Tribal Water Quality Monitoring Programs in the Klamath River and Major Tributaries

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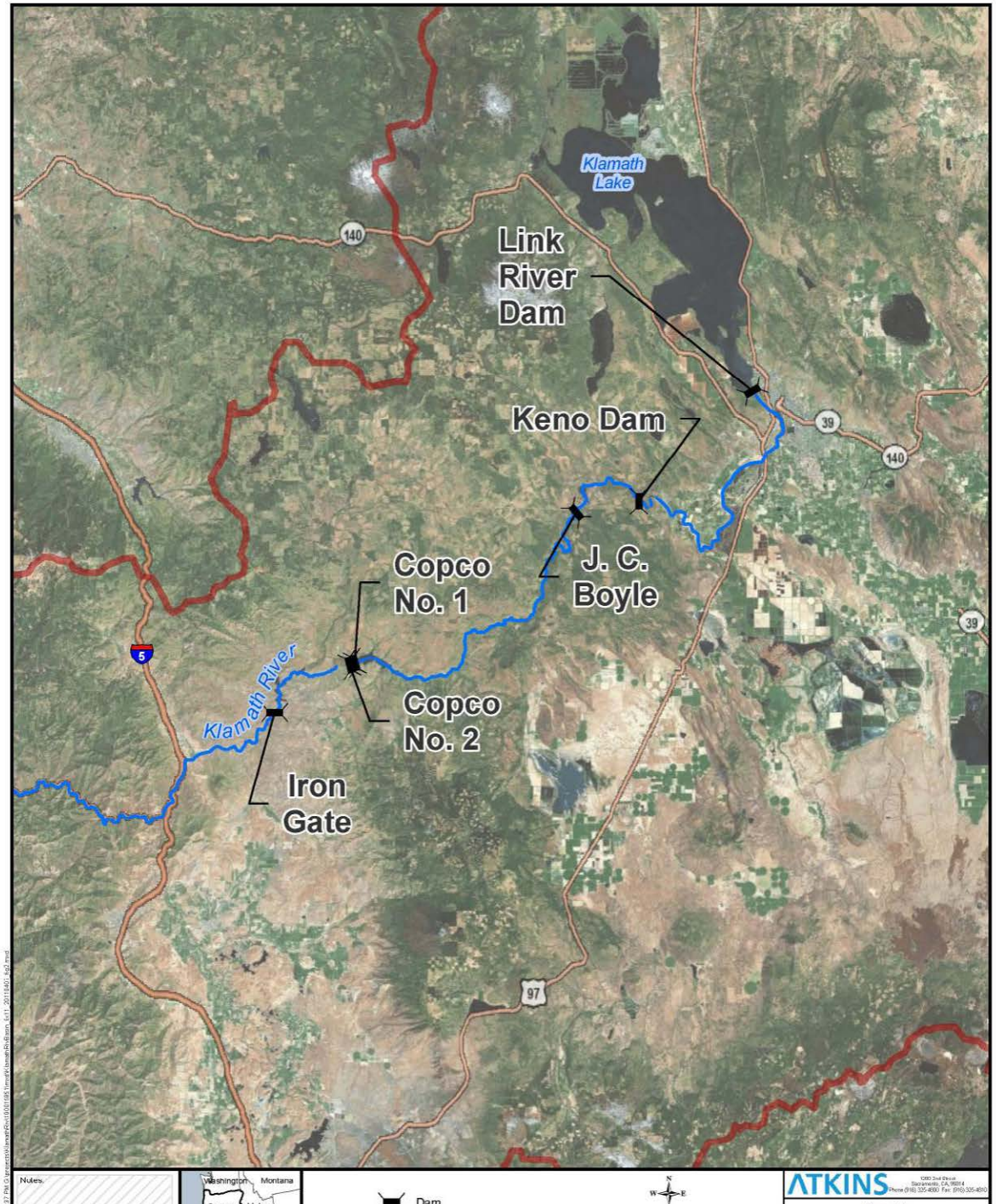
Ken Fetcho – Yurok Tribe
Ken Norton – Hoopa Tribe

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


Klamath Basin
Oregon
California
Medford
Klamath Falls
Williamson
Sprague
Upper Klamath Lake
Upper Klamath
Middle Klamath
Lower Klamath
Happy Camp
Scott
Yreka
Shasta
Butte
Lost
Salmon
Trinity
Willow Creek
Weitchpec
Arcata
Klamath
South Fork Trinity
Pacific Ocean
Crater Lake
Williamson R.
Sprague R.
Upper Klamath Lake
Link Dam
Keno Dam
JC Boyle Dam
Copco Dams I & II
Iron Gate Dam
Lost R.
Lower Klamath Lake
Tule Lake
Clear Lake Reservoir
Klamath R.
Shasta R.
Dwinnell Dam
Scott R.
Salmon R.
Trinity Lake
Trinity Dam
Lewiston Dam
South Fork Trinity R.
Dam
Federal Tribal Lands
Canal
0 10 20
Miles
HUMBOLDT STATE UNIVERSITY
http://www.humboldt.edu/~kwi/
Data Sources: ESRI, TIGER/USGS 2008, CalWater
GIS and Cartography: C. Rayer (2009)


Klamath Lake
Link River Dam
Keno Dam
J. C. Boyle
Copco No. 1
Copco No. 2
Iron Gate
Klamath River
140
39
5
97
Nules
Washington
Montana
Dam
ATKINS

Unresolved Issues and Outcomes

- Spring 2001: Federal govt cut water deliveries to BOR's Klamath Project due to ESA concerns
- 2002: at least 30,000 adult fall run salmon prematurely died in the Klamath River
- 2005: annual water contact warning postings for toxic algae began
- 2006: Pacificorp's license to operate the KHP expires. They continue to operate under an annual license while applying to FERC for another license.
- 2006: Negotiations of potential dam removal began between parties
- 2006: severe restrictions on commercial, tribal and recreational Chinook salmon harvest occurred along 700 miles of CA and OR coast as well as inland on the Klamath River
- 2009: Klamath area ocean commercial salmon harvest was closed
- 2010: significant reductions to BOR's Klamath Project due to dry hydrologic conditions
- 2010: Klamath Tribe's limited sucker harvest to ceremonial use for the 25th yr and experienced their 92nd yr without access to salmon

NEED: Long-term Solution

- **Klamath Hydroelectric Settlement Agreement (KHSA)** – Agreement between PacifiCorp and 45 organizations including: state and federal agencies/counties/tribes/commercial fisheries/irrigators/non-profits to study the potential removal of the four hydroelectric dams on the Klamath River
- KHSA requires that the Secretary of Interior undertake a series of scientific studies to determine if dam removal:
  - is in the best interest of the public
  - would advance restoration of the salmon fishery
- If the Secretary (in cooperation with the Secretary of Commerce and appropriate federal agencies) determines such then CA and OR governors would concur
- Currently – Draft EIS/EIR developed to aid the Secretary, CA and OR as well as provide the required environmental review

- **Klamath Basin Restoration Agreement (KBRA) –**
  - basin wide approach to addressing the current resource challenges
  - Legislation to be signed by the US upon congressional authorization
  - Contains various commitments and actions that have been or will be proposed and/or undertaken by federal/state/local/tribal and private interests in the basin
  - Some KBRA actions hinge on an affirmative Secretarial Determination

Klamath Basin
Total Maximum Daily Load (TMDL)

- Trinity River (2001) – sediment
- Salmon River (2005) – temperature
- Scott River (2005)
  - temperature
  - sediment
- Shasta River (2006)
  - temperature
  - dissolved oxygen
- Klamath River (2010) - CA
  - temperature
  - nutrients
  - dissolved oxygen
  - Microcystin
- Lost River (2010) – CA
  - Temperature
  - dissolved oxygen
  - ammonia toxicity
  - chlorophyll a

Lost River and Klamath River - OR
Contested – pending……?

