Yurok Tribe and Climate Change:

An Initial Prioritization Plan

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Yurok Tribe Environmental Program

With Funding from
USEPA Environmental Justice Small Grants Program

September 2011

Introduction

Purpose of the Project

To conduct a preliminary assessment of available information on Climate Change, potential regional and local impacts on Yurok People, Resources and Lifeways for the purposes of identifying community priorities for a Yurok response to a changing environment.

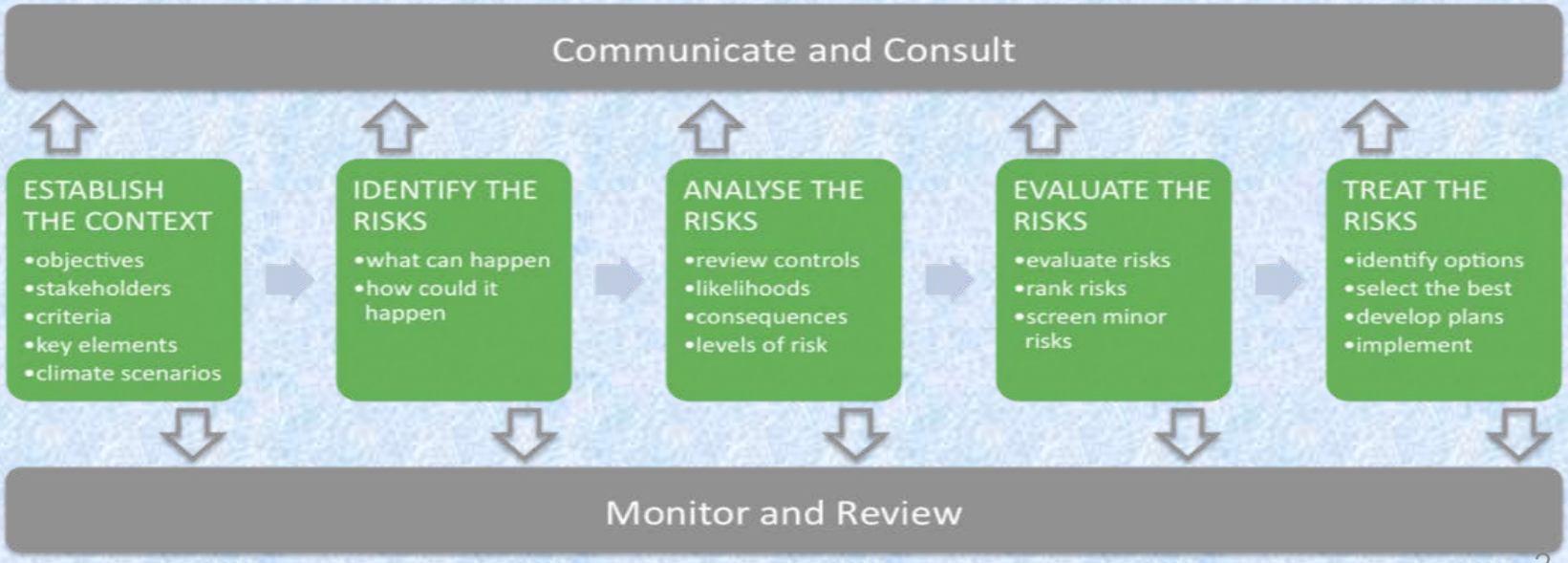
Purpose of this Plan

To provide summary information, research findings and Tribal staff /community recommendations to Yurok Tribal leadership , Tribal members, community residents and decision-makers to inform future Yurok Tribe Climate Change research and planning efforts.

Methods Used for this Study

Background research, technical training for Environmental Program staff, and community-based participatory research to identify Tribal priority areas of concern and response.

The first two steps in the process illustrated below describe the methods used by the Yurok Tribe Environmental Program to complete this project and report. Next steps: conduct Vulnerability Assessment to complete the next 2 steps in the planning process. The final step will be the completion of Yurok Tribe Climate Change Mitigation and Adaptation Plans.



Project Overview

The 2010 Environmental Justice grant from USEPA enabled Yurok Tribe Environmental Program staff to complete the following:

- Build partnerships and develop staff capacity on technical and scientific issues surrounding Climate Change, research, state of the science, and planning and response efforts by Tribes, federal and state agencies.
- Compile available information on Climate Change impacts at the global, regional and local level and identify data gaps and information needs specific to Yurok.
- Conduct community scoping with Tribal Council, Tribal Membership and Tribal staff and departments to share information on Climate Change, consider potential impacts, and identify Tribal priorities for Climate Change research, planning and response.
- Completion of an Initial Yurok Tribe Climate Change Prioritization Plan.

Environmental Justice Issues

Climate Change is a growing Environmental Justice Issue for Indigenous People throughout the world.

Disproportionate and adverse impacts resulting from Climate Change, including lack of representation in governmental and agency planning efforts, are significant Environmental Justice issues facing Tribes and Tribal governments.

Tribes need dedicated resources to adequately advocate for Tribal rights, Trust Resources and to counter the disproportionate and adverse impacts on tribal communities as a result of Climate Change: impacts, planning and responses.

