



Yurok Tribe Water Quality Monitoring Program: A Tribal Perspective

Ken Fetcho –
Yurok Tribe Environmental Program
December 8, 2011

Jurisdictions and Stakeholders

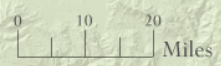
- Two States: California, Oregon
- Two EPA Regions: 9 and 10
- Six Federally Recognized Tribes: Klamath, Karuk, Quartz Valley, Hoopa, Resighini and Yurok
- Stakeholders:
 - Agriculture
 - Commercial and Tribal Fisheries
 - Hydropower – 4 dams
 - Timber
 - Public Lands
 - Wild and Scenic River - Recreation



Oregon

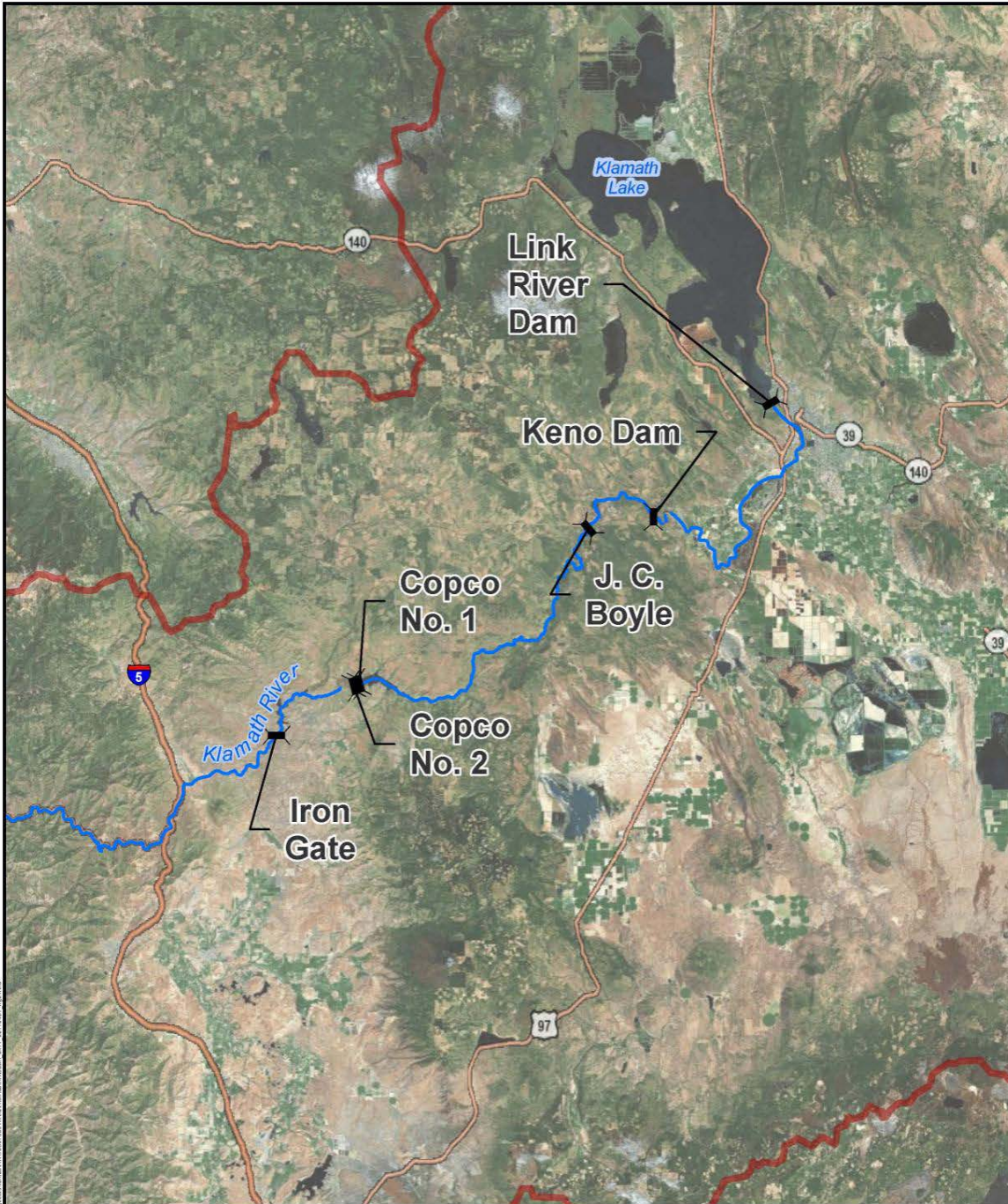
California

- Dam
- ~ Federal Tribal Lands
- Canal



HUMBOLDT STATE UNIVERSITY

<http://www.humboldt.edu/~kwi/>
 Data Sources: ESRI, TIGER, USGS 2008, CalWater
 GIS and Cartography: C. Rover (2009)