Sub-basin Summaries

Provide ideal salmon (Chinook and coho) and steelhead spawning habitat

Historically experienced heavy timber extraction and mining

- Trinity – hatchery at headwaters, sturgeon spawning habitat
- Salmon – last remaining Spring Chinook run in Klamath basin, sturgeon spawning habitat
- Scott – largest coho salmon run in Klamath basin, currently large agricultural water diversions and groundwater extraction
- Shasta – currently large agricultural water diversions and substantial agricultural return water

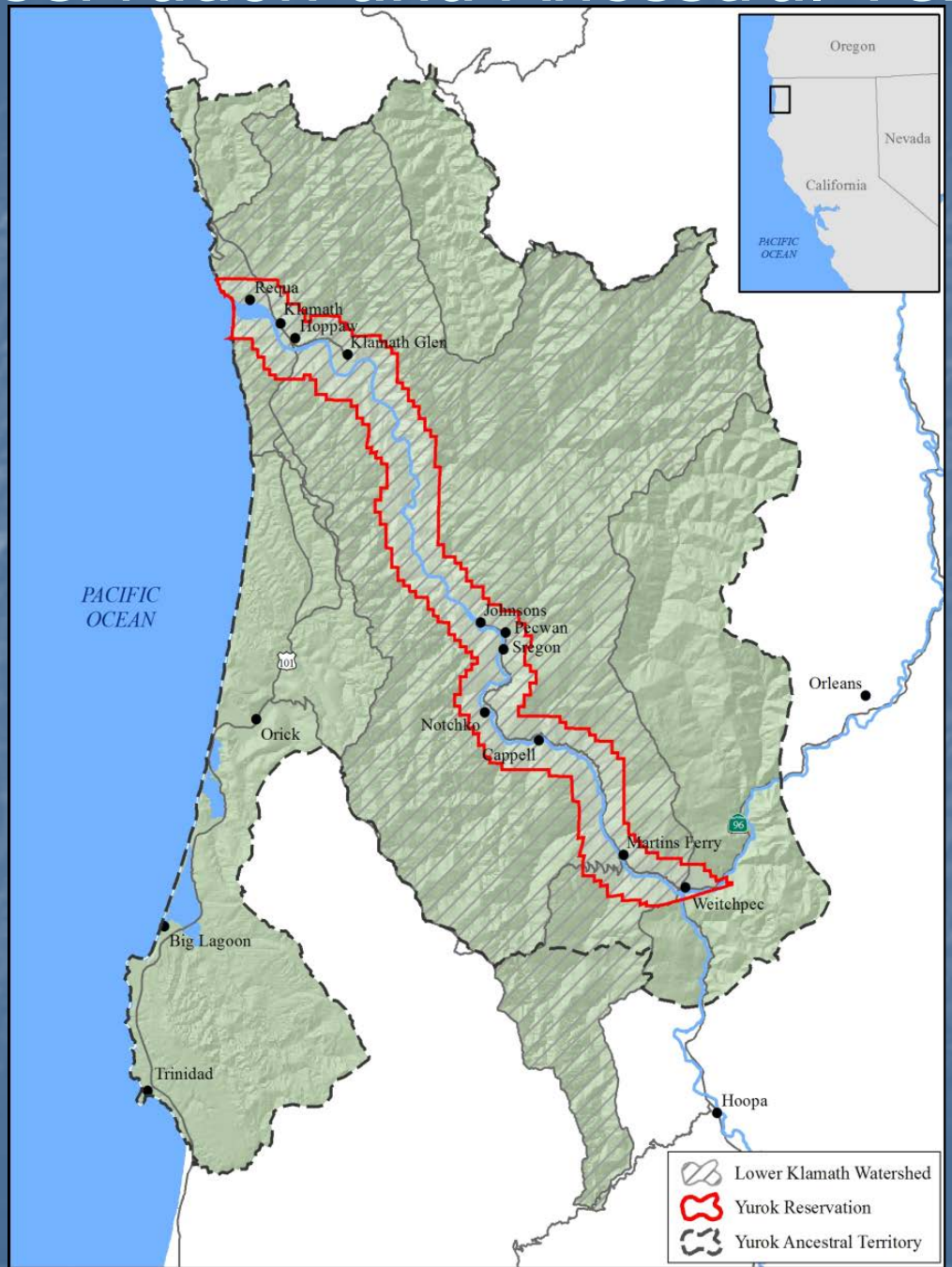
Fishing Rights

- Yurok
  - Federally recognized
  - State allocation
  - 45 river miles
- Hoopa
  - Federally recognized
  - State allocation
  - Trinity River
- Karuk
  - State recognized
  - Ishi Pishi Falls, Klamath River
- Commercial Ocean harvest
- In-River Sport

Hindrances to Fish Abundance and Harvest

- Annual closures and/or allocation reductions
- Listed Coho Salmon – CA state (2002) and federal (1997)
- Annual disease mortality
- Eulachon near extinction
- Lamprey and sturgeon sensitive species of concern

Yurok Reservation and Ancestral Territory



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.

- Copco Lake 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

Water Division (5 staff)

- Water Quality Monitoring, Assessment and Reporting
- Hydrologic Monitoring, Assessment and Reporting
- Water Quality Regulatory Program
- Watershed Based Environmental Education
- Klamath Fish Health Assessment Team Participation
- KR TMDL and BGA Workgroup Participation
- Wetlands Inventory, Assessment and Protection

Purpose of WQ Monitoring

- Gather baseline information to improve our understanding of the Klamath River health 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 used by other agencies and future water quality and fisheries management professionals.