The United Nations Permanent Forum on Indigenous People states:

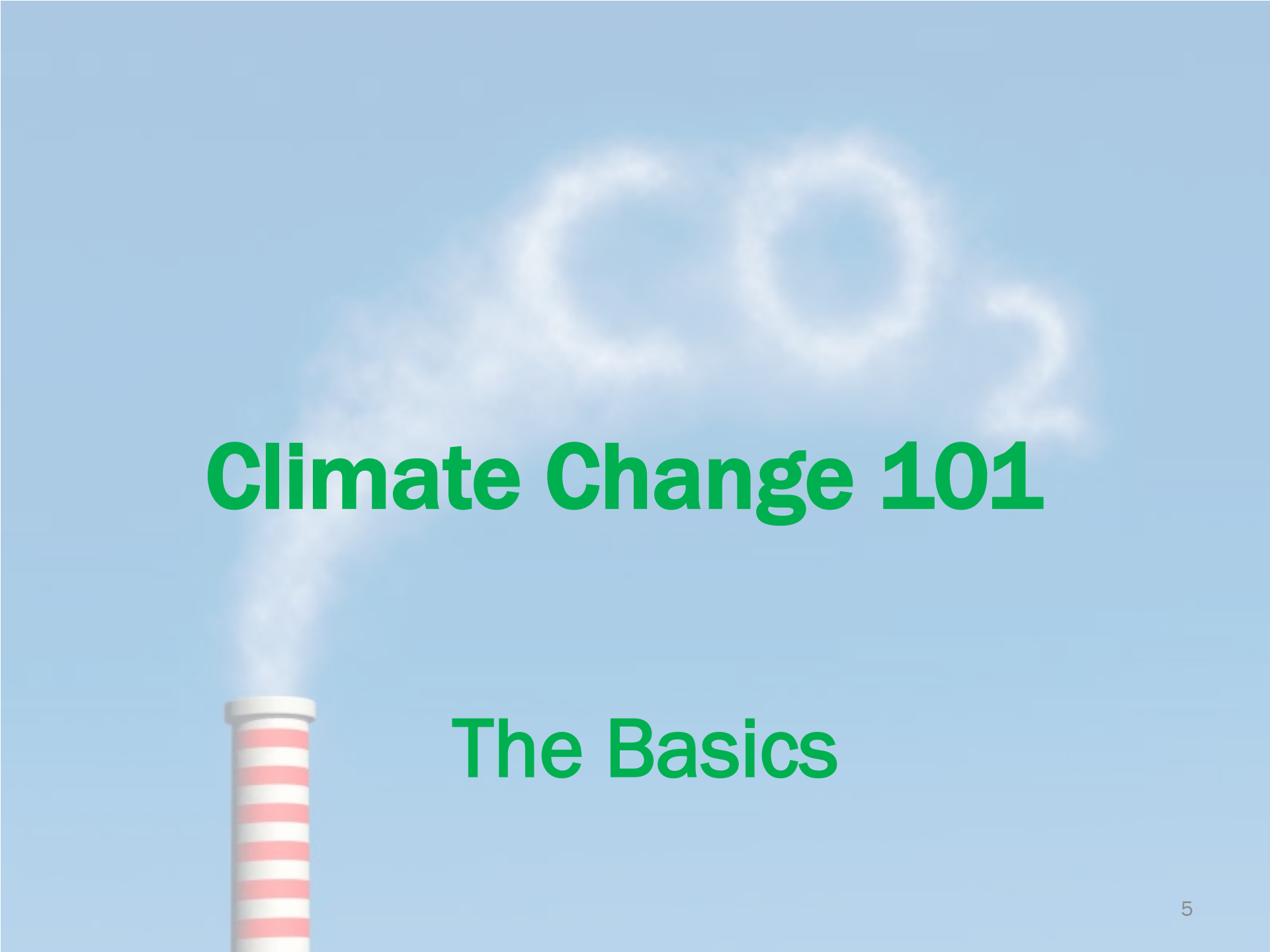
"Indigenous peoples are among the first to face the direct consequences of Climate Change, due to their dependence upon, and close relationship, with the environment and its resources. Climate Change exacerbates the difficulties already faced by indigenous communities including political and economic marginalization, loss of land and resources, human rights violations, discrimination and unemployment."

The 1994 Presidential Executive Order 12898 on Environmental Justice states:

"…each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations…"

Environmental justice (EJ) is defined in California law (Government Code section 65040.12) as:

"….the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws and policies."



Climate Change 101

The Basics

Climate Change Basics

What is Climate Change?

*"The term **Climate Change** is used to refer to changes in the Earth's climate. In the most general sense, it can be taken to mean changes over all timescales and in all of the components of climate, including precipitation and clouds as well as temperature. Climate changes can be caused both by natural forces and by human activities.*

However in recent usage, especially in the context of environmental policy, it refers more specifically to changes being studied in the present, including an average rise in surface temperature, or global warming. International efforts to study and address Climate Change are coordinated through the United Nations Framework Convention on Climate Change. Note, however, that the UNFCCC uses "Climate Change" for human caused change and "Climate variability" for non-human caused change. Sometimes the term "Anthropogenic Climate Change" is used to indicate the presumption of human influence."

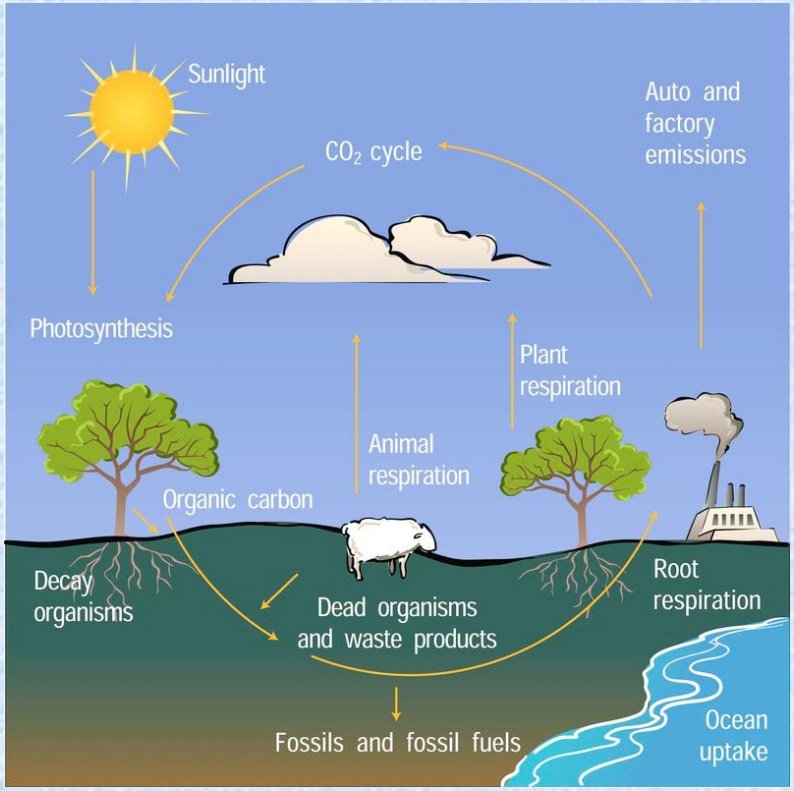
Source: http://www.wordiq.com/definition/Climate_change

