Development and Implementation of Electronic Catch Record Card (eCRC) Systems for Steelhead in Washington State

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Talk Outline

1) **Project Overview**
    a. Current CRC system for steelhead
    b. Benefits of eCRC for steelhead

2) **Ideas for eCRC Steelhead Harvest Estimators**
    a. Method 1. Statewide Expansion Factor
    b. Method 2. Fishery-Specific Bias Correction (eCRC paired with creel survey)
    c. Method 3. Statistical Bias Correction (add spatial, temporal, or demographic predictors)

3) **Integration of eCRC and Creel Surveys**
    a. Data Collection Protocols
    b. Database Modifications and Integration
    c. Data Applications for Estimation

Current Catch Reporting System

- Creel and paper-based card system
- In-season (creel) methods vary by region
- No sharing of information
- Paper-based estimates and CWTs delayed months, years

eCRC for Washington Steelhead

- **eCRC – Potential to Help Address CRC Lag**
  - Anglers report harvest on phone app
  - Real-time monitoring of harvest
  - Implemented in Oregon

- **Stepwise Approach for Washington**

Field Creel Surveys Maintained per Co-Manager Agreements

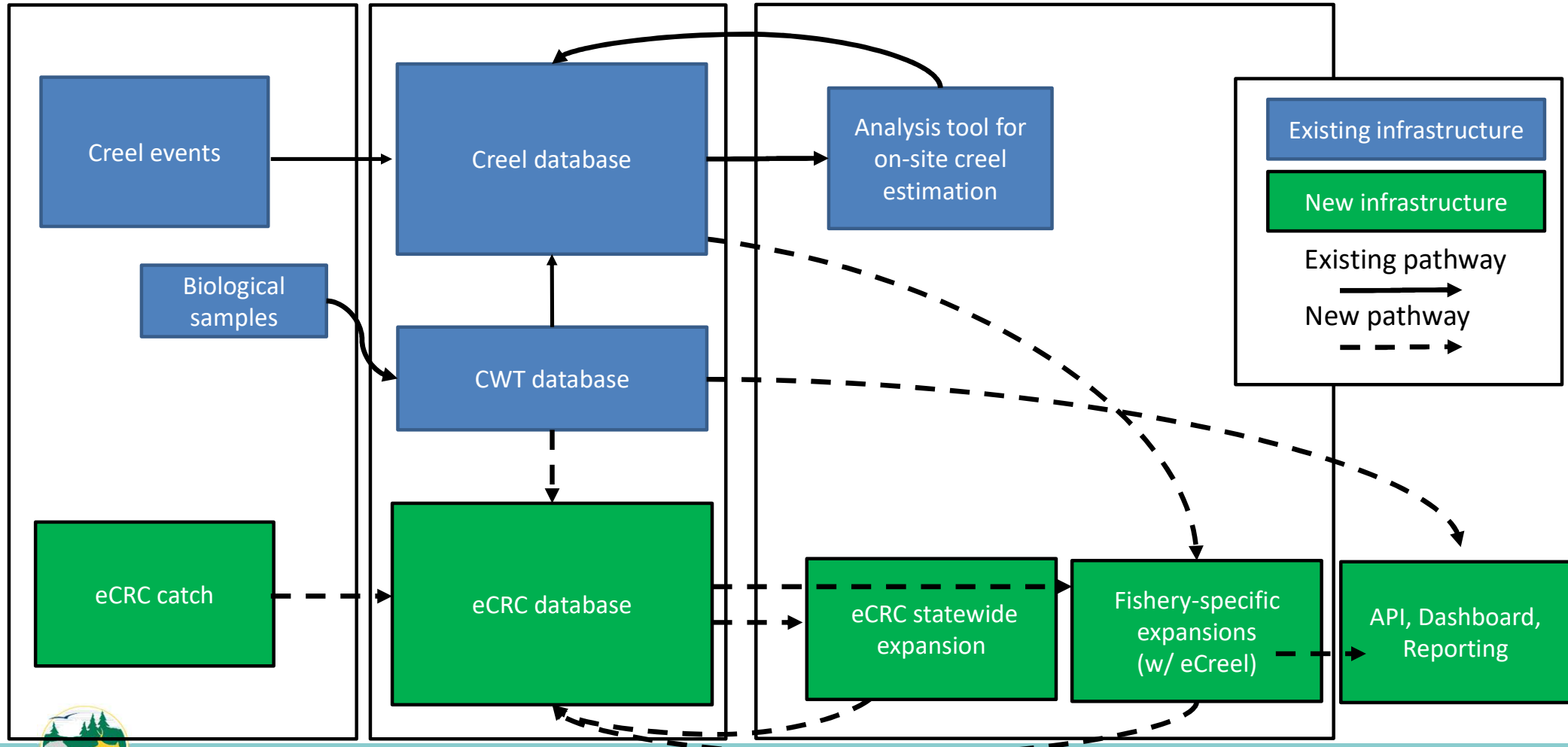
2026 Pilot Year

- Protocols and databases modified to facilitate data collection
- Estimation methods developed, coded, and piloted
- Anglers can choose to report using CRC or eCRC
- WDFW anticipates harvest estimated using similar methods as in recent years

2027 Test Year

- Test eCRC as potential method to improve harvest estimates
- Transition period dependent on eCRC adoption rate, performance of estimates, and tribal agreement

CRC Estimation “pipeline”



Why steelhead amplify the value of eCRC

Why steelhead amplify the value of eCRC

- Steelhead occupy longer river systems with more complex, distributed patterns
- Harvested in remote, low-access areas
- Winter steelhead fishing effort occurs in low-light and poor weather
- These gaps are filled by the eCRC data stream

eCRC may improve steelhead harvest estimation

- Steelhead fisheries often have low catch rates (small sample sizes)
- Expansions from low raw numbers is computationally difficult
- Prolonged runs (February – June) are better captured by real-time data streams

