Mid Columbia Coho Reintroduction Program

Using Adaptive Management to Achieve Success
Mid-Columbia CoHo Program
Overview

**Long Term Vision**
To re-establish naturally spawning coho populations in the mid and upper Columbia tributaries to biologically sustainable levels, which provides harvest in most years.

**Guiding Principles and Mandates**
- Tribal Restoration Plan - Provides an adaptive management framework to restore the Columbia River salmon
- Treaty of 1855 - Provides the opportunity for tribal harvest of coho in YN’s usual and accustom fishing areas

**Biological Objectives**
To develop a locally adapted spawning coho stock to support harvest with two identifiable metrics:
- Maintain a 3-year mean of natural origin returns in both the Methow and Wenatchee basins to exceed 1,500 fish
- Achieve a total harvest rate of 23% (includes mixed stock, mainstem, and terminal harvests)

**Implementation Plan**
Development of a long-term, comprehensive plan that emphasizes:
- Establishing a local brood source capable of returning to Upper Columbia tributaries
- Progressive brood development towards preferred habitats using a phased approach
- Focus on decreasing domestication while increasing population fitness
Mid Columbia Coho Reintroduction Program
Project Background

- **Historical Abundance (annual escapement)**
  - Wenatchee: 7,000-8,000
  - Methow: 23,000-31,000

- **Most abundant species within upper Columbia tributaries**
  - Construction of hydro facilities
  - Outsourcing of local brood eggs across the region
  - Impassable tributary dams
  - Restricted habitat

Coho Salmon
Methow River 1910, Mullan (1992)
Project Undertaking: An Uphill Battle

- **Project Limitations**
  - Extirpation of coho in the region
  - Lack of useful, scientific based species interaction studies
  - *Lack of fish production and acclimation/release facilities*

- **Determine feasibility**
  - A Technical Work Group (TWG) was developed to address key concerns from various agencies
  - Objectives were created to see what evaluations were needed to study potential interactions with listed and endemic stocks

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HONOR. PROTECT. RESTORE.
Feasibility Study Goals

- Determine whether a broodstock could be developed from Lower Columbia River (LCR) coho
- Initiate natural production in areas of low risk to sensitive species, such as spring Chinook and steelhead
- Study potential interactions that may occur among listed/sensitive species and reintroduced coho
Broodstock Development

**Wenatchee River**
- Icicle Creek
  - Primary broodstock development source
- Nason and Beaver creeks
  - Species Interactions
  - Natural Production

**Methow River**
- Winthrop NFH
  - Broodstock Development
- Wells FH
  - Supplemental Broodstock Development
Broodstock Development

The Development of a Local Broodstock
Wenatchee Basin (Brood Year & Source)

1997: LCR
- 2000: MCR 1st Generation
- 2003: MCR 2nd Generation
- 2006: MCR 3rd Generation
- 2009: MCR 4th Generation
- 2012: MCR 5th Generation

1998: LCR
- 2001: MCR 1st Generation
- 2004: MCR 2nd Generation
- 2007: MCR 3rd Generation
- 2010: MCR 4th Generation

1999: LCR
- 2002: LCR & MCR 1st & 2nd Generation
- 2005: MCR 2nd & 3rd Generation
- 2008: MCR 3rd & 4th Generation
- 2011: MCR 3rd & 4th Generation
Broodstock Development
Wenatchee River Basin

2000-2002
Creating 1st generation MCR broods

2003-2005
Creating 2nd generation MCR broods

2006-2008
Creating 3rd generation MCR broods

2009-2011
Creating 4th generation MCR broods
Broodstock Development
Wenatchee River Basin

- Mean Escapement (generations removed from LCR)
  - 1st generation: 3,857
  - 2nd generation: 5,142
  - 3rd generation: 7,052
  - 4th generation: 14,689
Broodstock Development

The Development of a Local Broodstock Methow Basin (Brood Year & Source)

1998: LCR
   2001: LCR
      2004: MCR 1st Generation
      2007: MCR 2nd Generation
      2010: MCR 3rd Generation
   2002: LCR
      2005: MCR 1st Generation
      2008: MCR 2nd Generation
      2011: MCR 3rd Generation
   2000: LCR
      2003: LCR & MCR
         2006: MCR 1st & 2nd Generation
         2009: MCR 2nd & 3rd Generation
         2012: MCR 3rd & 4th Generation