Reports available on-line and data is submitted to WQX

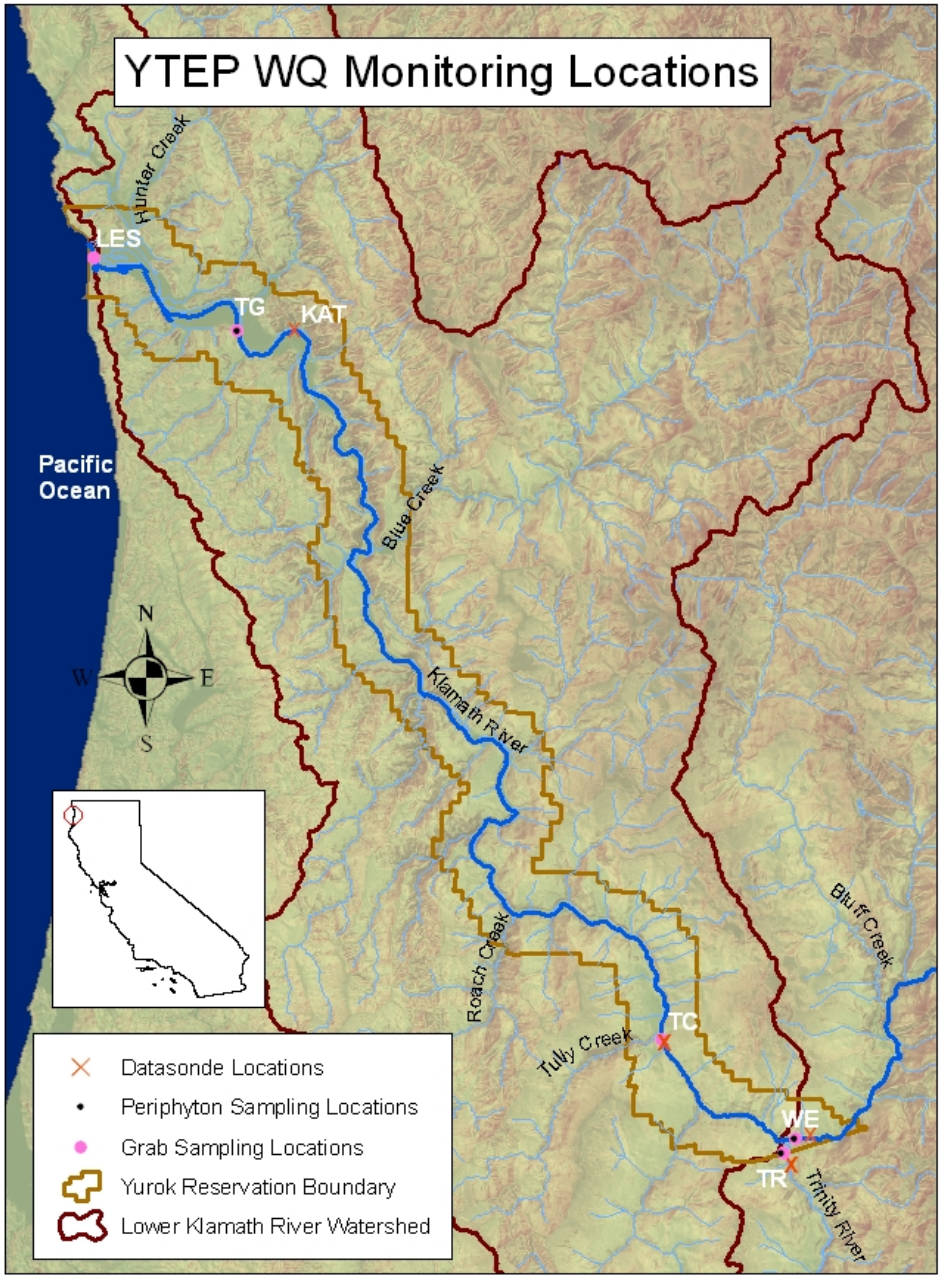
http://www.yuroktribe.org/departments/ytep/ytepreports.htm

Water Quality Monitoring Objectives

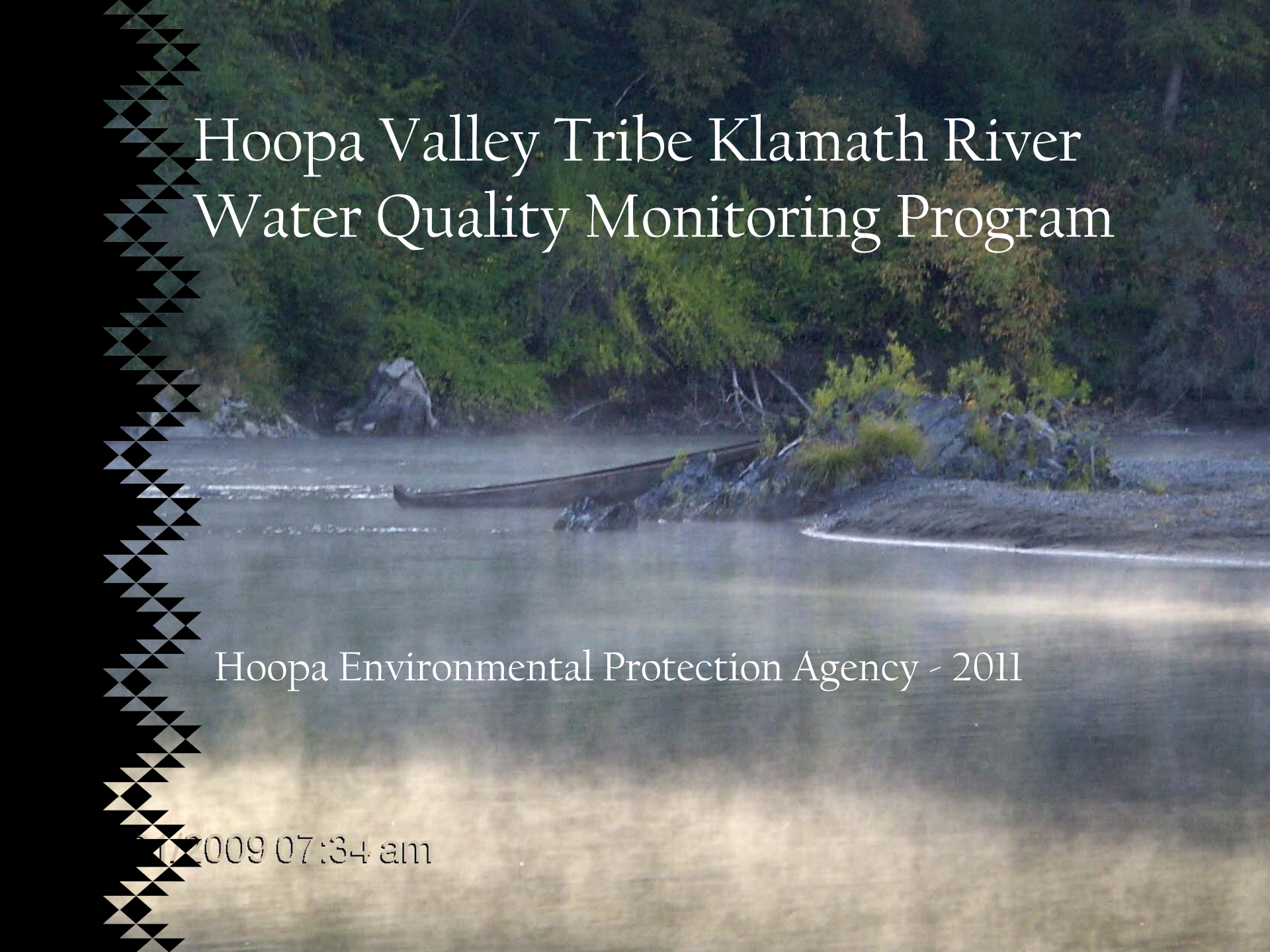
- To establish baseline conditions across a wide array of water years
- To track long-term spatial and temporal trends through consistent, comparable sites and methods
- To document effects of various short-term and long-term management and regulatory actions throughout the basin