Ideas for eCRC Harvest Estimators

Potential Benefits of eCRC

- Timely and transparent recording/reporting of catches for e-CRC users
- Raw eCRC data can be combined with existing creel data, providing a fishery specific, bias-corrected estimate of total catch (e.g., ODFW, IDFG approach)

Three Ideas

Method 1: Catch Expansion using Statewide Expansion Factor

Method 2: Fishery-Specific Bias Correction Factor

Method 3: Statistical Model for Bias-Correction

Ideas for eCRC Harvest Estimators

Method 1: Catch Expansion using Statewide Expansion Factor

- Simple approach: expand eCRC catch by proportion using eCRC reporting

$$\hat{p} = \frac{e}{s}$$

$$\widehat{H} = \frac{M}{\hat{p}}$$

$\hat{p}$: proportion of anglers reporting catch through eCRC
e : number of anglers reporting catch through eCRC
s : total statewide licenses
$\widehat{H}$: total catch
M : total eCRC-reported catch

Ideas for eCRC Harvest Estimators

Method 1: Catch Expansion using Statewide Expansion Factor

- Simple approach: expand eCRC catch by proportion using eCRC reporting

$$\hat{p} = \frac{e}{s} \qquad \frac{33{,}333}{100{,}000} \qquad = 0.33$$

$$\hat{H} = \frac{M}{\hat{p}} \qquad \frac{1{,}000}{0.33} \qquad = 3{,}030$$

$\hat{p}$: proportion of anglers reporting catch through eCRC
e : number of anglers reporting catch through eCRC
s : total statewide licenses
$\hat{H}$: total catch
M : total eCRC-reported catch

Ideas for eCRC Harvest Estimators

Method 1: Catch Expansion using Statewide Expansion Factor

- Simple approach: expand eCRC catch by proportion using eCRC reporting

- Assumes: consistent proportion anglers using eCRC across fisheries
  - ✓ Oregon provided proof of concept
    - 0.31: mean proportion for four basins with creel surveys (CV: 7.1%)
    - 0.29: mean proportion for statewide license sales

➢ **Can we do better?**

Ideas for eCRC Harvest Estimators

Method 2: Fishery-Specific Bias Correction Factor

- Use creel surveys to estimate fishery-specific bias correction factors

$$\hat{p} = \frac{m}{h}$$

$$\widehat{H} = \frac{M}{\hat{p}}$$

$\widehat{p}$: proportion of catch reported through eCRC
h : total creeled catch
m : total eCRC-reported fish observed in creel
$\widehat{H}$: total catch
M : total eCRC-reported catch