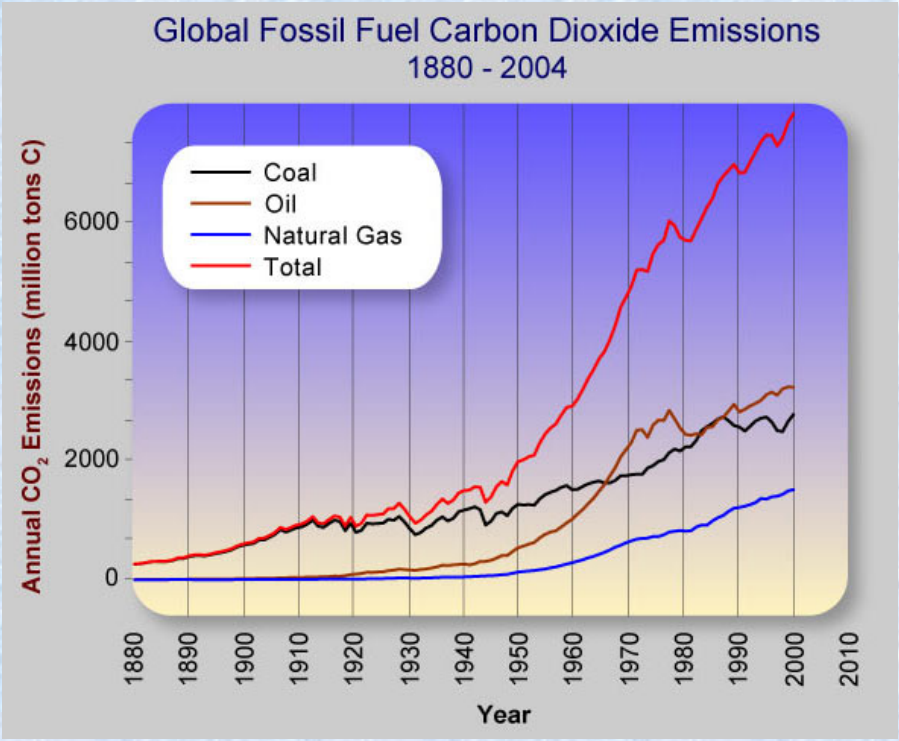
Climate Change Jargon:

- Carbon Cycle
- Green House Gas (GHG)
- Global Warming
- Models and Scenarios
- Vulnerability
- Resiliency
- Mitigation
- Adaptation

The Carbon Cycle

Carbon Dioxide (CO2) has a natural cycle for moving through our planet's atmosphere and environment.