2004: MCR 1st Generation
2007: MCR 2nd Generation
2010: MCR 3rd Generation
2005: MCR 1st Generation
2008: MCR 2nd Generation
2011: MCR 3rd Generation
Broodstock Development
Methow River Basin

2001-2006
Creating 1st generation MCR broods

2007-2009
Creating 2nd generation MCR broods

2010-2012
Creating 3rd generation MCR broods
Broodstock Development
Methow River Basin

- Mean Escapement (generations removed from LCR)
  - 1\textsuperscript{st} generation: 328
  - 2\textsuperscript{nd} generation: 2,213\(^*\)
  - 3\textsuperscript{rd} generation: 3,022\(^*\)

\(^*\) denotes an increase in hatchery release production (500K release starting in 2006)
Feasibility Phase
Species Interactions

- Predation
- Redd superimposition
- Residualism
- Competition
Direct Predation
Hatchery Releases

- No detected predation on sockeye fry by hatchery coho
  - Sockeye-coho interaction evaluations (2003)
    - Coho smolt radio-telemetry
      - Hatchery smolt movement through Lake Wenatchee
    - Hydro-acoustic surveys
      - Sockeye fry distribution and diel movements
  - Tow-net transects
    - Sockeye fry distribution data-verification of species composition
Direct Predation
Hatchery Releases

- Low incidence of predation by hatchery coho on spring Chinook fry.
  - Modeling Variables
    - Number of coho in-stream
    - Mean residence time
    - Gastric evacuation rates
  - Samples sizes
    - 1,033 in 2001
    - 1,056 in 2003

![Incidence of Predation](chart.png)
Natural Production
Redd Superimposition

- 2001 – Redd Superimposition Evaluation
  - No superimposition found on Nason Creek
Rates of Residualism

- **Low Rates of Residualism**
  - **2000**
    - Icicle Creek: 4 residuals observed (expands to 20; 3 surveys; 20% sample rate)
    - Nason Creek: No residuals observed (3 surveys 20% sample rate)
    - Methow River: 4 residuals observed (expands to 25 (3 surveys; 28% sample rate)
  - **2001**
    - Icicle Creek: 2 residuals observed, (expands to 10; 1 survey; 20% sample rate
    - Nason Creek: No residuals observed (1 survey; 25% sample rate)
    - Methow River: 1 residual observed (1 survey; 26.8% sample rate)
Species Interactions

- Microhabitat Use Studies – 2002 & 2003
  - Used fry plants as surrogates for naturally produced coho
  - Established Control and Treatment Reaches
  - Habitat Based Evaluation

- Results
  - Coho, Chinook, and steelhead select different microhabitats when they co-occur
  - No evidence of habitat displacement
Flow Velocities used by Chinook, Coho, and Steelhead

- **MANOVA** to analyze habitat use
  - Independent variables
    - Species (STHD, SCK, COH)
  - Dependent variables
    - Flow velocity
    - Water depth
    - Substrate size
  - Surveys where all 3 species were found
  - **Results**: coho observed in slowest water and steelhead in fastest water.
Flow Velocities used by Chinook, Coho, and Steelhead

- MANOVA to analyze habitat type
  - **Results**: Steelhead found in fastest water regardless of habitat type
  - **Results**: Chinook found is significantly faster water than coho
Master Plan Development

- Phased Approach to Reintroduction
  - Broodstock Development Phases
  - Natural Production Phases
Proposed Phased Approach

- **Broodstock Development Phases**
  - **Broodstock Development Phase 1 (BDP1)**
    - Focus: Initial broodstock development
      - Biological criteria: 100% local broodstock
  - **Broodstock Development Phase 2 (BDP2)**
    - Focus: “fine-tune” broodstock development
      - Biological Criteria: 3 yr. mean of 50% of the brood comprised from trappable fish at upper basin collection sites
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Proposed Phased Approach

Natural Production Phases

- **NATURAL PRODUCTION IMPLEMENTATION PHASE (NPIP)**
  - Initiate releases into most habitat areas, begins the ‘local adaptation’ process

- **NATURAL PRODUCTION SUPPORT PHASE**
  - Emphasizes local adaptation – goal PNI > 0.50
How do we get there?