Ideas for eCRC Harvest Estimators

Method 2: Fishery-Specific Bias Correction Factor

- Use creel surveys to estimate fishery-specific bias correction factors

$$\hat{p} = \frac{m}{h} \qquad \frac{10}{40} \qquad = 0.25$$

$$\hat{H} = \frac{M}{\hat{p}} \qquad \frac{1{,}000}{0.25} \qquad = 4{,}000$$

$\hat{p}$: proportion of catch reported through eCRC
h : total creeled catch
m : total eCRC-reported fish observed in creel
$\hat{H}$: total catch
M : total eCRC-reported catch

Method 2 – Integration of eCRC and Creel Surveys

Enhanced (eCRC) sampling should:

- Creel surveys can provide the independent observation necessary to assess quality of electronic self-reported data
- Improve the timeliness of information collected by additional creel programs
- Support eCRC-based harvest estimation, collecting the data necessary to quantify Method 2 fishery-specific eCRC bias-correction factors

Data Collection Protocol

Objectives

1. Use baseline sampling to estimate the **proportion of eCRC reported catch ($\hat{p}$)** in salmon and steelhead fisheries
2. Sample to test the **accuracy of the angler-reported eCRC submitted harvest (bias-corrected $\hat{m}$)**

Data Collection Protocol

Baseline sampling - proportion of eCRC reported catch ($\hat{p}$)

The proportion of total creel sampled harvest representing the eCRC reported harvest

Data needs:

- Number of eCRC, paper CRC, and non-licensed anglers
- The total number of creel sampled harvested fish ($\boldsymbol{h}$)
- An angler-reported reporting pathway (eCRC, paper CRC, none) assigned to harvested fish
- The angler-reported total number of fish submitted as eCRC harvest ($\hat{\boldsymbol{m}}$)

➢ ***…but, it assumes reporting method (eCRC or CRC) and catch are correctly recorded…***

Data Collection Protocol

Assumption testing – verification of angler-reported eCRC submitted harvest (bias-corrected m)

Test assumption that number of harvested fish submitted via eCRC equals catch sampled during creel surveys

Data needs:

- Electronic verification of eCRC submitted harvest for eCRC holders in group
- Yields a verified total number of angler-reported fish submitted as eCRC harvest ($\boldsymbol{m}^*$)
- Used to estimate a bias correction factor $\hat{\beta}$ for inaccurate eCRC reporting

$$\hat{\beta} = \frac{m^*}{m}$$

Data Collection Protocol (Method 2)

Summary

- eCRC 1) baseline and 2) assumption testing procedures assess and verify eCRC harvest reporting
- Combines established creel methods with procedures that linking eCRC reporting to sampler observed harvest
- Potential approach to quantify accuracy and compliance
- Ongoing coordination and testing with WDFW creel programs in 2026

