

## Yurok Tribe :

### Climate Change Adaptation Plan for Water and Aquatic Resources

The Yurok People, often self-described as *salmon people*, inhabit the most downriver lands of the Klamath River in what is now the northwest corner of California. They have managed and relied upon the abundance of salmon and other aquatic species in the Klamath River since time immemorial. The Yurok people's traditional subsistence diet and practices derived from the river and coast are a vital part of their cultural identity, creating an intricate connection between them, the species, river, land, and seasons.

The river is the lifeline of the Yurok people. It provides the majority of the Yurok's food supply. Food resources provided from the ocean are also important to Yurok people, as well as foods offered from terrestrial areas. Together all these sources supply food for Yurok throughout the year with various fish runs returning, seaweed blooming, shellfish spawning, and fruits ripening during different times.

In September 2002, an event occurred that intensely affected the Yurok people on spiritual, emotional, and economic levels. Starting on September 19<sup>th</sup> and continuing to the end of the month, an unprecedented and massive fish kill took place in which an estimated 34,000 to possibly double that number of fish perished, mostly in the lowermost 30 miles of the Klamath River on the Yurok Reservation.

The fish were mainly adult fall-run Chinook salmon returning home to spawn. However, Coho salmon, steelhead, and other fish were lost as well. Elders on the Yurok Culture Committee said, "Never in our time, have we, the elders of the Yurok Culture Committee, seen such a mass destruction of our salmon resource." Although the direct causes of the fish kill were pathogens, warmer water temperatures and low river flows due to dam regulation contributed to the disastrous event.

The fish kill served as a sign, reminder, harbinger, and call. It was a sign of how sick the river had become and the deep implications that has for the Yurok people. It was also a reminder of the important role Yurok play as stewards and as a voice for their ancestral home and the ecosystems and species within it. For many Yurok, the fish kill was a warning as well of the potentially profound effects of an increasingly evident and global force shaping the environment – climate change. Rising water temperatures, increasing drought intensities, and lower summer flows are all anticipated with climate change, conditions markedly similar to those that occurred in 2002.

Ultimately, the fish kill was a powerful call - to continue and further ongoing Yurok efforts to restore the natural environment and to take new actions to prepare for the emerging climate change challenge. The development of this **Yurok Tribe Climate Change Adaptation Plan for Water and Aquatic Resources** is one of those actions.