Notes:

Washington Montana



Dam



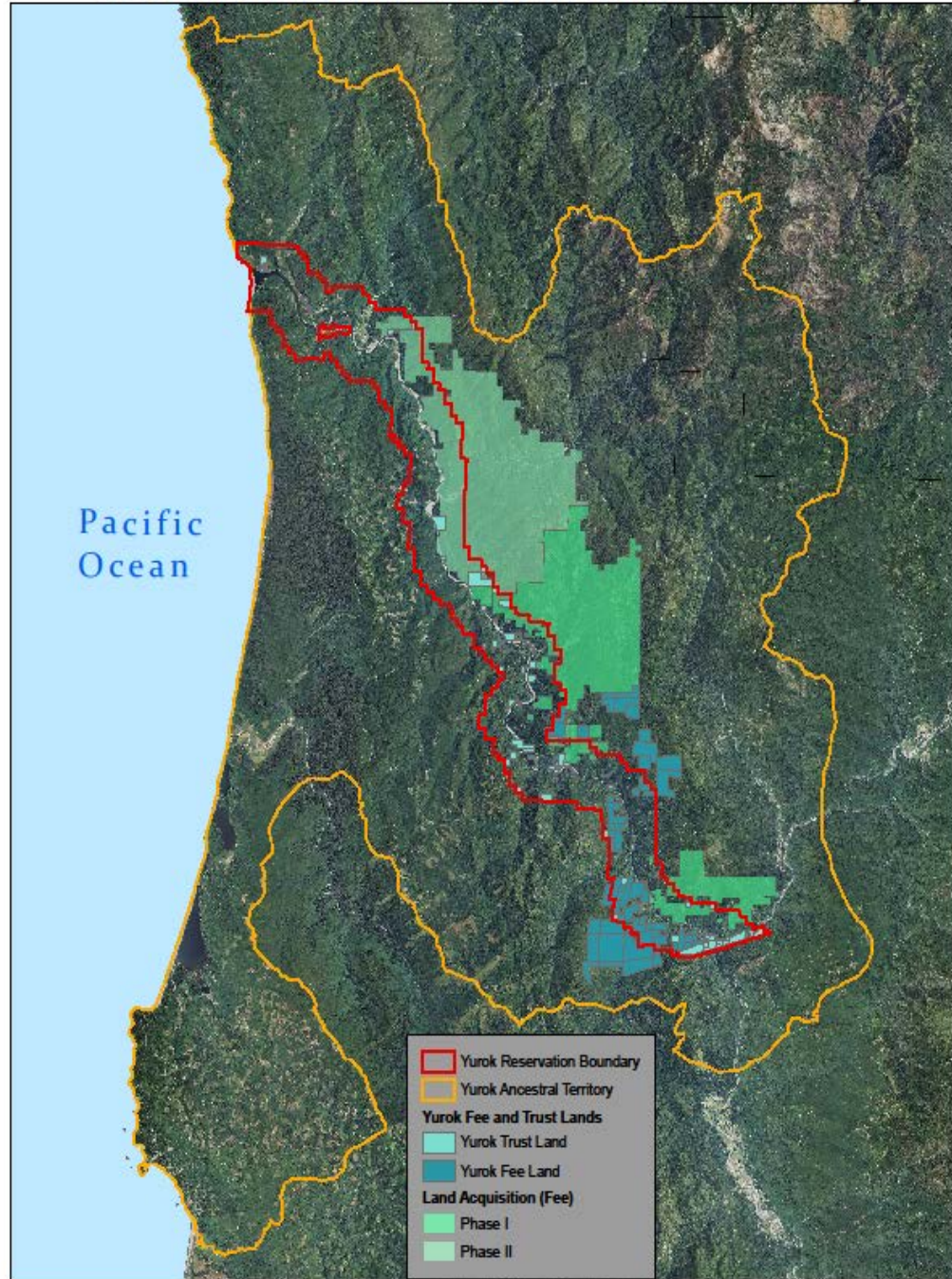
ATKINS

1201 7th Street
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2011-01-11 10:00:00 AM C:\Users\james\Documents\Klamath\Klamath Dam\Klamath Dam.mxd 10:00:00 AM 10/11/2011 10:00:00 AM



