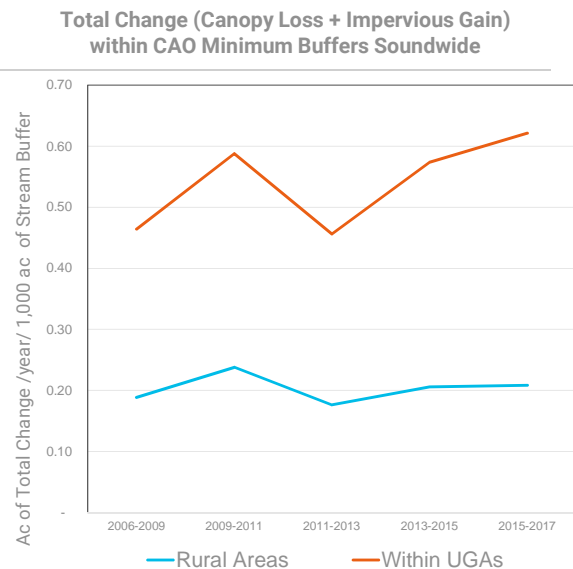
- Portion of Critical Area trees that will be lost in a decade at recent rate (red slice)
- Soundwide riparian averages
  - Urban Areas: 0.36% canopy loss per decade
  - Rural Areas: 0.17% canopy loss per decade



43

## Indicator #3

- Acres of change per year in Critical Areas
  - Total change and canopy change
- Soundwide total change averages (2006-2017)
  - Urban Areas: 0.53 ac change per 1,000 ac of riparian area
  - Rural Areas: 0.20 ac change per 1,000 ac of riparian area

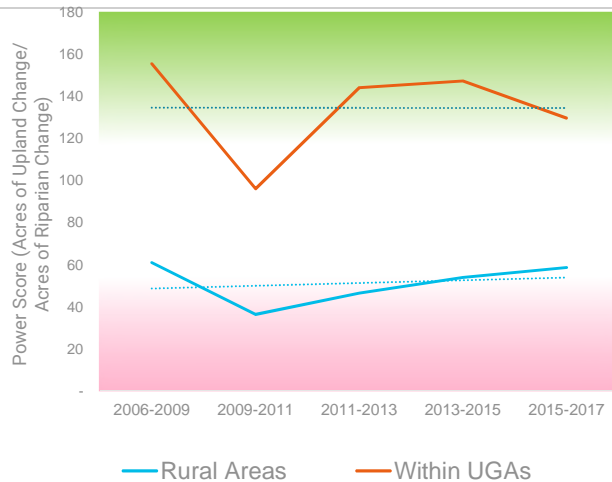


44

## Indicator #4

- “CAO Power Score”:  
(Relative Change)
  - “For every acre of change **within** Critical Areas, how many acres of change happened **outside of** Critical Areas?”
  - Larger number = More powerful CAO
- Soundwide averages (2006-2017):
  - Urban Areas: 135
  - Rural Areas: 52

Soundwide CAO Power Score, 2006-2017



## How Ideal are these Proposed Indicators?



Quantify extent to which development is **shifted** out of critical areas



Quantify extent to which change occurs in critical areas



Quantify lift provide by offsets



Be timely, reliable, and affordable



Provide context and actionable insights

What is "normal"?  
How urgent/good/bad is this?  
Where to dig deeper?



Be the subject of locally created benchmarks

# How Ideal are these Proposed Indicators?

- ✓ Quantify extent to which development is **shifted** out of critical areas
- ✗ Quantify extent to which change occurs in critical areas
- Quantify lift provide by offsets
- Be timely, **reliable**, and affordable  
*\*Dependent on the accuracy of your base map*
- Provide context and actionable insights  
What is "normal"?  
How urgent/good/bad is this?  
Where to dig deeper?
- Be the subject of locally created benchmarks

Locals do this

47

## Survey: Utility of Indicators

---

?

How useful would it be to know the results of these five CAO performance indicators for your jurisdiction?

Very, somewhat, a little, not at all, unknown

?

Knowing these indicators for my jurisdiction would likely result in us revising our CAO to better protect critical areas.

Strongly agree, agree, disagree, strongly disagree, I don't know

48



## Survey: Application of Indicators



How helpful would it be to be able to compare...