### Yurok Adaptation Planning Process

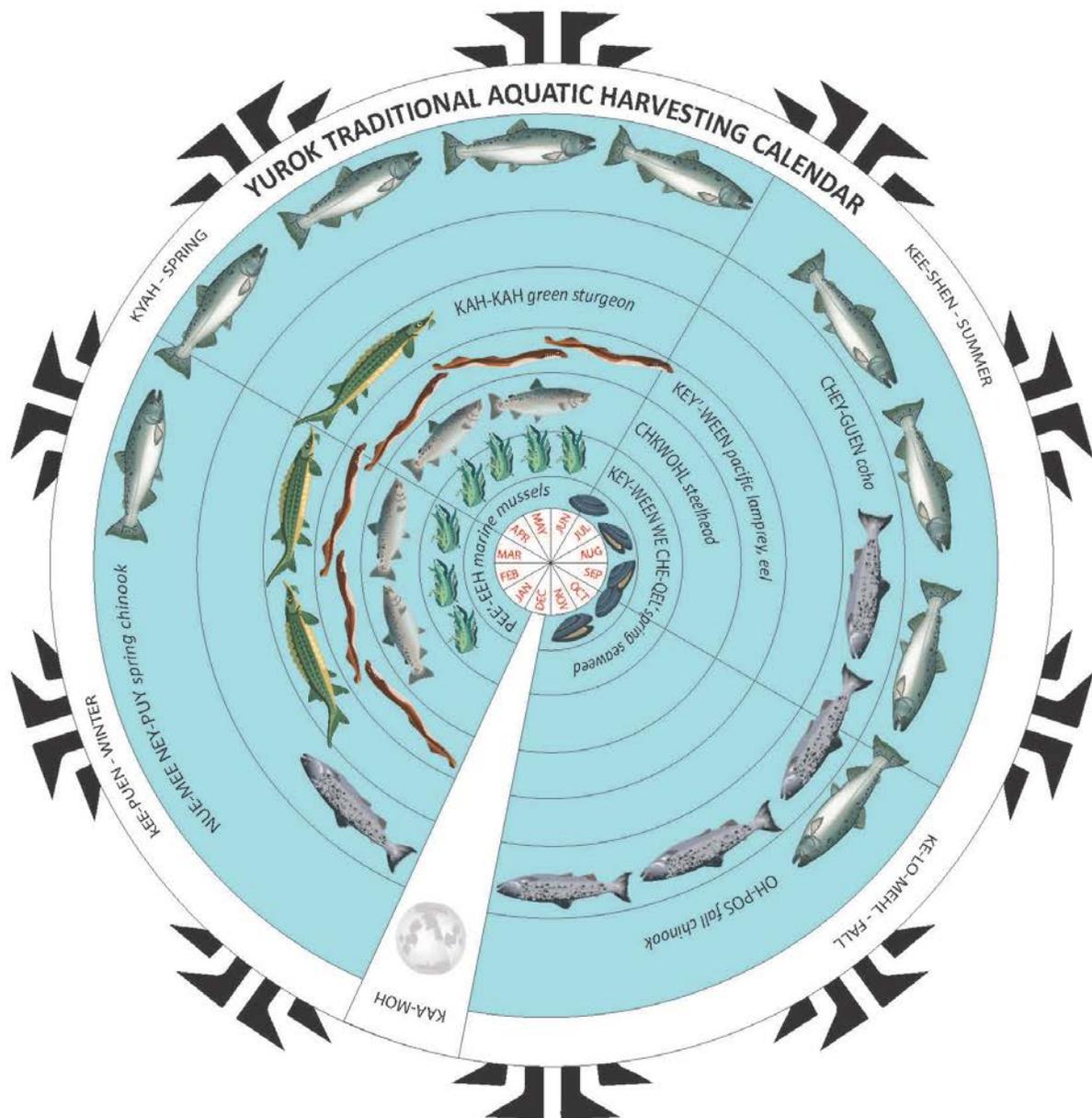
In 2014, YTEP was awarded a three-year Science to Achieve Results (STAR) Grant by the US Environmental Protection Agency (EPA) to develop, among other activities, a Yurok Tribe Climate Change Adaptation Plan for Water and Aquatic Resources.

The planning process was primarily informed and guided by Yurok Tribal knowledge. Experiences, information, stories, and opinions from the Natural Resource and Culture Committee members, Tribal staff, and general Tribal Membership including elders and community members' input were all sought. In addition, Federal and State agencies were invited to engage with the Yurok and participate in some of the community workshops and outreach activities.

YTEP also engaged outside collaborators to help in the development of the Plan. YTEP partnered with the Institute for Tribal Environmental Professionals (ITEP) to provide input, advice, and services to YTEP project leads throughout the planning process. YTEP reached out to the Alaska Native Tribal Health Consortium to assist in the development of the Yurok Environmental Observer Network. Adaptation International assisted with the health assessment component of the Plan.

### Yurok Tribe's previous climate change work

The 2002 Klamath River Fish Kill spurred the Yurok Tribe into action to address increasing environmental changes and the Yurok Tribe Environmental Program was organized. Its mission is to protect the lands, air and water resources of the Yurok Indian Reservation for the benefit of current and future generations of Tribal Members. By 2008, the Yurok Tribal Council, Tribal Members, the Yurok Tribe's Natural Resources,



and Culture Committees, and other tribal departments had begun to raise concerns over shifting seasons and decreased availability of many traditional foods. In response, YTEP began building staff capacity on climate change science.