The Yurok Reservation and Ancestral Territory



Reservation Total = 55,890 acres

Trust Lands = 2,657 acres

Tribally owned fee lands = 31,063 acres

Phase I (recent purchase) = 22,262 acres

Phase II = 25,532 acres
(future purchase)

YTEP Mission

- The mission of the Yurok Tribe Environmental Program (YTEP) is to assess, protect and restore Tribal natural resources through the exercise of high quality scientific practices in coordination with the community, Tribal departments, Tribal Council and adjacent jurisdictions.

Water Division (6 staff)

- Water Quality Monitoring, Assessment and Reporting – **Scott Sinnott – WQ Specialist**
- Hydrologic Monitoring, Assessment and Reporting – **Micah Gibson Hydro Specialist**
- Wetlands Inventory, Assessment and Protection
Bill Patterson – Wetlands Specialist
- Water Quality Regulatory Program
- Watershed Based Environmental Education
- Klamath Fish Health Assessment Team Participation
- KR TMDL and BGA Workgroup Participation

Leverage USEPA CWA 106 Funding

Pursue additional funding to meet needs:

- CWA Section 104 (b) 3
- US BOR Klamath River Funding Source
- USEPA Wetlands Program Development Grant
- National Information Exchange Network
- KHSA Interim Measure #15

Purpose of WQ Monitoring

- Gather baseline information to improve our understanding the health of the Klamath River as a whole, and to help identify potential limiting factors or new studies that need to be undertaken to more precisely identify problems and solutions.
- Data will be shared with other agencies and future water quality and fisheries management professionals.

Water Quality Monitoring Objectives

- To establish baseline conditions across a wide array of water years
- To track long-term spatial and temporal trends through consistent, comparable sites and methods
- To document effects of various short-term and long-term management and regulatory actions throughout the basin

Major Issues Guiding YTEP's Water Quality Monitoring Activities

- Klamath River fish populations are in decline some species are extinct others on ESA list
- Klamath River listing of impairments: nutrients, dissolved oxygen, microcystin, water temperature and sediment impairments for Lower Klamath Hydrologic Unit (HU)
- Toxic BGA Blooms in Hydroelectric Project reservoirs 190 miles upstream of Yurok Reservation sends water downstream that contain toxic species and toxins