Klamath and Trinity Rivers WQ Monitoring Activities

- **Continuous water quality monitoring- datasondes**
- **Grab Samples – Collected with Churn Splitter**
  - **nutrients**
  - **phytoplankton speciation and enumeration**
  - **cyanotoxins**
  - **bacteria (estuary only)**
- **Periphyton Sampling**
  - **speciation and enumeration**
  - **biomass (chl.a)**


YTEP WQ Monitoring Locations
Hunter Creek
LES
TG
KAT
Pacific Ocean
Blue Creek
N
W
E
S
Klamath River
Roach Creek
Bluff Creek
Tully Creek
TC
WE
TR
Trinity River
Datasonde Locations
Periphyton Sampling Locations
Grab Sampling Locations
Yurok Reservation Boundary
Lower Klamath River Watershed

Water Quality Monitoring Sites
Klamath and Trinity Rivers

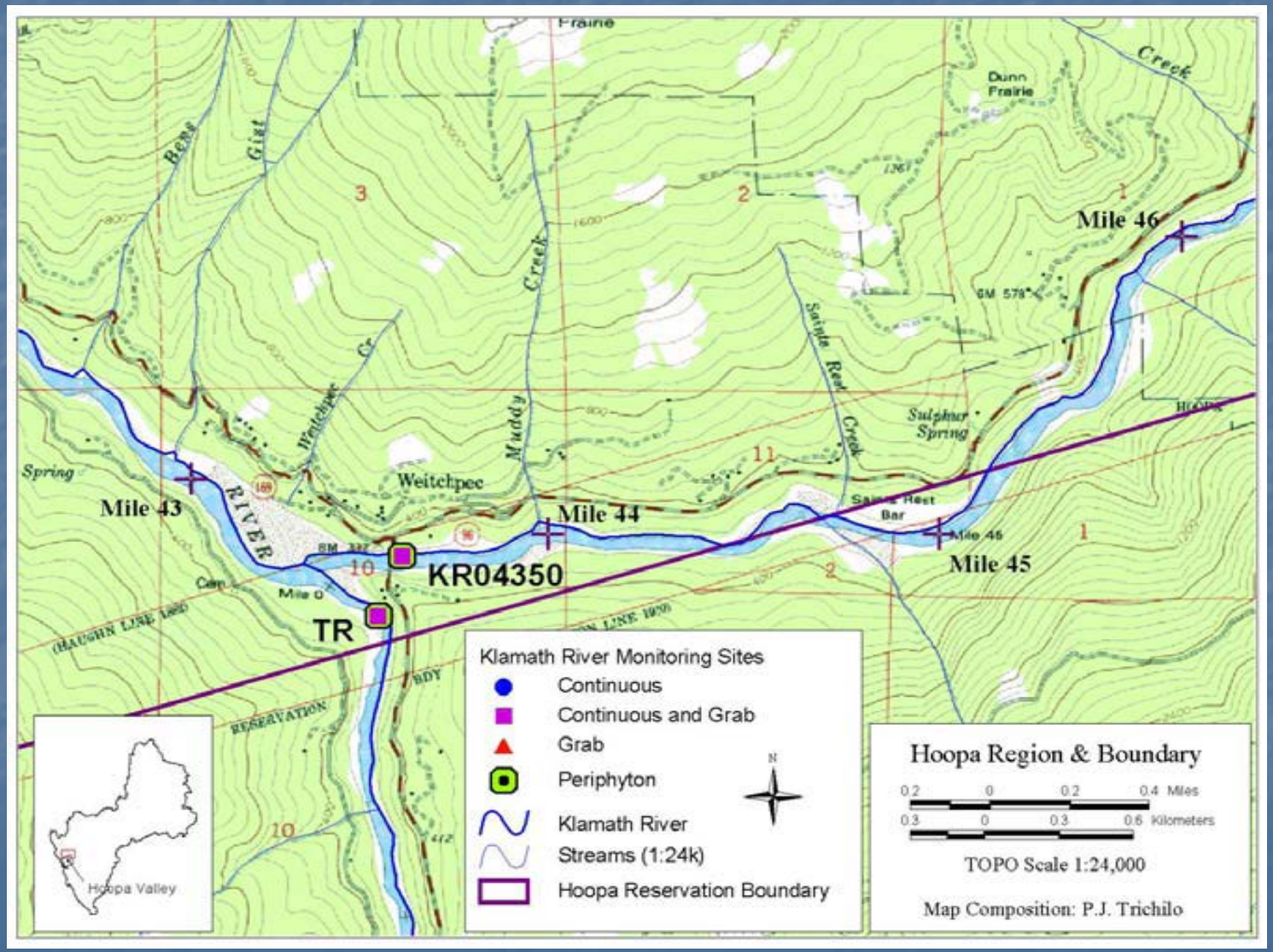


Hoopa Valley Tribe Klamath River Water Quality Monitoring Program

Hoopa Environmental Protection Agency - 2011


OREGON
Klamath Lake
HOOPA VALLEY
INDIAN RESERVATION
Klamath River
Trinity River
Trinity Lake
CALIFORNIA

Portion of the Klamath River under Hoopa Tribe Jurisdiction



Hoopa Valley Facts

- Located in Northern California
- Elevation: 3,570’ to 350’
- Largest land base reservation in California
- Covers 92,160 acres
- Total population: 4,033 which includes 2,889 enrolled Tribal members
- Important water bodies: Trinity and Klamath Rivers
- 92% of the Reservation is owned by the tribe, remaining 8% fee

Hoopa Valley Environmental Office

- Established in 1982
- Employees: 8
- Offices capabilities: Water Quality Laboratory & GIS network

- Administers Water Quality Programs:
  - WQS
  - Section 106 program
  - Water Quality Monitoring
  - Section 319 NPS program
  - Section 401 Certification
  - Reviews TMDL Documents

Tribal Water Quality Goals for Klamath River

Hoopa Tribe's impetus for developing WQS for Klamath River:

- Protect & maintain healthy "Salmon Runs"
- Establish a Comprehensive Water Quality Protection program
- Affirm tribal jurisdiction to enforce WQS on tribal lands
- Establish Cultural Beneficial Uses
- Address Water Quality Impacts from Dams & Water Diversions within Klamath River Basin
- Restore the natural river system to a level where its ecosystem can assimilate the nutrients

Klamath River Nutrient Sampling

Water Quality occurs bimonthly, beginning in May samples are taken every other week extending to mid October.