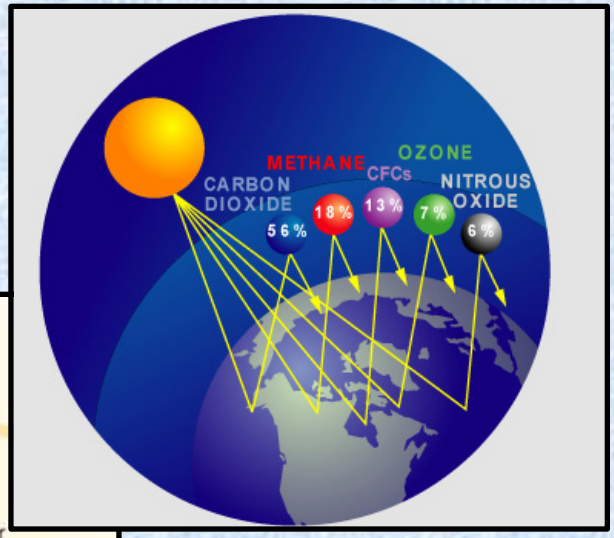


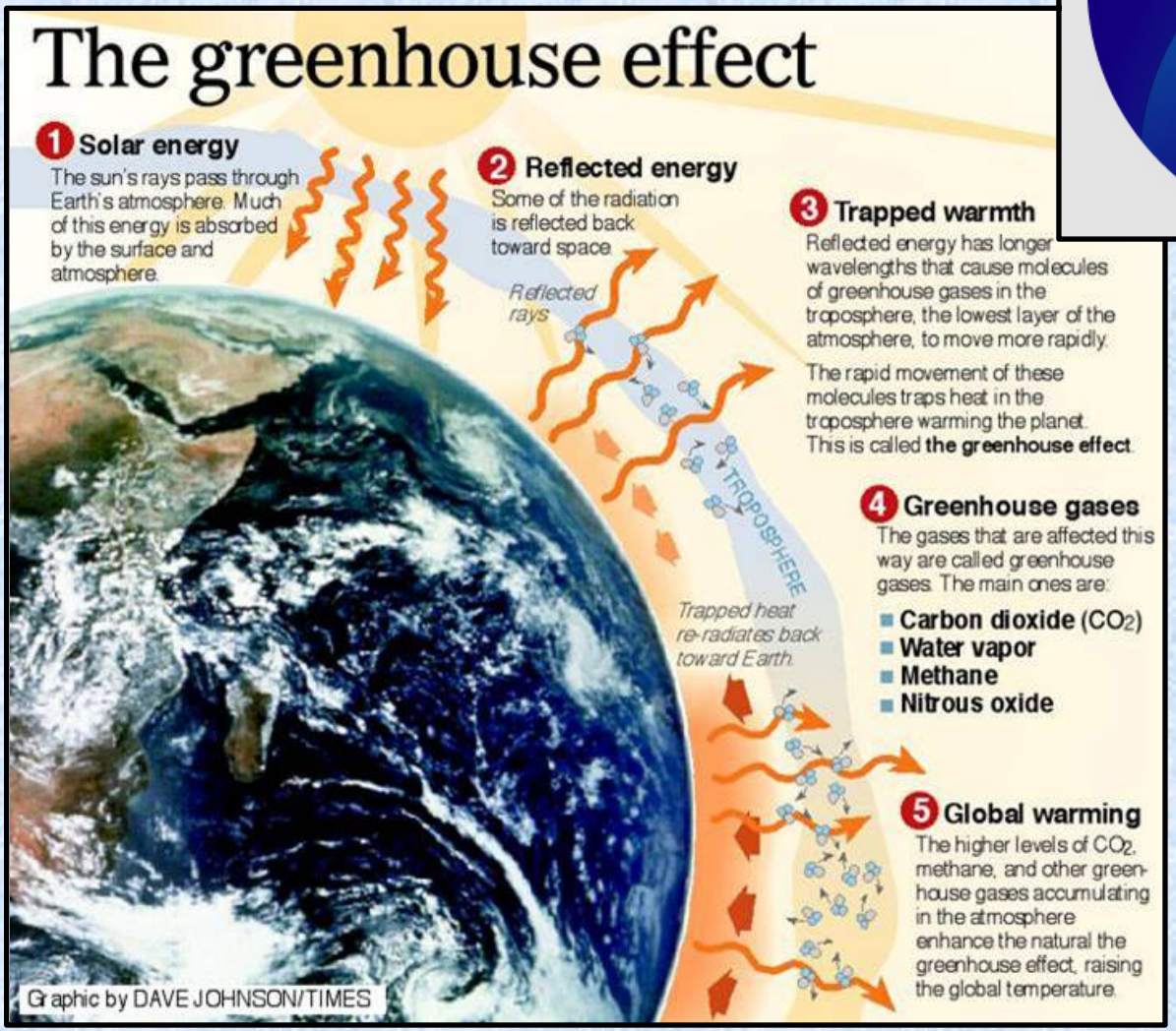


The burning of fossil fuels starting in the Industrial Age has resulted in excess CO2 in our global atmosphere and environment.

Green House Gases

Green House Gases (GHGs) exist in our atmosphere and trap heat that warms the planet.