■ Copco Reservoir 9-24-07 ■



KR Estuary 9/17/07 190 miles from IG



■ Iron Gate Reservoir 9-24-07

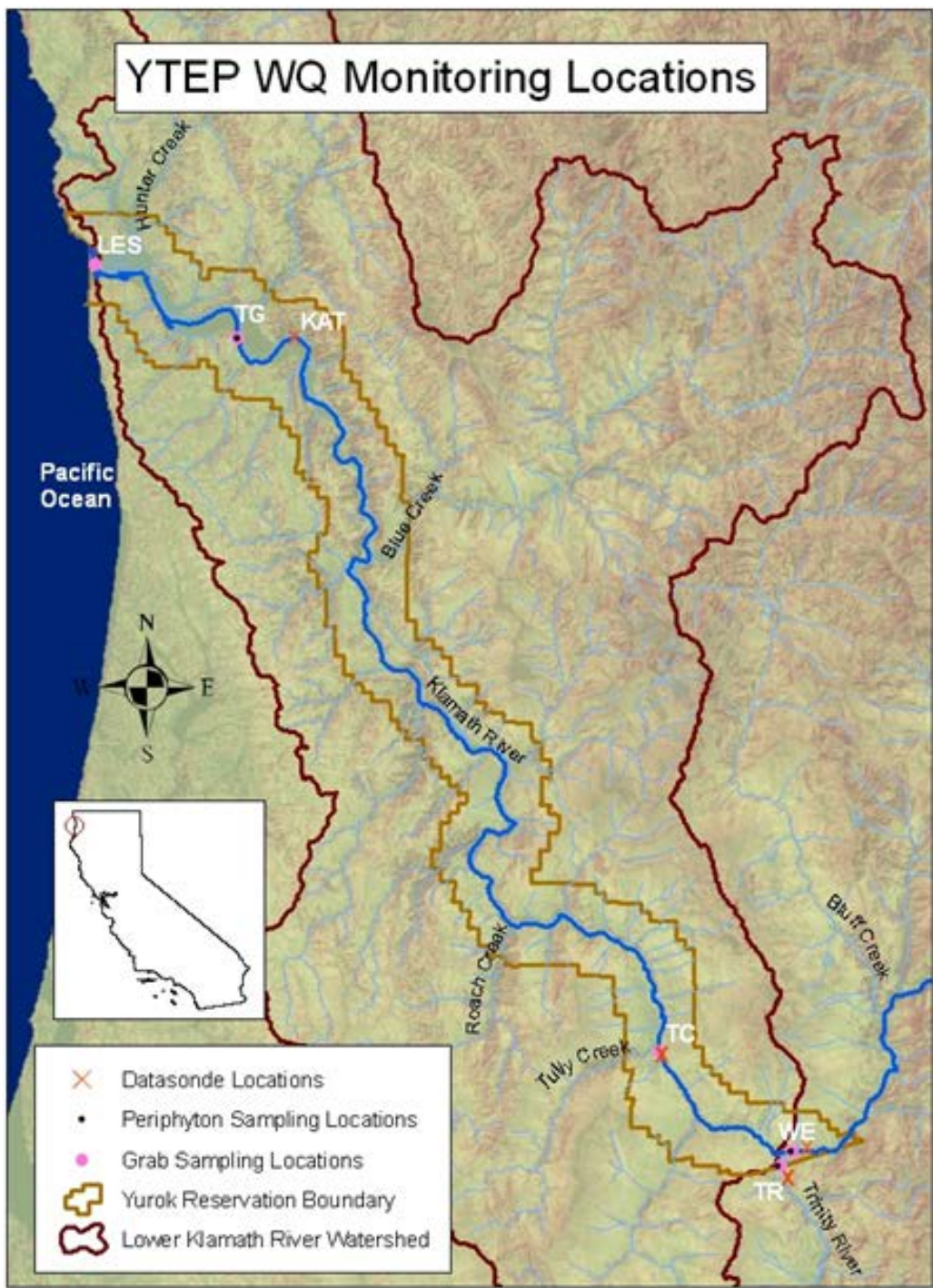


■ KR at Weitchpec 150 miles from IG Dam 9-25-07

Major Components of Klamath River WQ Monitoring and Assessment

- **Grab Sampling** – Initiated in 2001 by USFWS with Yurok and Karuk Tribes
- Starting in 2006 Yurok and Karuk Tribes fully supported project planning, funding acquisition and data management!
- Nutrient, phytoplankton and microcystin samples collected May – October on a bi-weekly interval monthly November - April
- Klamath River Sites – 3 KR Estuary - 1
- Mouth of Trinity River - 1
- Follow standard QA/QC methods for surface water sampling using churn sampler and certified labs

YTEP WQ Monitoring Locations



- X Datasonde Locations
- Periphyton Sampling Locations
- Grab Sampling Locations
- + Yurok Reservation Boundary
- Lower Klamath River Watershed

Water Quality Monitoring Sites Klamath and Trinity Rivers



Klamath River Estuary



Nutrient Related Analytes

- TOTAL-Phosphorus
- SRP (Ortho Phosphorus)
- TOTAL-Nitrogen
- NITRATE + NITRITE
- AMMONIA NITROGEN
- Chlorophyll-a/Phaeophytin-a
- Particulate Organic Carbon
- Dissolved Organic Carbon
- TOTAL Suspended Solids
- Volatile Suspended Solids
- ALKALINITY
- Turbidity



Cyanobacteria Related Analytes

- Phyto Species ID and cell count
 - Aquatic Analysts Lab
- Total Microcystin
 - USEPA Region 9 Lab
- Microcystins
 - RR, Demethyl-RR
 - LR, Demethyl-LR
 - YR
 - LA
 - LW
 - LF
 - LY
 - Anatoxin-A
 - CA Fish and Game Water Pollution Control Lab



Microcystis aeruginosa cell colony

Major Components of WQ Klamath River Study (Contd.)