In 2010, with funding from the U.S. EPA's Office of Environmental Justice Small Grants Program, YTEP began an initial plan to identify community priorities for a Yurok response to a changing environment. Community scoping for the prioritization plan revealed that the number one priority was to protect and preserve Yurok lifeways, culture, and traditions. It was recommended that YTEP research and help protect the Yurok trust resources that may be affected by climate change impacts. In 2014, funding and support from the North Pacific Landscape Conservation Cooperative enabled YTEP to assist the Tribe in collecting and documenting Yurok Traditional Ecological Knowledge (TEK) on ecosystem functions, community structure, species behavior, and habitat use.

Using the elders' advice to, "follow the water", it was determined that the priority planning areas for the Yurok Tribe's initial climate change plan should focus on the aquatic environment and resources. Areas identified that are the focus of the Adaptation Plan include: (1) aquatic habitats, (2) drinking water, (3) *ney-puy* (Chinook and Coho salmon), (4) *chkwohl* (steelhead), (5) *kah-kah* (green sturgeon), (6) *key'-ween* (Pacific lamprey), (7) *seyk-soh* (marine shellfish), (8) *key'-ween we' chey-gel'* (spring seaweed), and (9) Tribal Members' health (physical, mental, spiritual, emotional). These particular species were chosen to be the focus of this Plan because they (1) are significant for Yurok food sovereignty and practices, and (2) are indicator species of ecosystem conditions throughout the year. The Yurok Aquatic Harvesting Calendar illustrates how different species occupy the river at different times of the year. All of these species have been reported to be in decline in recent years.

While the funding received for this Plan was to specifically focus on aquatic habitats and resources and Tribal health, the intention is not to separate the priority planning areas or create a hierarchy but rather to create a starting point for adaptation planning efforts.

## Goal of the Plan

The goal of the Plan is to assess the vulnerabilities and resiliencies of Yurok waters, aquatic species, and people in the face of climate change and to identify strategies that will allow Yurok lifeways, culture, and health to continue and grow. The Plan encompasses both the Yurok Reservation and broader Ancestral Territory.

## Climate effects and the Yurok Tribe

Yurok community members are even now bearing witness to changes that may be linked to climate change, such as rising air temperatures, warmer river waters, and increasing drought. The following is a summary of anticipated climate changes in Yurok territory that could affect Yurok water resources, traditional aquatic foods, and Tribal health:

### Changes in Air Temperatures and Precipitation Regimes

- ❖ Rising air temperatures
- ❖ Precipitation amounts are uncertain
- ❖ Heavier downpours

#### Changes in Ocean Processes

- ❖ Warming ocean temperatures
- ❖ Rising sea levels
- ❖ Increasing coastal inundation and erosion
- ❖ Ocean acidification
- ❖ Potentially increasing coastal dead zones
- ❖ Potentially increasing marine harmful algal blooms

#### Changes in Inland Hydrology

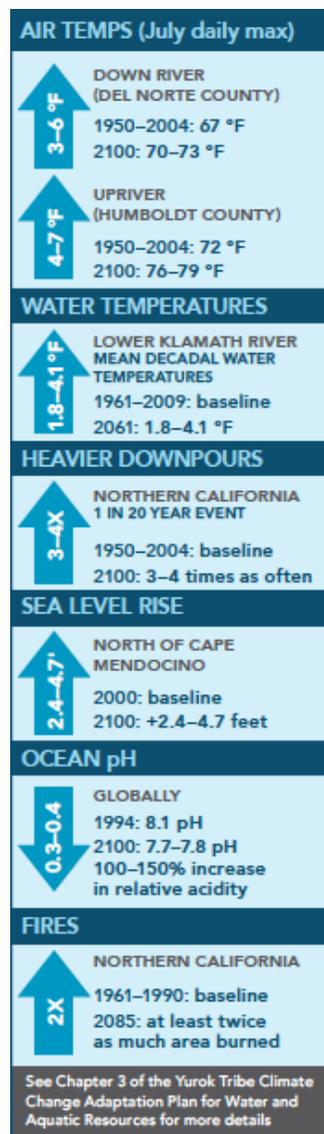
- ❖ Shift from snow to rain, increasing rain-based winter floods
- ❖ Earlier spring snowmelt
- ❖ Decreasing snowpack
- ❖ Increasing winter flows in Klamath River and tributaries
- ❖ Decreasing late spring/summer flows in Klamath River and tributaries
- ❖ Increasing drought intensities
- ❖ Decreasing snow-driven spring/summer floods