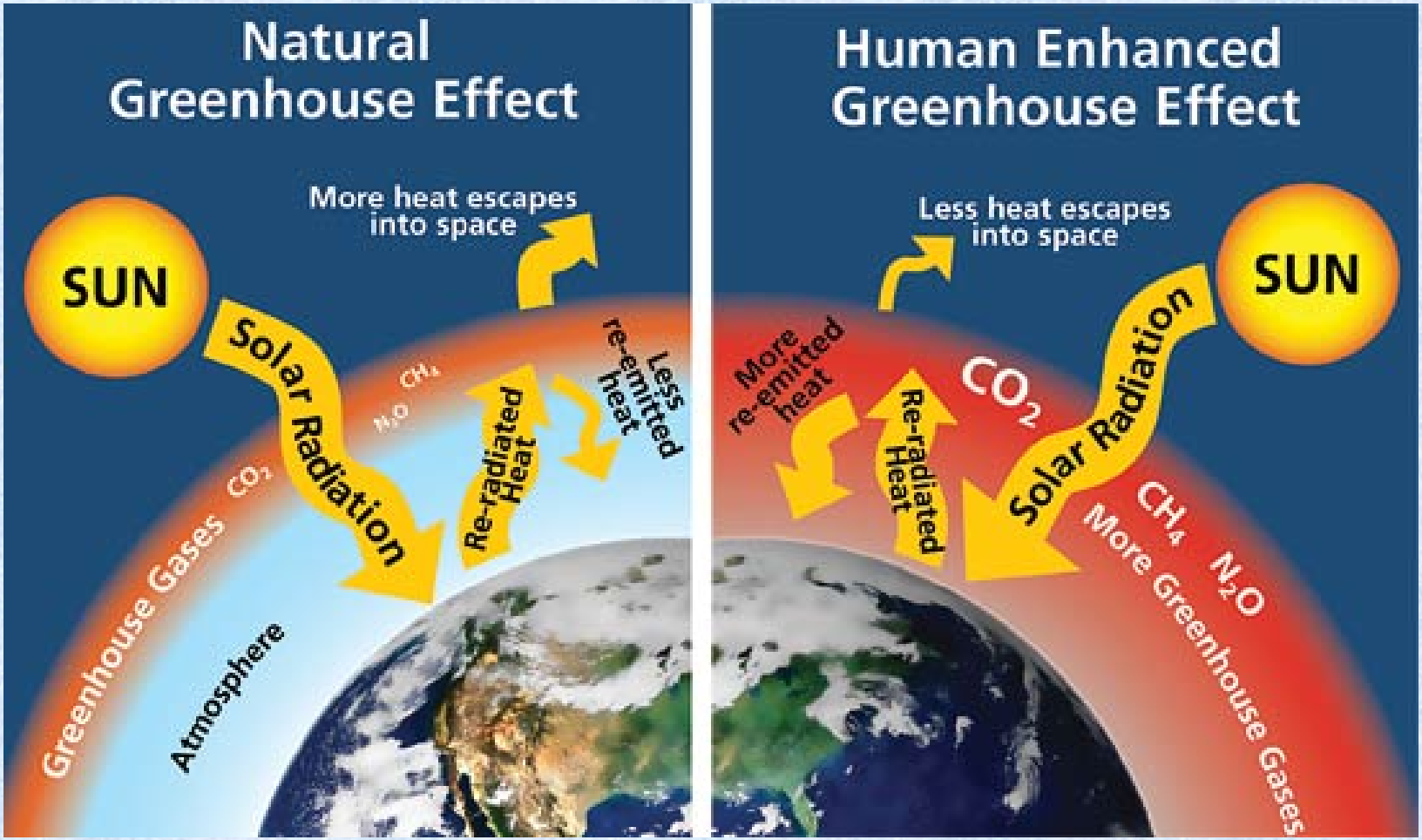




An increase in GHGs results in an increase in the amount of heat trapped on our planet.

GHGs: Natural vs Human Caused

Human behavior has resulted in the "Enhanced Greenhouse Effect". This is why recent Climate Change is often referred to as "*Anthropogenic*", meaning it is caused by human activity. An increase in GHGs results in more heat being trapped in the Earth's atmosphere.



GHGs and Human Causes

Climate Change is attributed to *Anthropogenic* (Human) causes based upon the increases in GHGs as a result of human, industrial activities.

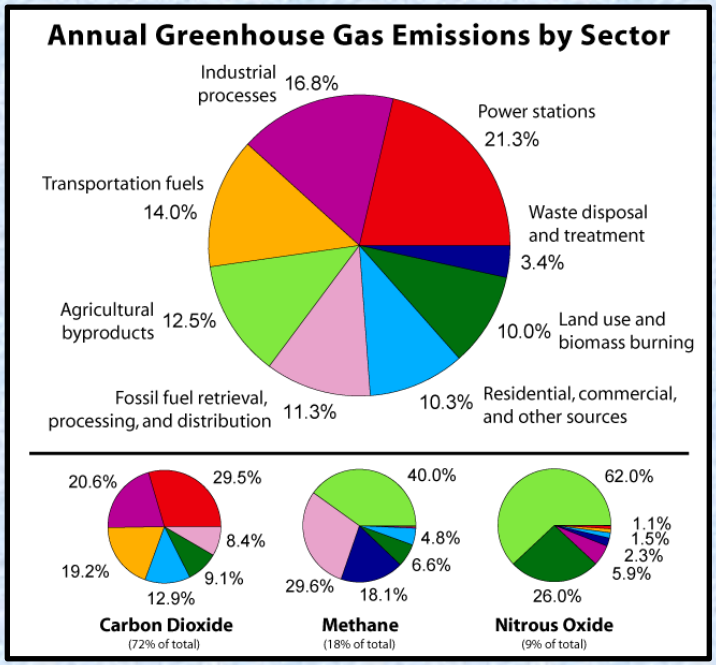
The main greenhouse gases

Name	Pre-industrial concentration (ppmv *)	Concentration in 1998 (ppmv)	Atmospheric lifetime (years)	Main human activity source	GWP **
Water vapour	1 to 3	1 to 3	a few days	-	-
Carbon dioxide (CO_2)	280	365	variable	fossil fuels, cement production, land use change	1
Methane (CH_4)	0,7	1,75	12	fossil fuels, rice paddies waste dumps, livestock	23
Nitrous oxide (N_2O)	0,27	0,31	114	fertilizers, combustion industrial processes	296
HFC 23 (CHF_3)	0	0,000014	260	electronics, refrigerants	12 000
HFC 134 a (CF_3CH_2F)	0	0,0000075	13,8	refrigerants	1 300
HFC 152 a (CH_3CHF_2)	0	0,0000005	1,4	industrial processes	120
Perfluoromethane (CF_4)	0,00004	0,00008	> 50 000	aluminium production	5 700
Perfluoroethane (C_2F_6)	0	0,000003	10 000	aluminium production	11 900
Sulphur hexafluoride (SF_6)	0	0,0000042	3 200	dielectric fluid	22 200

* ppmv = parts per million by volume, ** GWP = Global warming potential (for 100 year time horizon).

UNEP | GRID Arendal

United Nations Environment Programme / GRID-Arendal

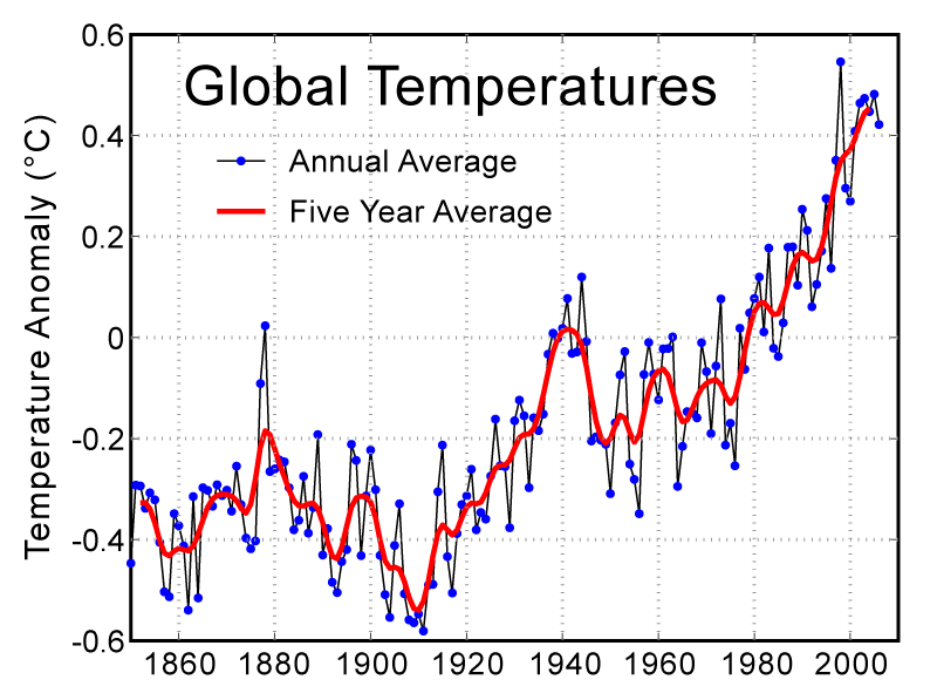


It is the increase in GHGs, and the resulting increase in the amount of heat trapped in our atmosphere that causes the phenomenon known as *Global Warming*.

