Russian River Habitat Blueprint Focus Area

Improve Precipitation and River Flow Forecasting to Maximize Water Capture for Fisheries

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Russian River Forecasting and Reservoir Operations: Outline

- Objectives
- Project Description
  - How Objectives Are Supported
- Participants
- Tasks and Schedule
- Gaps
- Partners and Outreach

Russian River Forecasting and Reservoir Operations: Objectives

- **Objective 1:** Apply advanced Atmospheric River (AR) precipitation monitoring and forecasting techniques to assist maximization of reservoir water capture. For reservoir storage operations, it is important as well to forecast conditions where heavy rainfall will not occur
- **Objective 2:** Examine reservoir forecast-based operations (FBO) that involve accounting for anticipated runoff, or the lack thereof, in advance so that flow fluctuations can be reduced and increases in spring runoff storage and summer-fall low flows could be increased
- **Objective 3:** Assess how potential increases in main stem summer-fall season low flows could help enhance fisheries habitat

Russian River Forecasting and Reservoir Operations: How Objectives Are Supported

- Improvements in AR detection, tracking and forecasting of the landfall location, timing and duration of these storms can provide longer lead times for reservoir managers to adapt storage and release operations that account for anticipated runoff (or the lack of).
- Advanced hydrometeorological sensors provide more detailed mappings of precipitation as it occurs as well as informing higher resolution numerical weather prediction (NWP) models which provide refined forecasts of storm intensity and land falling locations.
- High-resolution precipitation forecasts coupled with distributed hydrologic modeling can improve the quality and usefulness of river flow forecasts throughout the basin, including reservoir inflows.
- Forecast-based reservoir operations practices hold promise for maximizing fisheries and other conservation benefits while maintaining flood reduction performance.
- A collaborative reservoir forecast-based operations modeling approach will involve stakeholders in data development, model review and incorporation of multiple perspectives.

Russian River Forecasting and Reservoir Operations: How Objectives Are Supported

- NIDIS (National Integrated Drought Information System)
  - Russian River selected as a NIDIS Pilot Study area
  - "Extreme Events" workshop held in 2012
    - ARs identified as key phenomena
    - Target output: Drought Early Warning Information System to meet stakeholder needs and reduce costs
- Proposed activities
  - Drought "scenarios": raise public awareness and preparedness
  - Data collection: use and enhance HMT's RR observing network
  - Transferability: products, information, and insights are developed as atemplate for other regions of the nation

Fisheries Benefits from Optimized Water Capture in Lake Mendocino

1. Ensures adequate flow releases from Lake Mendocino to sustain Chinook salmon run, October-December

2. Allows greater storage in Lake Mendocino thereby increasing the size of the coldwater pool **(hypolimnion)**

   If not depleted, the coldwater pool can continuously sustain cold temperatures for steelhead between Ukiah & Cloverdale during hot summer months.

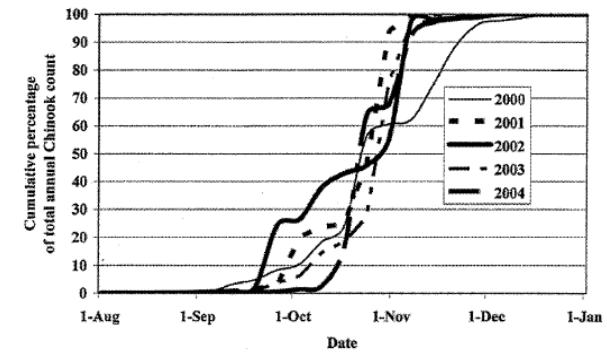

Figure 4. Run timing of adult Chinook salmon in the Russian River, CA, for the years 2000-2004 shown as the cumulative percentage of fish counted at the Mirabel Dam fish ladders.

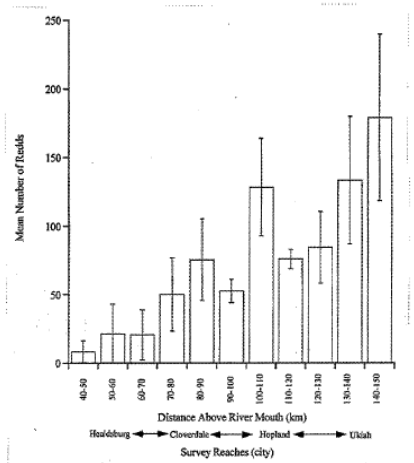

Figure 5. Mean number of redds observed along 10-km sections of the mainstem Russian River for 2002-2004 (n= 3 years). Error bars depict 1 SD. Cities that delineated approximate survey reach boundaries are also shown.

Ref:Chase, SD, DJ Manning, DG Cook, SK White. 2007

Russian River Forecasting and Reservoir Operations: Participants

- OAR Hydrometeorological Testbed (HMT)
- National Marine Fisheries Service
  - Habitat Conservation Division
  - Restoration Center
  - Protected Resources Division
- National Weather Service
  - California Nevada River Forecast Center (CNRFC)
  - Weather Forecast Offices – Monterey & Eureka
  - Office of Hydrologic Development (OHD)
- National Integrated Drought Information System

Russian River Forecasting and Reservoir Operations: Tasks and Schedule

- Increase in number of real time weather stations in and near the Russian River watershed – *1-3 years*
- Increase in Atmospheric River detection, forecasting and tracking
  - Verification of AR detections and forecasts – *1-3 years*
  - Implement AR forecasting tools at WFOs – *3-5 years*
- Couple AR forecasts and nowcasts with distributed hydrologic model
  - Analysis of historical record for reservoir inflow statistics – *1-2 years*
  - Verification of flow predictions – *2-4 years*
  - Deployment for real-time operations at WFOs – *3-5 years*
- Development of potential reservoir forecast-based operations schemes
  - Analysis of historical record using hindcasting techniques– *1-2 years*
  - Develop ensemble-based river basin management and reservoir operations model – *1-3 years*
  - Generate alternate FBO flow scenarios and resultant flow statistics – *1-3 years*
  - Interact with NMFS and stakeholders for assessment of target release flows – *1-3 years*
- Assessment of value of increased main stem flows for fisheries habitat
  - Spatial distribution of main stem fisheries habitat controls
  - Reservoir cold water pool

Russian River Forecasting and Reservoir Operations: Gaps

- Knowing the spatial distribution of main stem fisheries as influenced by reservoir releases
- Influence of reservoir release temperature levels and fisheries impacts
- How alternate FBO reservoir operations policies can be considered in the formal operations procedures of the water management agencies

Russian River Forecasting and Reservoir Operations: Partners and Outreach

- Certain or possible partners
  - SCWA
  - USGS - California Water Science Center and Ukiah Field Office
  - US Army Corps of Engineers
    - Hydrologic Engineering Center
    - Sacramento and San Francisco Districts
  - RRFC district, flood control and water conservation
  - Mendocino County Water Agency
- Outreach – Internal, partners, general public
  - NMFS, see above
  - Russian River Independent Science Review Board
  - Russian River basin water stakeholders

Russian River Forecasting and Reservoir Operations:

- Atmospheric Rivers Information Page
  - www.esrl.noaa.gov/psd/atmrivers/
- HMT web page
  - hmt.noaa.gov
- NIDIS web page
  - http://www.drought.gov/drought/content/what-nidis