#### Changes in Inland Water Quality

- ❖ Warming surface water temperatures
- ❖ Lower dissolved oxygen concentrations
- ❖ Increases in turbidity, sedimentation
- ❖ Expanding harmful algal blooms and possible increases in water-borne pathogens
- ❖ Potentially higher pollutant loadings
- ❖ Increases in saltwater intrusion into coastal aquifers

#### Changes in Fire Regimes

- ❖ Fire seasons are expected to become longer.
- ❖ Wildfire frequency and extent are expected to increase.



Some examples of how these climate effects are projected to impact the aquatic habitats, drinking water, and traditional aquatic species within Yurok territory, and Tribal Member health, include:

- **Aquatic Habitats:** Climate-induced rising air temperatures can lead to decreased snowpack and earlier snowmelt. This, in turn, can result in reduced flows in the mainstem Klamath during the spring and summer. Rising air temperatures can also lead to greater evaporation and possibly greater transpiration, increasing summertime water demands from, for example, forests, farmers, and marijuana growers. Together with the expected climate-induced increasing drought intensities, these various factors could contribute to lower summertime flows. Flow declines can contribute to problems for fish temperature thresholds and passage, and, as the 2013-16 drought showed, they can also negatively affect the ability of Yurok people to access drinking water from springs and creeks. Alternately, flow increases leading to flooding could scour fish eggs and degrade drinking water quality.

- **Drinking Water:** Climate change is giving rise to shifting ecological conditions and increases in extreme events. In Yurok country, these changes are expected to decrease source water quantity, alter the timing of supplies, increase water demands, degrade water quality, necessitate increasing and/or more advanced treatment, and damage water supply infrastructure. Difficulties achieving compliance with environmental regulations may result. The costs of treating water, responding to water supply emergencies, and repairing damage to equipment and infrastructure, are all anticipated to rise.
- **Traditional Aquatic Species:** Climate effects, such as rising air temperatures, warmer waters, and lower river flows, on traditional aquatic resources could result in increased food insecurity – reduced or less predictable food quantity, quality, and access – for Yurok Tribal Members. Specifically, this could mean:
  - ❖ Declining/unpredictable species' populations → availability of traditional foods is declining or less predictable
  - ❖ Shifting migration times → foods are no longer available during traditional times
  - ❖ Changing habitats → foods can no longer be harvested at traditional sites and in traditional ways, food quality and safety may be affected.
  - ❖ Youth are less able to share in intergenerational knowledge sharing → loss of cultural traditions, traditional knowledge
  - ❖ Increasing safety hazards when harvesting foods; toxins and storm surges
  - ❖ Mental health and extreme weather events
  - ❖ Multi-generational trauma
- **Tribal Health:** The Yurok Tribe Climate Change Health Assessment focused on eight diseases that have strong connections to climate, particularly climate-induced changes to water quantity and quality, and are already affecting a significant portion of Yurok Tribal Members. Each of these diseases falls into one of the three categories below.
  - ❖ Water resources: Waterborne pathogens, Rashes, and Shellfish poisoning
  - ❖ Mental health: Mental health and extreme weather events, and Multi-generational trauma
  - ❖ Subsistence diet: Heart disease, Diabetes, and Cancer

## Existing challenges (sensitivity)

There are a number of existing challenges – or sensitivities – that exacerbate the climate factors facing the Yurok Tribe and need to be taken into consideration when developing adaptive strategies to manage water and aquatic resources. Each priority planning area has specific challenges, but there are also some overarching challenges, some of which include issues related to:

- **Communication:** Tribal departments typically work in silos, with limited interdepartmental consultation and collaboration.
- **Funding:** The Tribe is highly dependent on state and federal grants to fund climate change and natural resource planning and project implementation. Such funding is often insufficient when considering needs, and processes to secure the funds may be complex and difficult to understand.
- **Staffing:** Tribal departments can be understaffed and retention of personnel can be low because living on the Reservation often results in long commutes, and because salaries and benefits are often not competitive with similar positions elsewhere.
- **Monitoring:** Long-term, local datasets are scarce or lacking, and data that are available are not always easily accessible.