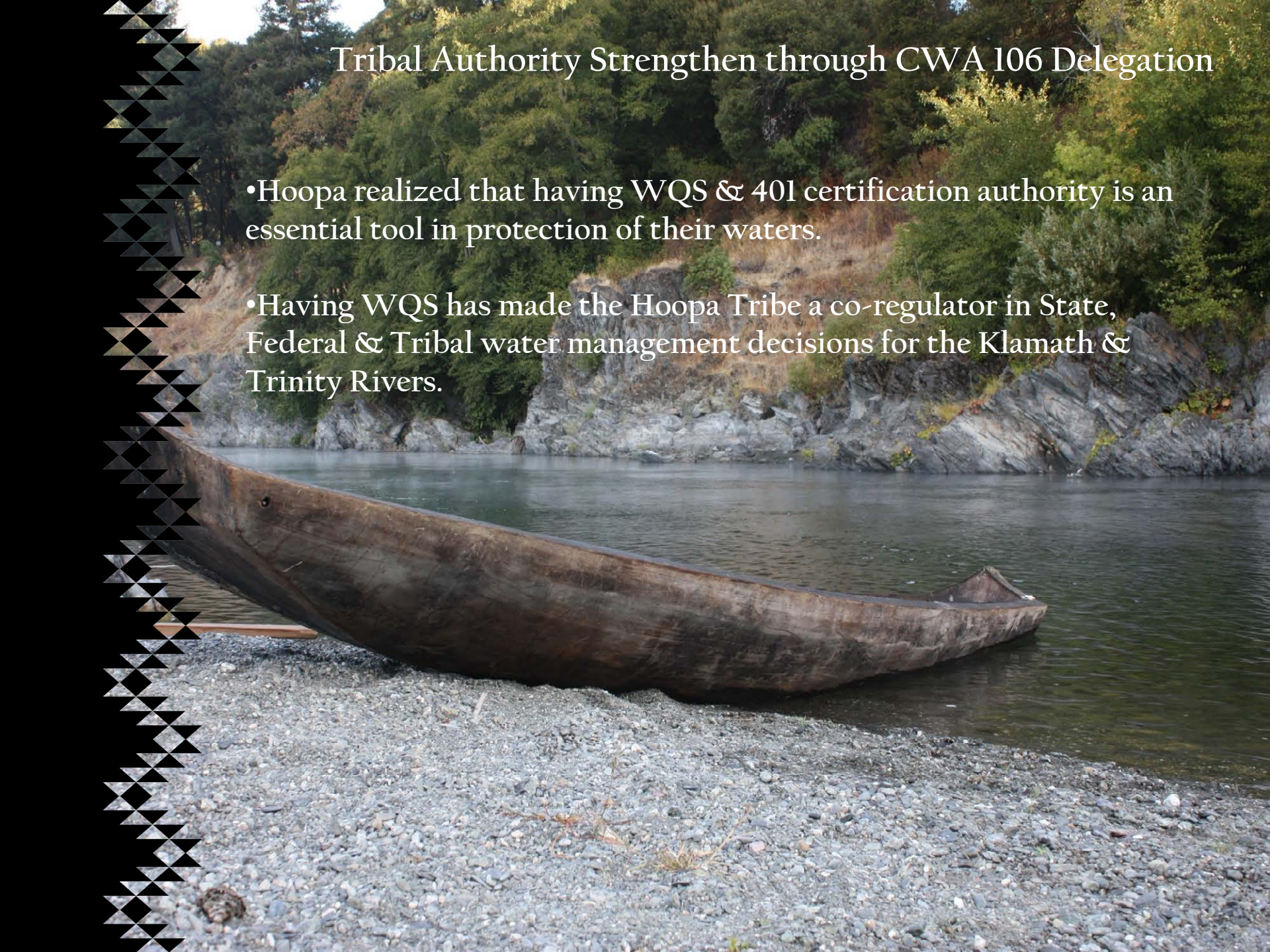
07/06/201

Klamath River Nutrient Sampling

Water Quality Parameters Sampled in Klamath River:

- Dissolved Oxygen
- pH
- Periphyton & Nutrients
- Cyanobacteria & Associated Toxins

Tribal Authority Strengthen through CWA 106 Delegation



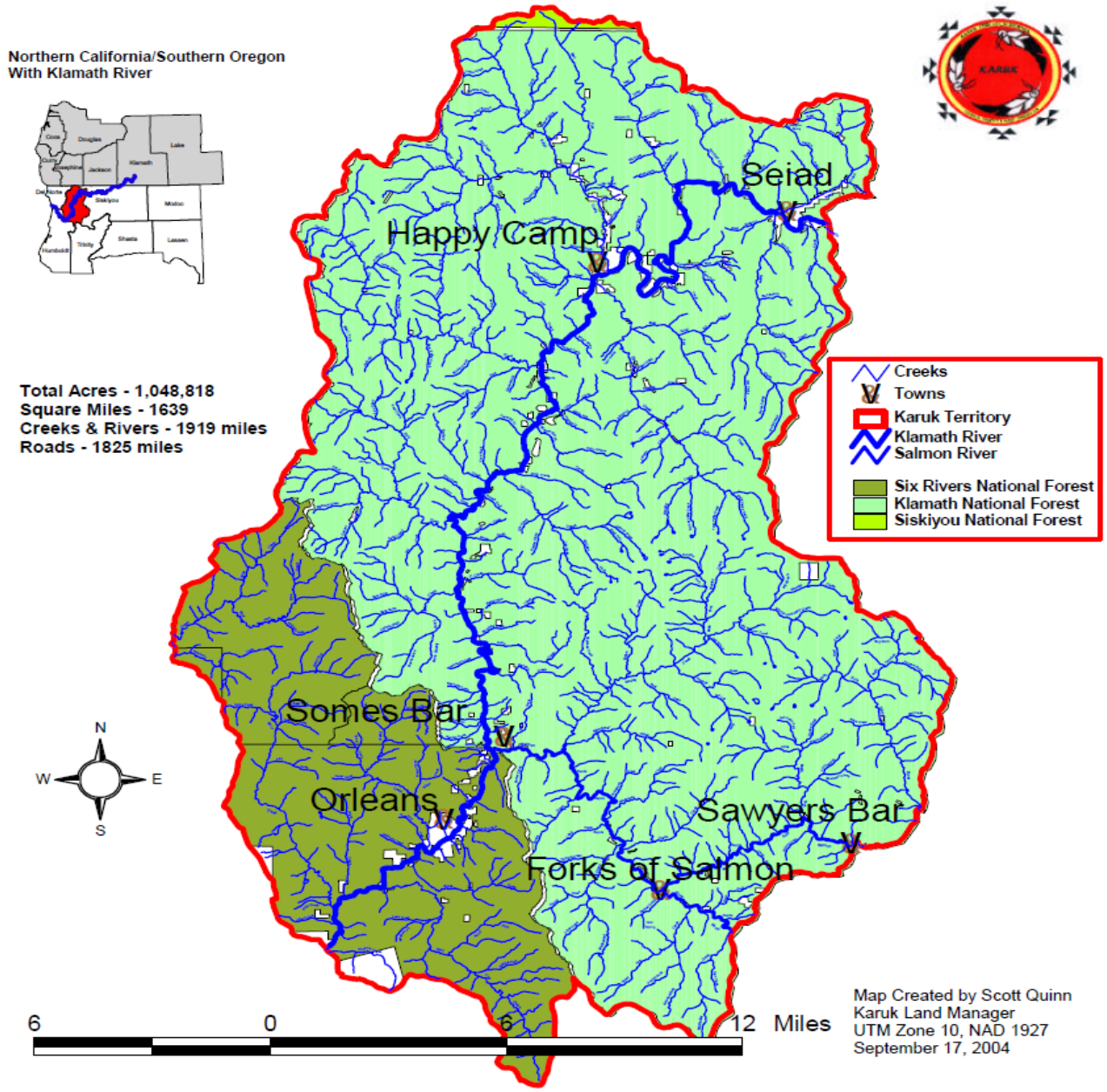
- Hoopa realized that having WQS & 401 certification authority is an essential tool in protection of their waters.