...your jurisdiction's scores **through time** (continuing into the future)?

Very, somewhat, a little, not at all, unknown

...your jurisdiction's scores to a **regional average score** (e.g., Soundwide)?

Very, somewhat, a little, not at all, unknown

...your jurisdiction's scores to other **similar jurisdictions**?

Very, somewhat, a little, not at all, unknown

49

## Q&A - "Effective" CAO WDFW's Five Proposed CAO Effectiveness indicators

TYPE YOUR QUESTIONS IN THE Q&A BOX IN YOUR TOOLBAR



50

# Demonstration: Information Available from WDFW

Robin Hale, Landscape Analytics Section, WDFW



**Project background and data  
High Resolution Change Detection (HRCD)**

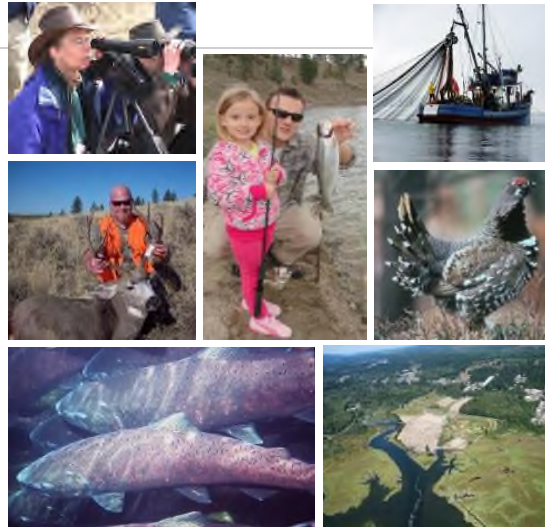
# Project background

WDFW Mandate:

*"Preserve, protect, perpetuate, and manage" fish and wildlife (RCW 77.04.012)*

USDA National Agriculture Imagery Program (NAIP)

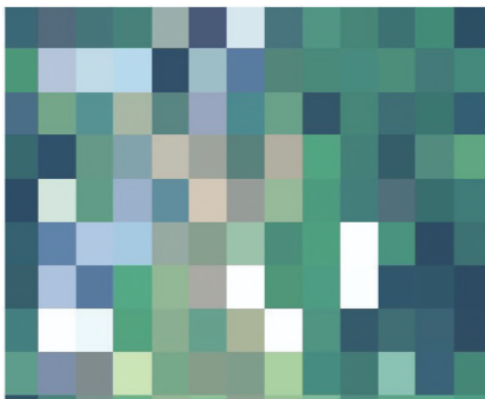
Salmon Recovery Funding Board



Department of Fish and Wildlife

# Spatial resolution matters

30-meter resolution



1-meter resolution (used by HRCD)



Department of Fish and Wildlife

## Project data

- 1) Land cover changes
  - 2006-09
  - 2009-11
  - 2011-13
  - 2013-15
  - 2015-17
- 2) Tree canopy
  - 2017
- 3) Visible surface water
  - 2017
- 4) Analyses and reports\*