Common Sources of GHGs

Global Warming

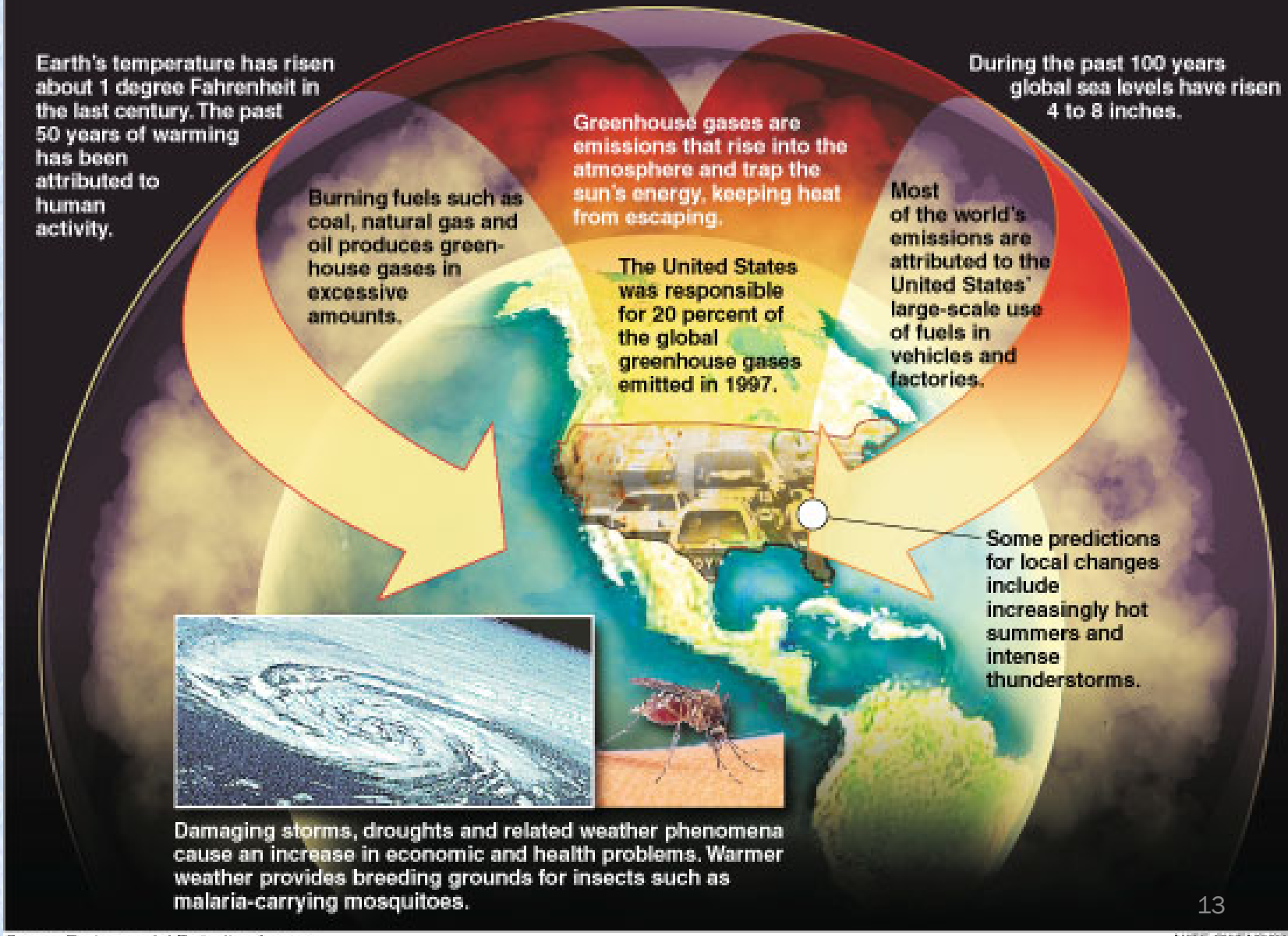
*"**Global Warming** is a term used to describe an increase over time of the average temperature of Earth's atmosphere and oceans. Global warming theories attempt to account for the rise in average global temperatures since the late 19th century (0.6 ± 0.2 °C) and assess the extent to which the effects are due to human causes.*



The most common global warming theories attribute temperature increases to increases in the greenhouse effect caused primarily by anthropogenic (human-generated) carbon dioxide."