- **Continuous Real-Time WQ Monitoring** – Initiated in 2001 by USFWS with Yurok and Karuk Tribes
- Follow *USGS Guidelines and Standard Procedures for Continuous WQ Monitors*, 2006

-SITES-

- 3 Mainstem Klamath River sites
- 1 Trinity River Site (Tributary)

-Equipment-

- YSI 6600 Extended Deployments Systems - Design Analysis data logger and transmitters

-Parameters-

- Water Temperature
- pH
- Dissolved Oxygen
- Specific Conductivity

-Optical Probes -

- Dissolved Oxygen
- Blue-green Algae

Major Components of WQ

Klamath River Study (contd)

- **Benthic Periphyton Sampling** –
Initiated in 2004 by State of CA,
PacifiCorp and Yurok Tribe
- Adapted methods from *USGS
METHODS FOR COLLECTING
ALGAL SAMPLES*, 1993



-Sites-

- 2 Mainstem Klamath River sites
- 1 Trinity River Site (Tributary)

-Parameters-

- Benthic Algae Species ID and counts
- Total Density (#/ml)
- Total Biovolume ($\mu\text{m}^3/\text{mL}$)
- Periphyton chlorophyll-a



Major Issues Guiding YTEP's Hydrologic Monitoring Activities - Tributaries

- Majority of lands draining into Lower Klamath River Sub-basin have been logged and are heavily roaded
- Klamath River fish populations are in decline some species are extinct others on ESA list
- Yurok Tribe Fisheries and Watershed Restoration Programs performing restoration activities
- Yurok Tribe is developing the Reservation



Permanent Hydrologic Monitoring Stations

- Water level monitoring
- Turbidity and water temperature monitoring
- Stream flow measurements
- Suspended sediment concentration sampling
- macroinvertebrate sampling
- YTFP performs fish population monitoring





Field Methods

Flow Measurements

- Wadable
- Non-wadable
- Pygmy or Price AA
- Bank, cableway, bridge, or ADCP
- Follow USGS methods

Suspended Sediment Sampling

- Wadable DH-48
- Non-wadable D-74
 - 1) Bridge
 - 2) Cableway
- Follow USGS methods - Equal width increment (EWI) depth integrated (DI)

Bioassessment Field Methods

- Sampling occurs under USEPA approved QAPP (2001) and Macroinvertebrate Sampling and Analysis Plan (2003)
- 2001-2003 followed 1999 CSBP methods
 - no defined reach length sample 3 riffles out of 5, selected randomly
- 2004 and 2005 adopted 2003 CSBP methods
 - 100 meter reach 3 transects selected randomly in riffle habitat
 - DF&G held training in Klamath, Spring 2004
- 2006 – 2011 adopted SWAMP Bioassessment Procedures
 - 150 meter reach Multi-Habitat Method every 15 meters (11 kicks total) P-Hab is more quantitative