- Need to focus on program infrastructure
  - Adequate adult capture sites
  - In-basin facilities for adult spawning/egg incubation/early rearing
  - Additional sites to acclimate juvenile coho throughout the Methow and Wenatchee basins
Semi-Natural Acclimation Sites

- Disconnected waterways
  - Beaver ponds
- Constructed earthen ponds
- Existing waterways
  - Side channels/wetland complexes
Monitoring and Evaluation
Monitoring and Evaluation

- Goal: to monitor and evaluate the results of reintroduction so that operations can be adaptively managed
  - Demonstrate when phased restoration goals are met
  - Provide science based recommendations for management consideration
Monitoring and Evaluation

- **Project performance indicators**
  - Smolt-to-adult survival rates
  - Egg-to-emigrant
  - Smolt-to-smolt survival rates
  - In-pond Survival
  - Spawning escapement & distribution
  - Adult-to-adult productivity

- **Species interactions**
  - Monitoring of NTTOC species

- **Adaptability to local conditions**
  - Genetic Monitoring
    - Past brood years (2001-2011) are being genotyped by CRITFC
  - Morphometrics and life history traits
    - Adult energetics studies
    - Mark-recapture study in the Wenatchee basin
    - Juvenile swim performance
Project Performance Indicators

Methods and Techniques

- **CWT Tags**
  - SARs
  - Harvest rates
  - Natural Return Rates
  - Adult-adult survival
  - Natural smolt production*
  - Egg to emigrant Survival*
  - Spawning escapement and distribution

- **PIT Tags**
  - Release to McNary Survival
  - In-pond survival
  - Volitional release run-timing and tributary residence
Project Performance Indicators

Methods and Techniques

- Smolt Trapping
  - Volitional release and run timing*
  - Natural smolt production*
  - Egg-to-emigrant Survival*
  - NTTOC – size*
  - NTTOC – abundance*
  - Predation*
  - Morphometrics and life history traits*

- Electrofishing/Snerding
  - NTTOC – size
  - Could also be used for distribution and abundance
Project Performance Indicators

Methods and Techniques

- Underwater Observation
  - NTTOC distribution*
  - NTTOC abundance*
  - Competition

- Redd Counts
  - Spawning escapement and distribution
  - SARS
  - Adult-Adult survival
  - Morphometrics and life history traits
Juvenile survival estimates were performed using PIT tag data captured from release sites to McNary Dam.
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Smolt-to-Adult Return ratios or rates provide a metric for survival and determined from CWT analyses and/or scale analyses.
Coho Project Redd Counts (return year)

Adult Performance

- Wenatchee
- Methow
Project Milestones and Timelines
Project Benefits

- Provide increased cultural and socio-economic value to the region
- Opportunity to study the local adaptation process and at what rate it can occur
- Supplying marine nutrients at the onset of winter
- Increase abundance of a keystone species within ecological communities
Key Project Milestones

**March 2010**
- Finalized Mid-Columbia Coho Reintroduction Master Plan

**March 2012**
- YN and BPA co-authored and NEPA approved Final Environmental Impact Statement (FEIS)

**July 2012**
- Received a Record of Decision (RoD) from BPA to move forward with long term implementation
  - Project level NEPA and SEPA coverage

**Fall 2012/Winter 2013**
- Finalizing Biological Assessments (BA) for impacts to ESA listed species for NOAA and USFWS review and consultation

**Spring 2013**
- Supplemental Analyses to original NEPA/SEPA for additional sites and changes
Key Project Milestones (con’t)

Fall 2013

- Begin broodstock collections for increased production for releases in targeted tributaries in Methow basin to initiate wide-scale natural spawning
- Site development of several acclimation sites in Methow and Wenatchee basins

Summer/Fall 2014

- Begin construction on Natapoc Hatchery Facility (Wenatchee in-basin, full-term rearing)
- Finalize Methow acclimation sites/construction for increased releases in spring of 2015