Source:http://www.wordiq.com/definition/Global_warming

Global warming: Causes and effects



Source: Environmental Protection Agency

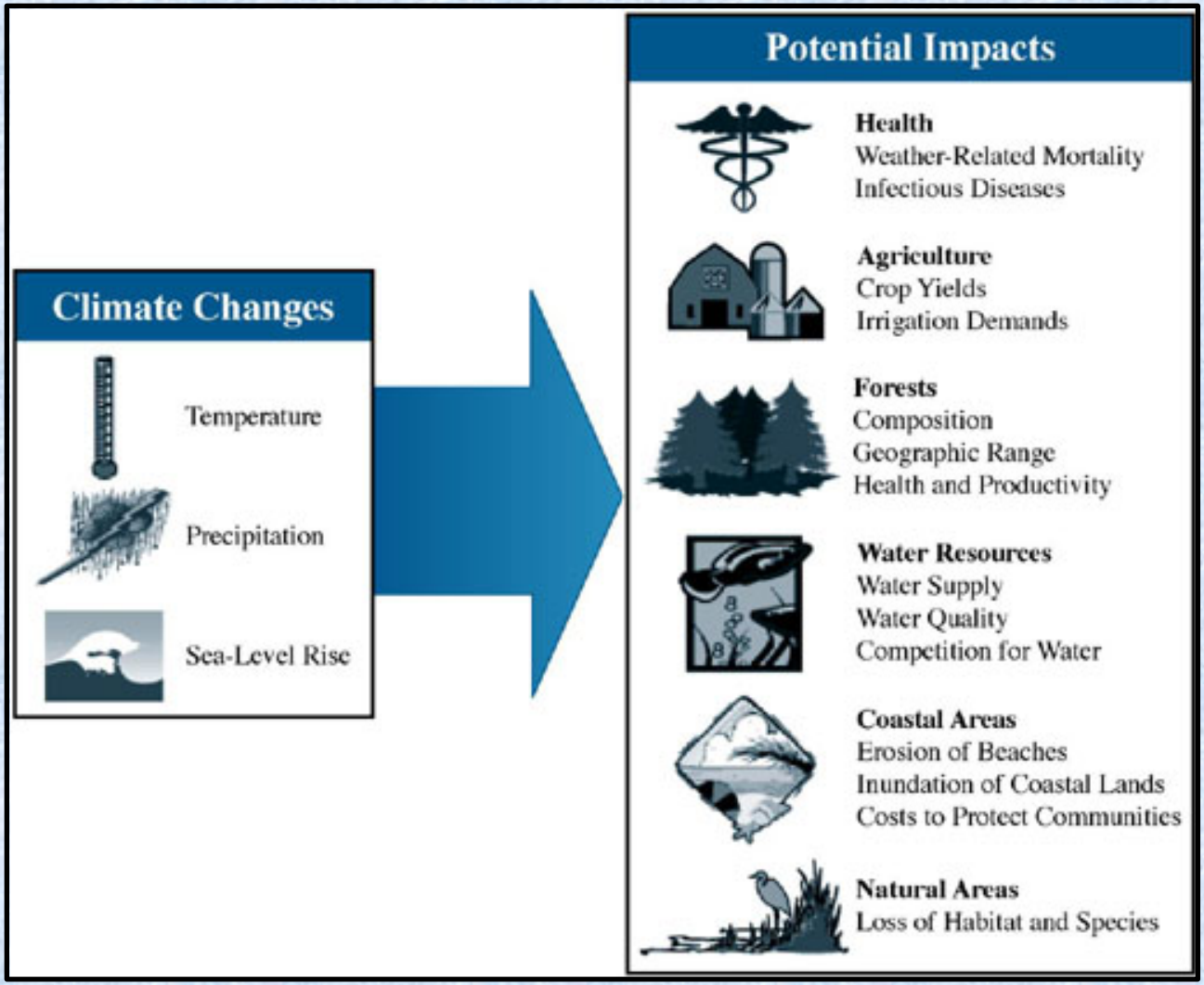
NATE OWENS/STAFF

Predicting Climate Change

Climate Change has the potential to impact all sectors of society, regardless of where you live.

Predicting probable impacts can help communities build resiliency and plan for an uncertain future.

Climate Change Models and Scenarios have been developed to predict potential impacts on specific sectors and regions to inform decision-makers in planning responses to Climate Change