## Land Cover: Canopy & Visible surface water



## What is 'change?'

Tree canopy loss



Impervious surface increase



Semi-pervious surface increase



## An example of change

2006 Imagery



2017 Imagery



HRCD Data

Area: **4.5 acres**  
Initial land cover: **Mixed natural**

Canopy loss: **25%**  
New impervious: **25%**  
Total change: **50%**

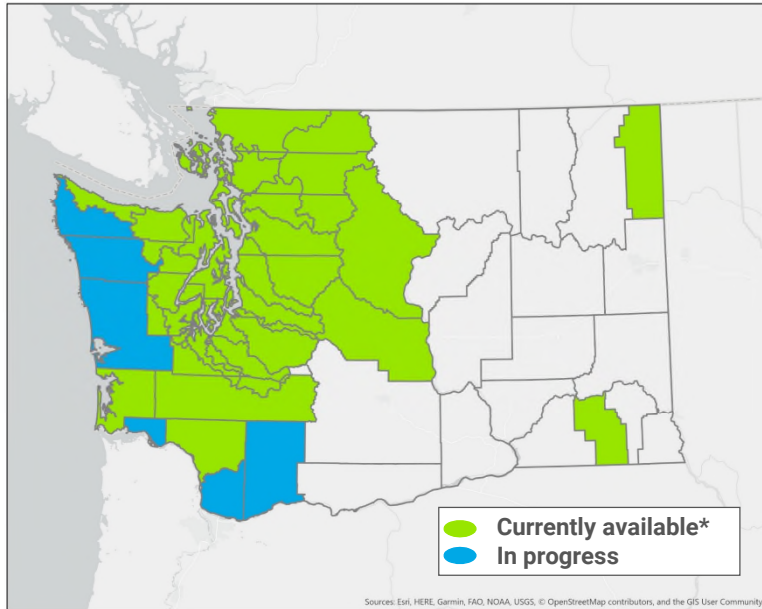
Cause of change: **Development**



## Data Availability

- **Currently available\***
- **Planned**

\* Some counties are partially completed due to lidar availability



Department of Fish and Wildlife



## Obtaining the data

**High Resolution Change Detection Project**

Data Tutorials Documentation Methods Projects FAQs Contact

# GIS Data

**Download or request data**

The Change data for Puget Sound is available at the [Washington Geospatial Open Data Portal](#). To quickly locate HRCDC change data, search for "change."

[Downloadable Data](#)

Can't find what you're looking for? Additional GIS data including [Tree Canopy](#), [Visible Surface Water \(VSW\)](#), and areas outside of Puget Sound are available by request.

[Request Data](#)

Data availability as of March 2021

Department of Fish and Wildlife

61

## Option 1: Washington Geospatial Open Data Portal

Currently for:

- Changes (*within Puget Sound*)

Soon:

- For all data products

**Washington Geospatial Open Data Portal**

**Puget Sound High Resolution Change Detection 2006-2017**

Last updated 8 months ago | 251,440 Records

Please zoom in to see the filter applied to the map

Overview Data API Explorer

Showing 1 to 10 of 17,306 WRIA number: 1 - 1


OBJECTID	WRIA number	Start Year	End Year	Initial Land Cover Class code	Initial Land Cover Class name	Chang
25627	1	2006	2009	6	Mixed Not Built	3
25628	1	2006	2009	6	Mixed Not Built	3
25629	1	2006	2009	6	Mixed Not Built	3
25630	1	2006	2009	8	Herbs and Shrubs	1

Download APIs

Full Dataset  
Spreadsheet  
Filtered Dataset  
Spreadsheet  
KML  
Shapefile

Department of Fish and Wildlife

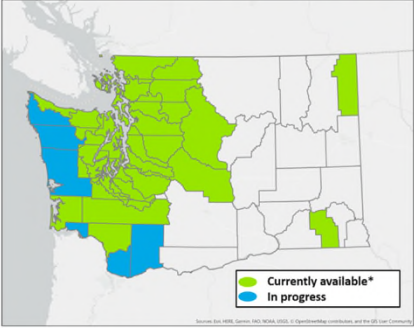
62



High Resolution Change Detection Project

[Data](#)
[Tutorials](#)
[Documentation](#)
[Methods](#)
[Projects](#)
[FAQs](#)
[Contact](#)

# GIS Data



Data availability as of March 2021


### Download or request data

The Change data for Puget Sound is available at the [Washington Geospatial Open Data Portal](#). To quickly locate HRCDC change data, search for "change."

[Downloadable Data](#)

Can't find what you're looking for? Additional GIS data including [Tree Canopy](#), [Visible Surface Water \(VSW\)](#), and areas outside of Puget Sound are available by request.

[Request Data](#)



Department of Fish and Wildlife

63

## Option 2: Data Request Form

Currently for:

- Tree canopy
- Visible Surface water
- Changes (*outside of Puget sound*)

**Project Description\***

Please briefly describe your project and intended use for the data you are requesting.

My data will be amazing 977

**Contact Information**

**Name\***


Robin Hale

**Email\***

robin.hale@dfw.wa.gov

**Phone**

Submit



Department of Fish and Wildlife

64



# Online resources: [hrcd-wdfw.hub.arcgis.com](https://hrcd-wdfw.hub.arcgis.com)

Learn  
Download Data  
Explore

**HRC Data**

Download HRC Data

Want to download HRC data for your area of interest? It's FREE!  
The most current data is available at the Washington Geospatial Open Data Portal. To quickly locate HRC data, search for "change."