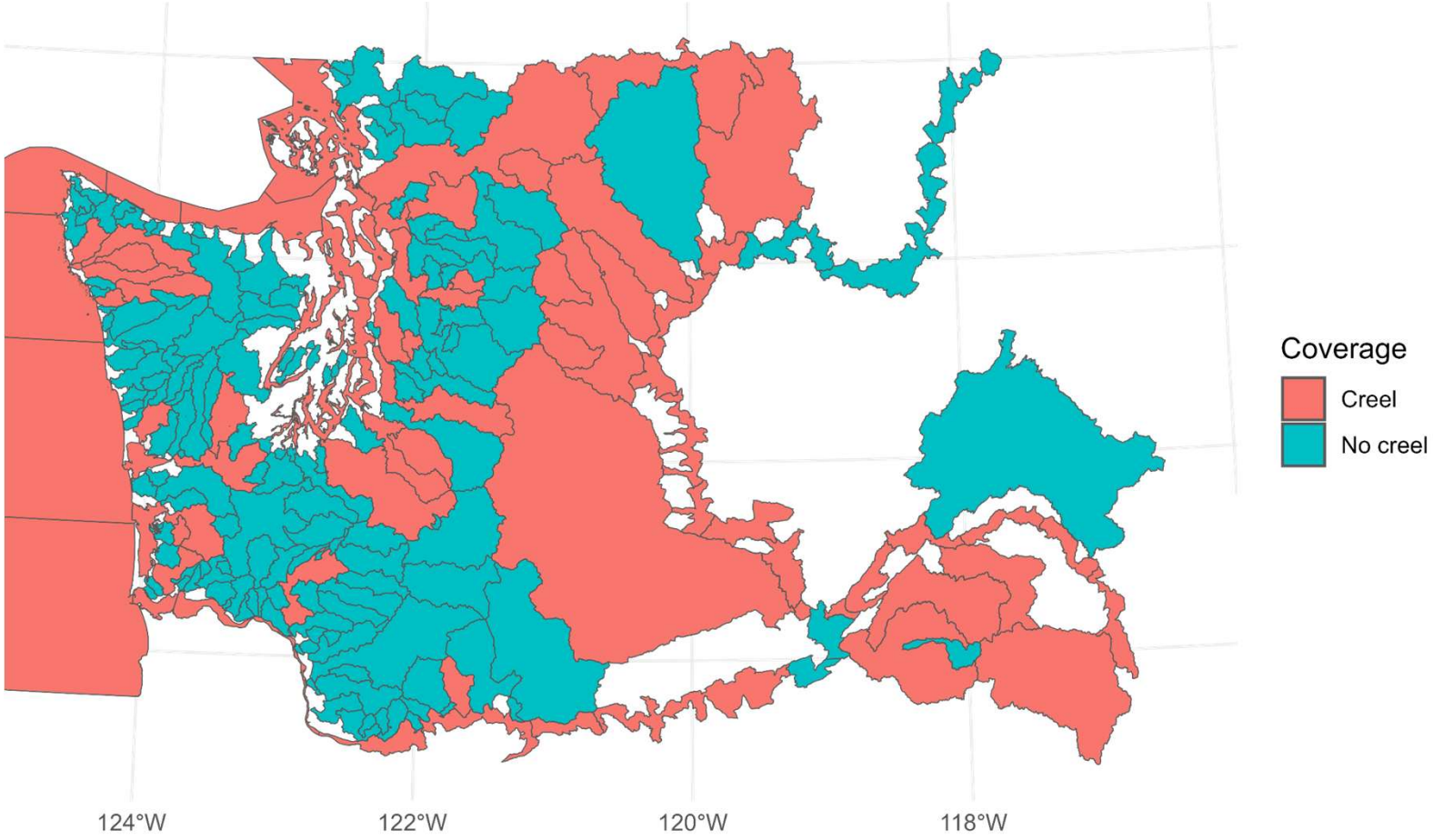
Ideas for eCRC Harvest Estimators

Method 2: Fishery-Specific Bias Correction Factor

- Use creel surveys to estimate fishery-specific bias correction factors
- Does not use demographic, spatial, or temporal information
- Many steelhead catch areas do not have consistent creel coverage (if any)

➢ **Can we do better?**

Some steelhead fisheries are not creeled



Ideas for eCRC Harvest Estimators

Method 3: Statistical Model for Bias-Correction

- Synthesizes multiple estimates of eCRC proportions from creel

- Potential covariates
  - ✓ Demographic data from creel survey and licenses
  - ✓ Space and time

- Potentially improve estimates of eCRC catch proportion ($\hat{p}$)

Preliminary Ideas for eCRC Harvest Estimators

Method 3: Statistical Model for Bias-Correction

- Statistical models or machine learning
- Data-intensive
- Continuous Integration-Continuous Development (CI/CD) of candidate models
- Train -> Test -> Predict -> Repeat

Summary

- **Timeliness and Transparency.** eCRC provide opportunity to accelerate CWT reporting and increase timeliness and transparency of sport catch estimates
- **2026 Pilot Year** to initiate collection of data, modify databases, and code estimators
  - Creel surveys maintained per co-manager agreements
  - Anticipate using existing methods (creels + paper CRC) for catch estimation in 2026
- **Preliminary methods identified** to estimate catch using eCRC and licensing data
- **Fishery-specific bias correction and assumption testing** through enhanced creel surveys