Yurok Tribe Environmental Program (YTEP) – Water Division

-Wetlands Program, Bill Patterson

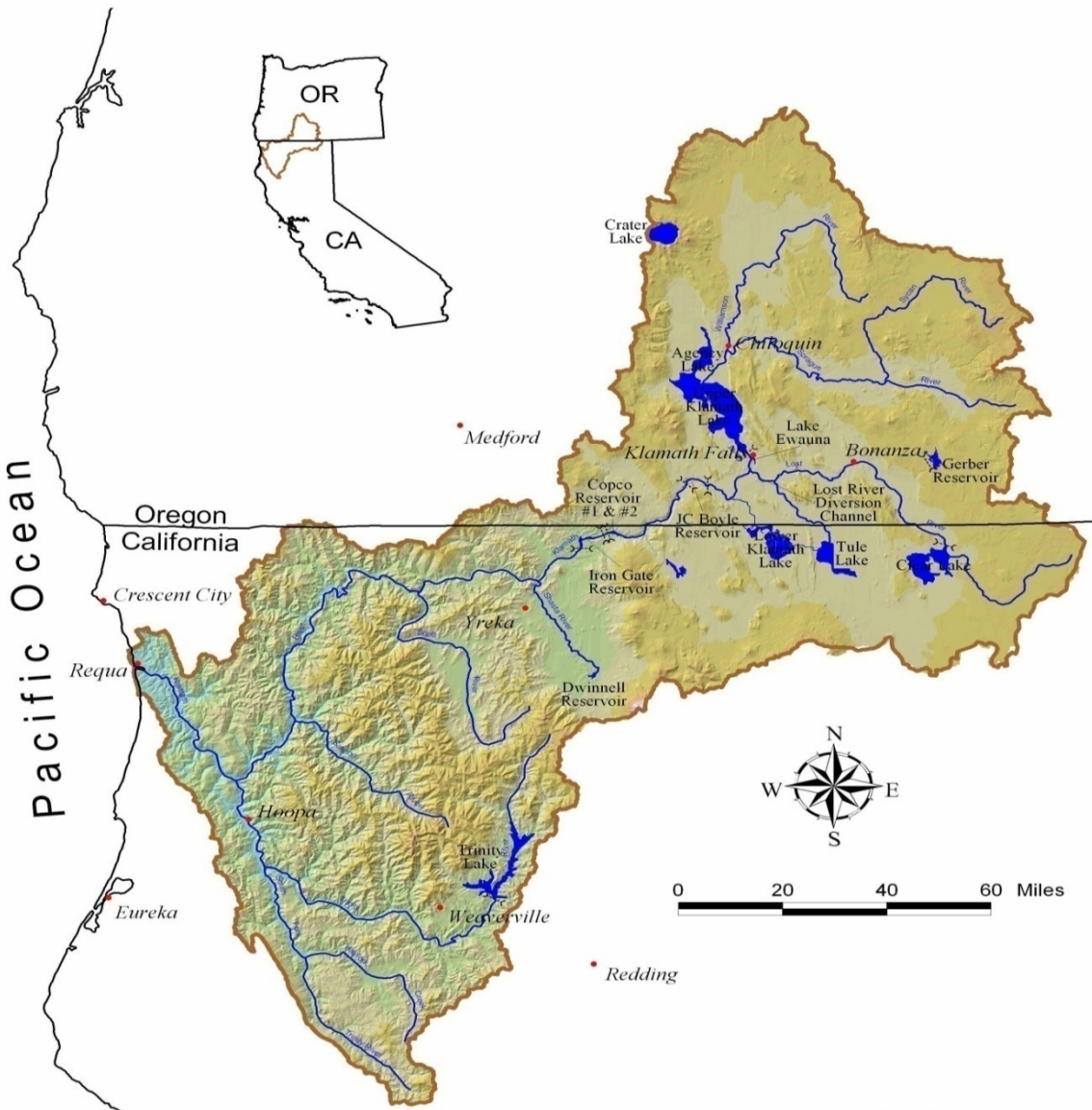
**-Funded by EPA Region 9,
Wetland Program Development Grant**

-2008-2009, 2010-2011, 2012-2013

Why study the wetland complexes adjacent to the KR Estuary?

- Critical habitat in the survival of culturally significant species
- Salmonids; especially threatened Coho salmon
- Emerging as an area in need of study
- Not many wetlands upstream on the YIR
- Staffing and funding constraints

Klamath River Basin



-Klamath River Estuary may be considered small when compared to West Coast watersheds of similar size. —National Estuarine Eutrophication Assessment Update 2004

i.e.
-Klamath Estuary = 6 km²
Watershed = 40,579 km²

-Eel Estuary = 22 km²
Watershed = 9,444 km²

-Coquille Estuary = 9 km²
Watershed = 2,722 km²

-Umpqua Estuary = 26 km²
Watershed = 1,566 km²

-Geographic constraints limit estuary and wetland size

-Resources “bottlenecked”

Major Impacts

-Roads ; fill, levees, rip rap, impervious surfaces

-Agricultural alterations; ditches; levees, hydrologic alterations

-Anthropogenic development

Degradation of wetlands are magnified

6 Wetland Complexes

-Salt Creek

-Panther Creek

-Spruce Creek

-South Slough

-Richardson Creek

-Waukell Creek

* Focused on
Depressional and
Estuarine wetland types



2008 – 2009

Inventory and Assess Wetland Condition

-In 2008 YTEP began assessing wetlands using the California Rapid Assessment Method (CRAM)