[Go to the Data](#)

Explore HRC Data

Click on any of the features on the map to view HRC data in your area.

**High Resolution Change Detection**  
FACT SHEET

**WHAT IS HRC?**  
The High Resolution Change Detection (HRC) project extracts resolution imagery (~1m) and provides details on classes. The HRC data products are available at [www.geo.wa.gov](http://www.geo.wa.gov) and [www.wdfw.wa.gov](http://www.wdfw.wa.gov).

**High Resolution Change Detection**  
USING HRC DATA: RIPARIAN BUFFER CHANGES

One of the uses for HRC data within riparian areas is to estimate tree/canopy loss within riparian buffers. The example below demonstrates how to determine the amount of a riparian area which experienced canopy loss between 2011 and 2017 using HRC data.

**STEP 1 - GATHER DATA**  
Download the HRC dataset from the Geospatial Open Data Portal ([www.geo.wa.gov](http://www.geo.wa.gov)) and add the polygons (pink) to your GIS software. Also add a stream centerline (blue) to your GIS from your choice of data source.

**STEP 2 - ID CHANGES WITHIN RIPARIAN AREA**  
Add a buffer to the stream centerline to represent the riparian area. This example uses a 100 ft buffer (orange outline). Use the new riparian buffer area to clip the HRC polygons.

**STEP 3 - CALCULATE CANOPY LOSS**  
The remainder of calculations use the attribute table for the newly clipped HRC polygons. Review the fields for Shape Area (in acres) and for Canopy Loss (%). Update the Shape Area field and the Canopy Loss field.

**WHY USE HRC DATA?**  
Unlike traditional land use within a given area over time, in addition to large change (two trees) (Canopy Loss) or change on the landscape (shed or planting) (jurisdiction), HRC data is available for...



<https://hrcd-wdfw.hub.arcgis.com/>

## A tour of WDFW's HRC Data Hub

**HRC Data**

Download HRC Data

Want to download HRC data for your area of interest? It's FREE!  
The most current data is available at the Washington Geospatial Open Data Portal. To quickly locate HRC data, search for "change."

[Go to the Data](#)

**About**

- [Help Documentation](#)
- [FAQs](#)

**Download Data**

The High Resolution Change Detection change data is available for download on the Washington Geospatial Open Data Portal.

[Go to the Data](#)

**Contact Us**

- Email us at: [HRC@dfw.wa.gov](mailto:HRC@dfw.wa.gov)

# How to Calculate the Four Performance Indicators

A demonstration using a fictitious Puget Sound city

## Survey: Your Jurisdiction's Indicators



How interested are you in calculating your jurisdiction's CAO performance indicator scores?

Very, somewhat, a little, not at all, unknown

Can your jurisdiction map your critical areas with reasonable accuracy?


Yes, No, I don't know

Are you (or a colleague) capable of doing a *union* with ArcGIS?

Yes, No, I don't know



# 1 Create the Initial Map of Your Jurisdiction



- **Exclude non-GMA areas**
  - Federal lands; Tribal lands; Forestry Lands
- **Exclude surface water**
  - Use HRCD's visible surface water & others
- **Differentiate "critical areas" from "non critical areas"**
  - Use your CAO's definitions and maps where possible
- **Counties: Differentiate UGAs from non UGAs; do separate analysis**
- **The Initial map shows 100% of your jurisdiction (no overlaps) as**
  - "Critical Area"
  - "Non Critical Area" or
  - "Out of Study Area"
  - Counties have two maps: one of rural area; one of unincorporated UGAs

70

## 2

## Evaluate Extent of Tree Canopy



- Instructions provided to help you determine extent of trees in critical areas and in non-critical areas



71

## 3

## Use HRCD Polygons to Evaluate Change



- Instructions provided to help you determine extent of change within critical areas and non-critical areas
- Not so difficult; pivot tables help get results quickly



72

# 4 Calculate Your Performance Indicators

- Plug in the numbers into the spreadsheet
- Interpret the results:
  - What does it mean? How are you doing?
- Investigate things you might want to change
- Work with your policy makers to establish benchmarks
- Share results with neighboring jurisdictions; encourage them to calculate their performance indicators
- Include benchmarks in Countywide Planning Policies