- Having WQS has made the Hoopa Tribe a co-regulator in State, Federal & Tribal water management decisions for the Klamath & Trinity Rivers.

Karuk Tribe

- Tribal Members: 6,930
- Federal Recognition: 1979
- Aboriginal Territory:
  - Total acres: 1,048,818
  - Square Miles: 1,639
  - Creeks and Rivers: 1,919 miles
  - Roads: 1,825 miles

KARUK ABORIGINAL TERRITORY



Water Quality Program Goals

Short Term

1. Monitor and evaluate water quality in the Klamath and major tributaries
2. Provide data to state and federal water quality and fishery management agencies
3. Inform public of health risks and necessary precautions
4. Fulfill grant requirements

Long Term

1. Evaluate trends in water quality over time
2. Provide data for
   - Development and implementation of TMDL's
   - Fulfillment of KBRA and KHSA
   - Development of state and federal standards for protection of public health

Making Assessment Decisions

Designated Beneficial Uses and Tribal Goals	Parameter(s) to be Measured to Determine Support of Use of Goal
Rare, Threatened, or Endangered Species (RARE)	Temperature, DO, pH, Conductivity,
Subsistence Fishing (FISH)	Temperature, DO, pH, Conductivity
Cold Freshwater Habitat (COLD)	Temperature, Turbidity
Cultural Contact Water (CUL-1)	Temperature, Phosphorus, Nitrogen
Cultural Non-Contact Water (CUL-2)	Temperature, Phosphorus, Nitrogen
Fish Consumption (FC)	Temperature, Phosphorus, Nitrogen
Water Contact Recreation (REC-1)	Temperature, Phosphorus, Nitrogen
Non-Contact Water Recreation (REC-2)	Temperature, Phosphorus, Nitrogen
Spawning, Reproduction, and/or Early Development (SPWN)	Temperature, DO, pH, Conductivity, Turbidity

Water Quality Monitoring

Projects

- Annual Water Quality Monitoring
- Public Health
- Fish Disease

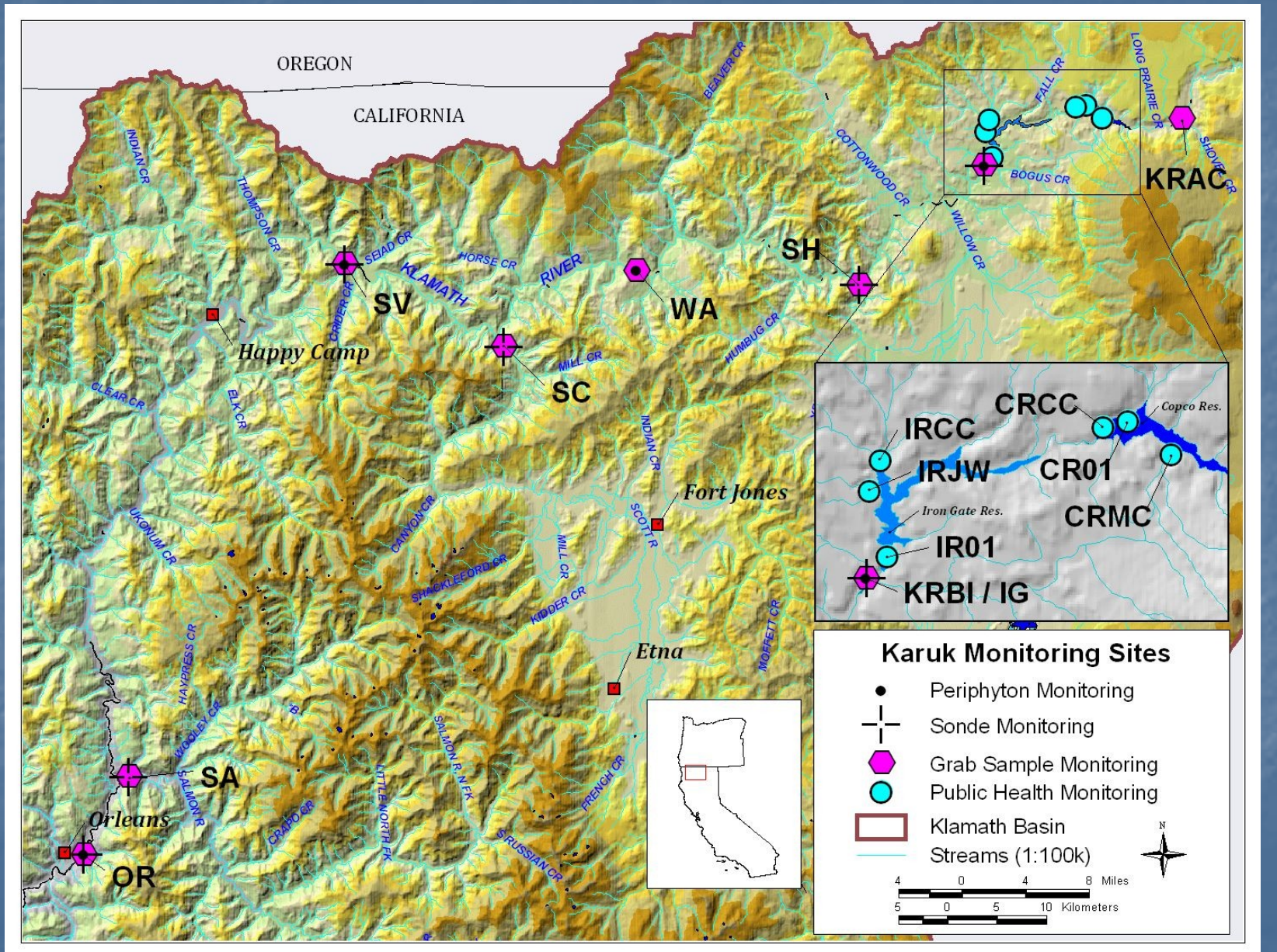
Funders

- US EPA
- Bureau of Reclamation
- Bureau of Indian Affairs
- National Fish and Wildlife Federation
- Pacificorp
- Humboldt State University