-Assessment data provided a way to quantify wetland degradation

-Allowed YTEP to identify the most degraded wetland areas

Results Summarized in Report:

Klamath River Estuary Wetlands Restoration Prioritization Plan

2010, 2011

KRE Wetlands Water Quality Study

- Characterize water quality conditions in wetlands**
- Occurred year round**
- Aimed to study the effect of wetland condition on water quality**
- Can WQ be linked to fish habitat and CRAM attributes and metrics?**

Results summarized in:

*2010 KRE Wetlands Water Quality Monitoring Report-
Investigating relationships with CRAM, Water Quality and
Juvenile Salmonid Habitat Function*

2012, 2013

Bioassessment Study of KRE wetlands and expand CRAM to Upper Reservation

- Bioassessment Study in KRE Wetlands to assess WL condition
- Update NWI imagery for Yurok Reservation
- Expand Inventory and CRAM assessment to Upper Reservation wetlands

Klamath River Water Quality Coordination

- Klamath Basin Tribal Water Quality Workgroup
- Klamath Basin Monitoring Program

Background on Formation of WQ Coordination in the Klamath Basin

- **Coordination among Tribes was Initiated in 2001 by USFWS with Yurok and Karuk Tribes**
- **PacifiCorp and stakeholders engaged FERC relicensing process**
- **KR TMDL technical analysis development by NCRWQCB**
- **KHSA Interim Measure #15 – Water Quality Monitoring for public health and comprehensive monitoring**

Klamath Basin Tribal Water Quality Workgroup (KBTWQWG)

- Fish kill 2002 over 30,000 adult salmon died on the lower Klamath River
- Yurok Tribe wrote letter to USEPA Regional Administrator expressing dissatisfaction
- Prompted USEPA to provide funding to all 5 Tribal jurisdictions in CA portion of basin to help address unmet scientific needs
- Started to fund Yurok and Karuk WQ sample analysis in 2007, 2009 started funding Hoopa and 2011/2012 QVIR and Resighini Rancheria

KBTWQWG

www.klamathwaterquality.com

- Coordination among Tribes not just limited to monitoring
- Jointly selected highly qualified consulting firm with funding
- Assistance in reviewing and developing comments for the following:
 - TMDL development process
 - FERC relicensing process and Secretarial Determination Process
 - State process to regulate WQ on USFS lands in CA
 - Suction Dredge Regulatory Process
 - Scott and Shasta River ITP Process
- Analyze existing data and develop technical reports
 - [Asarian, E. J. Kann, and W. Walker. 2010](#). River Nutrient Loading and Retention Dynamics in Free-Flowing Reaches, 2005-2008.
 - [Asarian, E. J. Kann, and W. Walker. 2009](#). Multi-year Nutrient Budget Dynamics for Iron Gate and Copco Reservoirs

Klamath Basin Monitoring Program (KBMP) Participation www.kbmp.net

- KBMP is a multi-agency organization which strives to implement, coordinate and collaborate on water quality monitoring and research throughout the Klamath Basin.
- KBMP evolved out of a collective concern regarding water quality issues facing the Klamath Basin. KBMP offers members and interested parties a forum for constructive synthesis and coordination of water quality monitoring efforts.
- KBMP members host an annual meeting aimed at addressing water quality concerns basin wide.

Data Reporting and Transmission

- Real-time Monitoring Network
 - Mainstem datasonde data – Yurok and Karuk sites
 - Tributary Yurok Hydrologic Sites
 - <http://exchange.yuroktribe.nsn.us/lrgsclient/stations/stations.html>
- Yurok Environmental Data Solution System
 - Node Client transmits data to WQX
- Published Reports www.yuroktribe.org/departments/ytep/ytepreports.htm
 - Annual Data Summaries available on Yurok Website

Acknowledgements

- YTEP Staff and AmeriCorps WSP Members

FUNDING:

- USEPA Region 9 CWA 106
- USEPA GAP funds Tribal WQ Workgroup
- USEPA Wetlands Program Development Grant
- PacifiCorp KHSA IM #15

Questions/Comments?

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