- **Youth education and engagement:** The Tribe faces some challenges in educating the next generation of Tribal leaders and resource managers engaging in climate education and adaptation work.

### Yurok strengths (adaptive capacity)

The Yurok Tribe has a great deal of adaptive capacity – or existing strengths – to enable and empower the Tribe to adapt to climate change, including but not limited to:

- **Communication and connection:** In 2016, the Tribe created a new position – Natural Resources Division Coordinator – to enhance collaboration among the programs and departments within the division. The Tribe builds community and communication through ceremonies and gatherings like the Salmon Festival and the annual Klamath River Clean-Up.
- **Staffing:** A conscious decision by Tribal administrators to enable Yurok to sit at any negotiation table on an equal standing to other Federal and State agencies was to recruit the best scientific trained personnel possible to represent Yurok values and protect Yurok lifeways. This has resulted in many excellent biologists, planners, engineers, and more working within a wide cross-section of Tribal departments.
- **Legal:** Tribal ordinances (for example, related to harvesting) can be changed fairly quickly to adjust to increasingly uncertain environmental conditions that may occur with climate change and are designed to include Tribal values and practices such as restorative justice.
- **Education and engagement:** A variety of opportunities exist for Yurok Members to further their education from pre-school through college, such as Yurok language programs at high schools and tele-presence initiative with the College of the Redwoods. Youth can also participate in the U.S. Fish and Wildlife Service’s Klamath Tribal Youth Program, and The Warrior Institute, a non-profit organization based in Hoopa, hosts programs including river, ocean, mountain, fitness, food and farm, language, and arts programs. This could ultimately support cohorts of Members who can work on climate change adaptation for the Tribe.
- **Traditional and community knowledge:** Yurok Tribal elders and community members have a wealth of traditional and community knowledge that has informed this adaptation planning process during all stages. This includes understandings of how the climate has been changing, insights into species’ behaviors and roles within ecosystems, and knowledge of how non-climatic factors are interacting with climatic ones to impact aquatic resources on the Reservation and in the Yurok Ancestral Territory. It also includes identifying adaptation strategies that can increase the resilience of both ecosystems and people.

### Key cross-cutting adaptation strategies

During the planning process, ideas from Yurok Tribal Members, Tribal staff, and a literature review resulted in over 400 adaptation actions being identified. These potential actions provide an extensive menu for Yurok Tribal departments, staff, and Members to choose pathways on how to move forward. Some actions may be relatively easy and minimal cost to implement while others may require longer-term sustained effort. The actions may become more or less applicable when considering staff and funding sources available to accomplish them. For those that seem out of reach with current resources, they could be used as touch points for focusing on building capacity needs.

In order to focus and guide next steps in implementing this climate change adaptation plan, the planning team evaluated the actions identified, considering factors such as whether the actions: address important areas of concern, are in line with the Yurok holistic world view on the inter-connectedness of all things,

provide benefits across multiple habitats and species and the degree of benefit provided, and might cause harm in some way.

Taking into account these factors the team honed in on three overarching adaptation themes that together help restore balance to the ecosystem and support Yurok water and food sovereignty and Tribal health. The themes revolve around restoring and strengthening:

- ❖ Healthy and connected species and ecosystems
- ❖ Healthy and connected individuals and communities
- ❖ Human-environment connections

For each of these three broad, inter-related themes, the planning team identified different strategies for achieving these goals as well as some more specific approaches and potential next steps or actions. To read more about these strategies, the complete **Yurok Tribe Climate Change Adaptation Plan for Water and Aquatic Resources**, and other related products, go to:

[www.yuroktribe.org/departments/ytep/com\\_eco\\_reports.htm](http://www.yuroktribe.org/departments/ytep/com_eco_reports.htm).

For further information, contact the Yurok Tribe Environmental Program, [www.yuroktribe.org/departments/ytep](http://www.yuroktribe.org/departments/ytep) or 707.482.1822.