Collaborators

- Yurok Tribe Environmental Program
- US EPA
- North Coast Water Quality Control Board
- Oregon State University
- Humboldt State University
- Pacificorp

Sampling Locations



Annual Water Quality Monitoring

- CWA 106 requirements
- Bi-weekly Nutrient sampling
  - May-October
  - Iron Gate Dam to Orleans
- Real-Time Data Collection (datasondes)
  - Internet available
  - 3 sites: Seiad, Orleans, Iron Gate
  - Temp, DO, pH, conductivity, turbidity and blue-green algae
- Special Studies
  - 2005 and 2006 – Copco and Iron Gate Reservoirs nutrient and BGA study
  - 2007 to present: Fish Disease Sampling
  - 2010 Fish Tissue Microcystin Study
  - 2011 Periphyton Pilot Project

Public Health

- Toxic Algae
  - Mycrocystis – liver toxin and tumor promoter
  - Anabaena – neurotoxin
- Bi-weekly sampling and Real-Time
  - Iron Gate (source) to Orleans (ceremonial site)
- Coordinated sampling
  - Yurok Tribe and Pacificorp
- Postings
  - USEPA, NCRWCB, Klamath and Six River's National Forest

Fish Disease Sampling

- Water Samples – spore levels
  - *Ceratomyxa shasta (C.shasta)*
  - *Parvicapsula minibicornis*
- Time and locations
  - Weekly, Year-round
  - Iron Date Dam to Tulley Creek
- Coordinated Sampling
  - Karuk fisheries
  - Yurok fisheries
  - Oregon State University

Microcystin Sampling – Fish Tissue

- Adult Chinook and Steelhead collection
  - September – November, 2010
  - Yurok : Estuary and Weitchpec
  - Karuk : Orleans and Ishi Pishi
  - CDFG : Iron Gate Hatchery
- Fillet and liver – microcystin analysis CDFG lab
- Internal Organs and fillet – Histopathology Animal Health Center BC, Canada
- Results
  - 10% of fish sampled microcystin detected in liver ONLY
  - Histology results, November 2011, to determine the effect on fish physiology

Periphyton Pilot Project

- Periphyton – attached algae, assimilates nutrients, photosynthetic effects to water quality
- Mainstem Sample Locations – Iron Gate, I5 Bridge, Quigley's Store, Seiad Valley, Happy Camp and Orleans
- Sample Frequency
  - Monthly
  - August transects: 2 sites only
- Coordinated Sampling
  - Pacificorp: Keno Reach
  - Karuk: Iron Gate to Orleans
  - Yurok: Weitchpec to mouth

Background on Formation of Tribal Coordination in the Klamath Basin

- **Coordination among Tribes was 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 and reporting!**
- **Leverage CWA 106 funds to pursue other funds such as US BOR, BIA, State of CA and NOAA**
- **These additional funds have helped fund this project to complete a long term monitoring program that covers over 190 river miles on the Klamath River and 4 major tributaries**

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 now funds QVIR and Resighini Rancheria

KBTWQWG

- 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

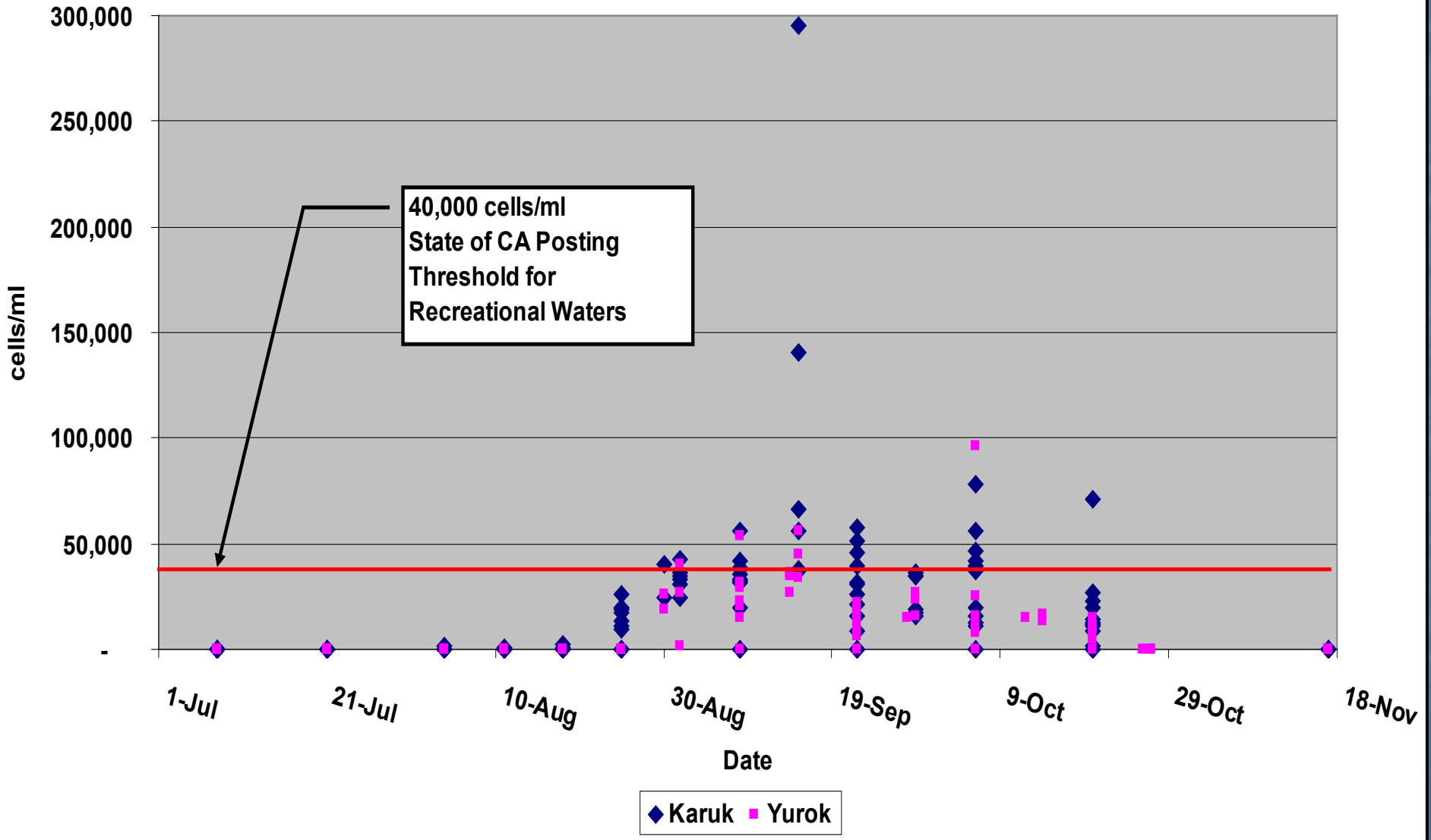
- KBMP is a multi-agency organization which strives to implement, coordinate and collaborate on water quality monitoring and research throughout the Klamath Basin. The KBMP evolved out of a collective concern regarding water quality issues facing the Klamath Basin. The KBMP offers members and interested 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.