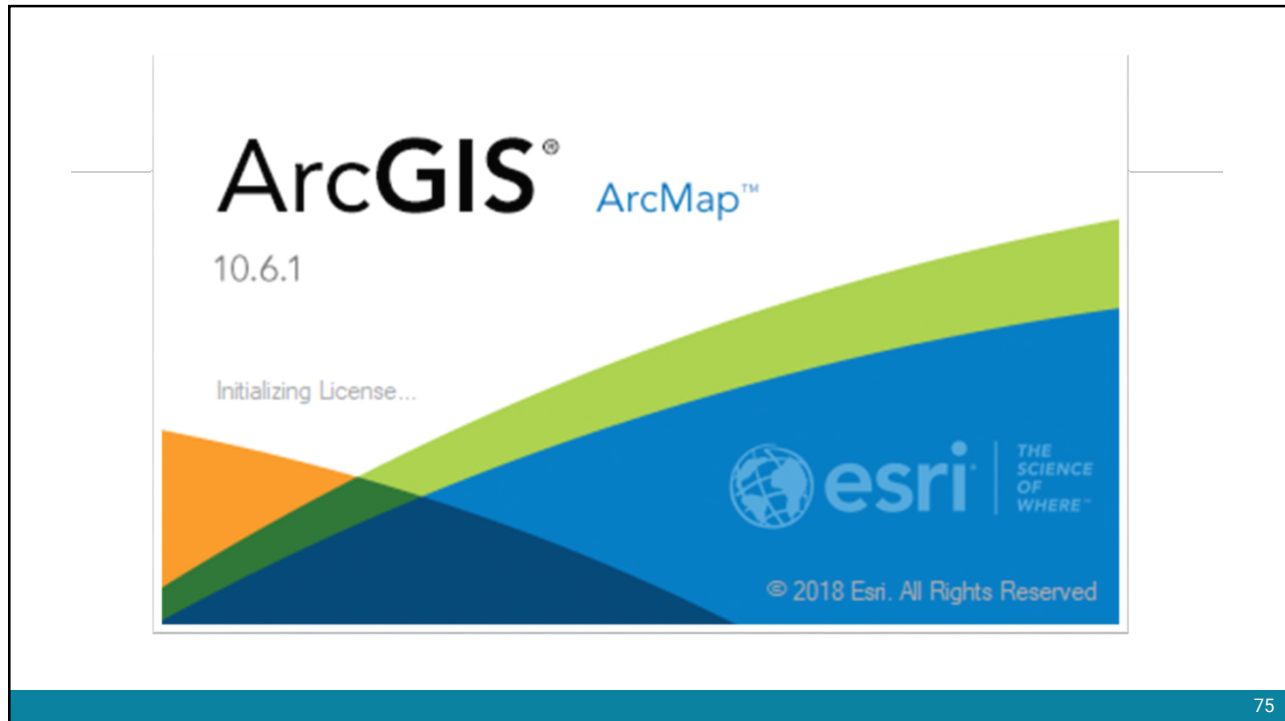


73



## River City, WA

- Population: 32,000
- Planning director, you, and one other planner
  - You have basic GIS skills
- New council member
  - Wants to know how well the city's CAO is protecting the environment and how to make meaningful improvements



## What's Next for This Work?

- Do the analysis in interested jurisdictions
  - City/county take lead doing step 1 map
  - We can help with the other steps
- Determine interest in developing regional indicators, trends, metrics, and benchmarks

## Survey: Your Jurisdiction's Indicators



?

How interested are you in calculating your jurisdiction's CAO performance indicator scores?

Very, somewhat, a little, not at all, unknown

?

Can your jurisdiction create a reasonably accurate map of your critical areas?

Yes, No, I don't know

77

## Q&A - WDFW HRCD Hub: HRCD, Tree Canopy, Visible Water Method for calculating CAO Effectiveness Indicators

TYPE YOUR QUESTIONS IN THE Q&A BOX IN YOUR TOOLBAR



78

**Thanks for  
attending.  
Contact me if you  
want to calculate  
your indicators!**

Keith Folkerts

CONSERVATION INFORMATION DELIVERY UNIT MANAGER

[keith.folkerts@dfw.wa.gov](mailto:keith.folkerts@dfw.wa.gov)

360-902-2390 (desk); 360-878-4230 (cell)