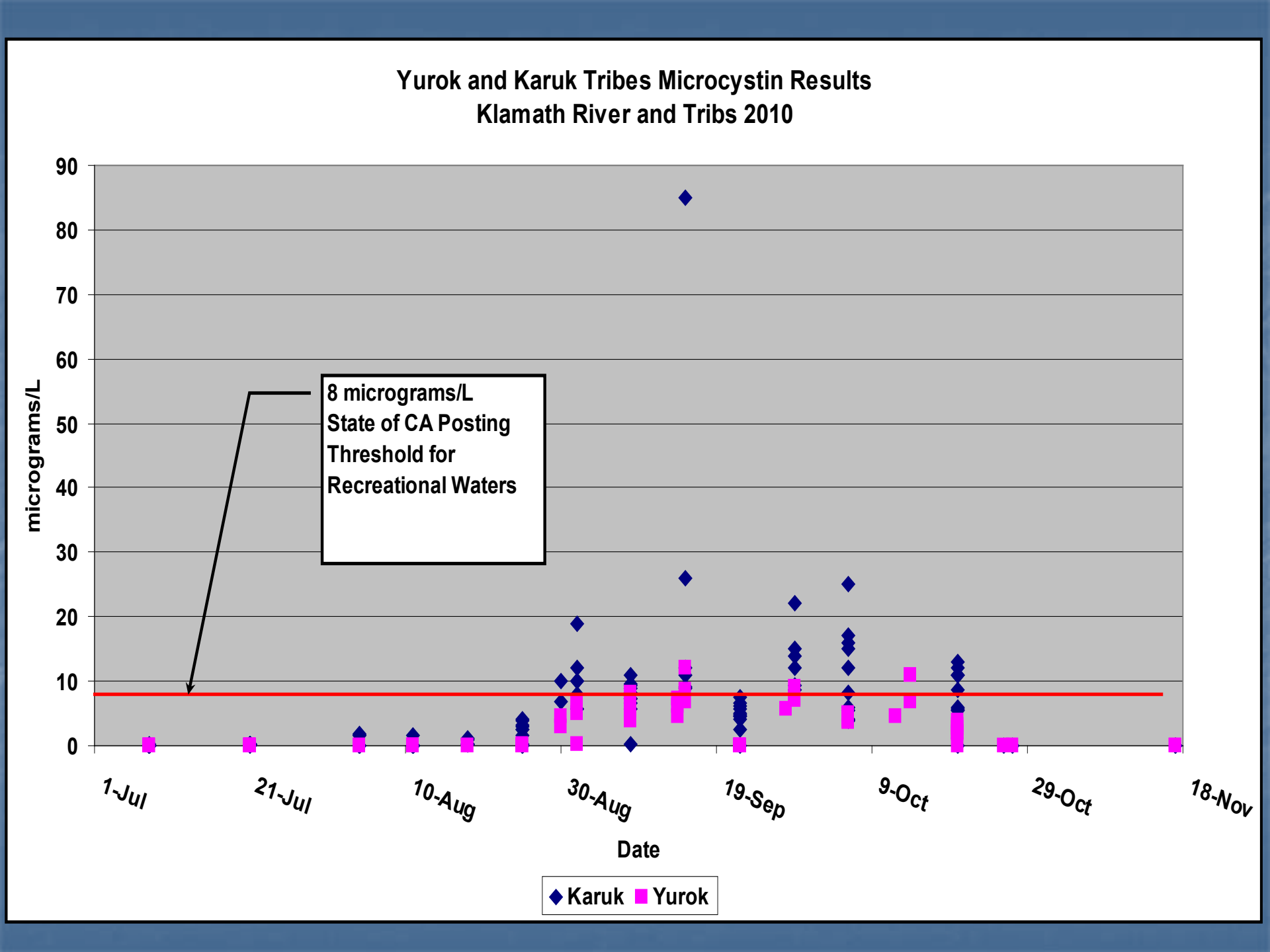
Benefits of Coordination

- Communication on method development
- Equipment and lab selection process
- Efficiency
- Comparable data
- Access to data
- Strength in numbers
- Familiarity of conditions outside network
- Place data in context of larger picture
- Assistance to neighboring Tribes

Uses of Data

- Understand linkages with nutrients, WQ parameters, periphyton and toxic algae
- Real-Time Continuous WQ is used by fish managers to evaluate conditions for migrating juvenile and adult salmon i.e, KFHAT
- TMDL development and tracking progress
- Established KHP effects to WQ downstream and effects to Tribal Members
- Evaluate short and long term effects of dam removal to track temporal and spatial trends


Yurok and Karuk Tribes *Microcystis aeruginosa* Results
Klamath River and Tribs 2010
300,000
250,000
200,000
150,000
100,000
50,000
-
cells/ml
40,000 cells/ml
State of CA Posting
Threshold for
Recreational Waters
1-Jul
21-Jul
10-Aug
30-Aug
19-Sep
9-Oct
29-Oct
18-Nov
Date
Karuk
Yurok


Yurok and Karuk Tribes Microcystin Results
Klamath River and Tribs 2010
micrograms/L
90
80
70
60
50
40
30
20
10
0
8 micrograms/L
State of CA Posting
Threshold for
Recreational Waters
1-Jul
21-Jul
10-Aug
30-Aug
19-Sep
9-Oct
29-Oct
18-Nov
Date
Karuk
Yurok

Conclusions

- Technical coordination builds strong ties in the Basin although Tribes may not agree politically
- Solidarity sends a strong message to Federal and State agencies to show ownership of the river and thorough knowledge of conditions and analysis of impairments
- Future Projects = 2006-2011 Water Quality Quantity Trend Analysis

Questions/Comments??