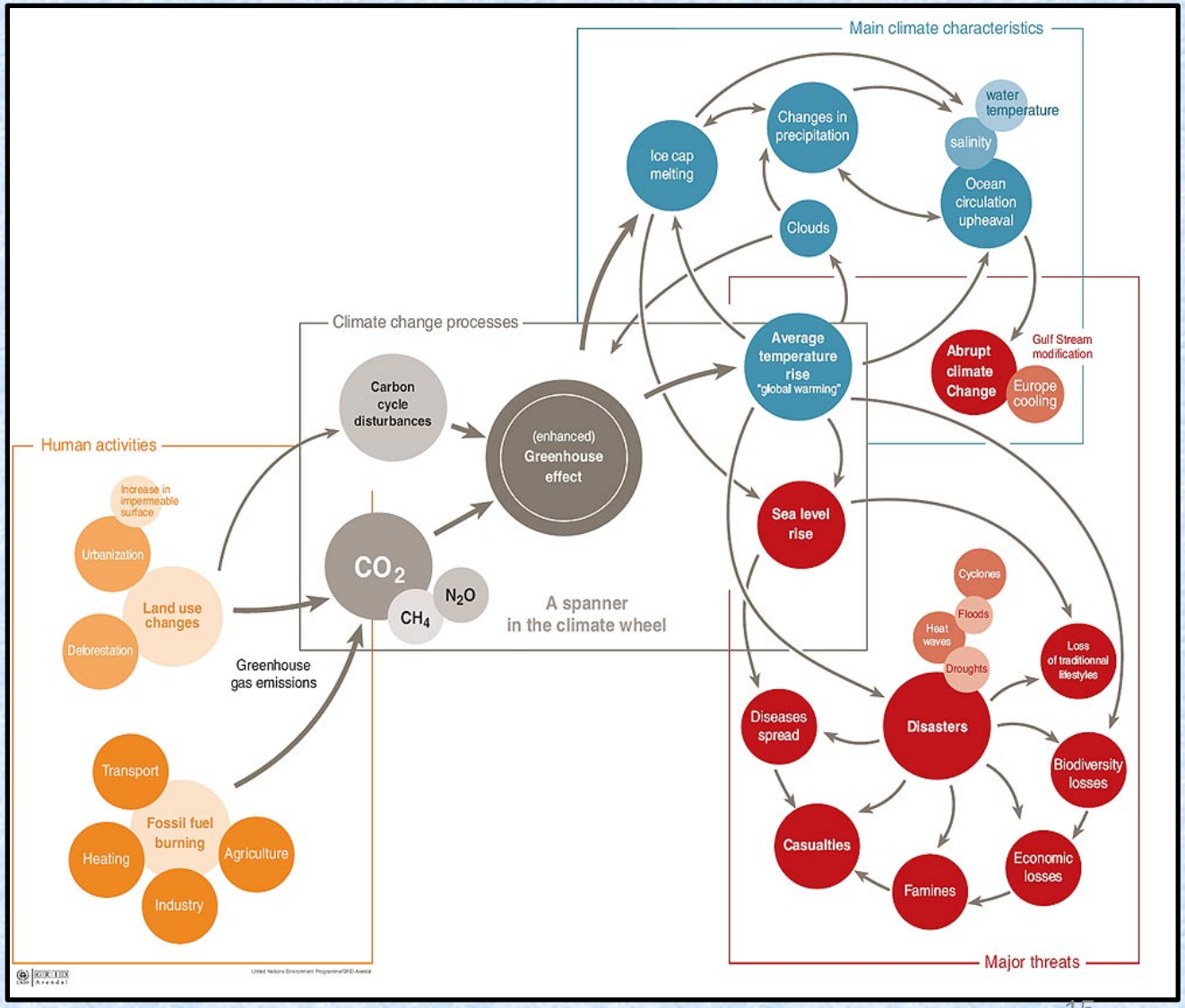
Climate Change Models

Climate Change Models are developed to predict future impacts and scenarios.

Due to the number of variables, modeling Climate Change is very complex.

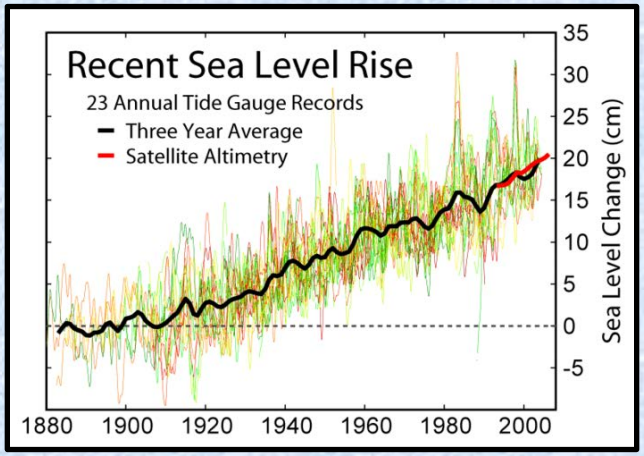
Recent observed changes indicate that previous Climate Change models were too conservative.

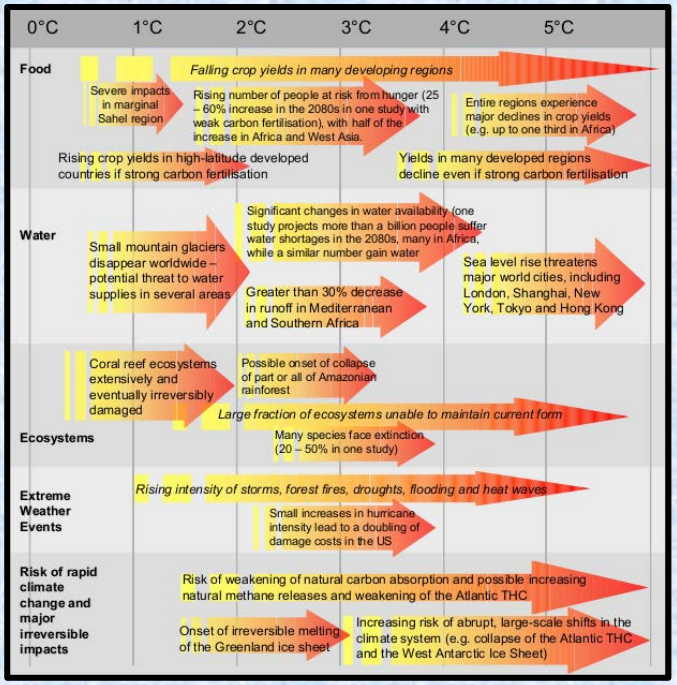
The Global Climate is changing faster than predicted.

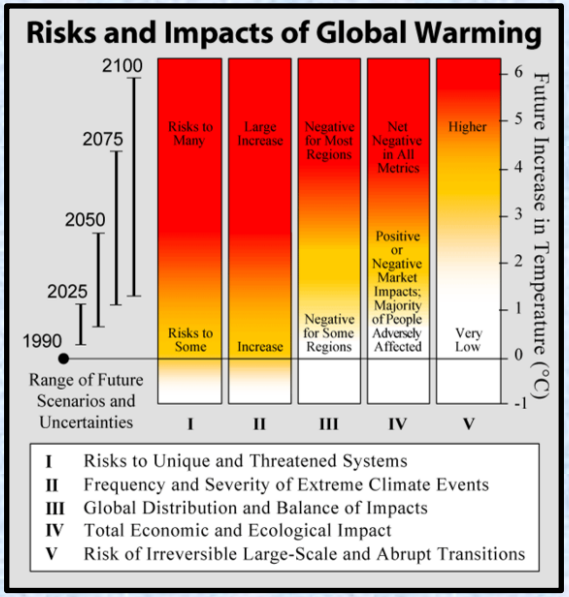


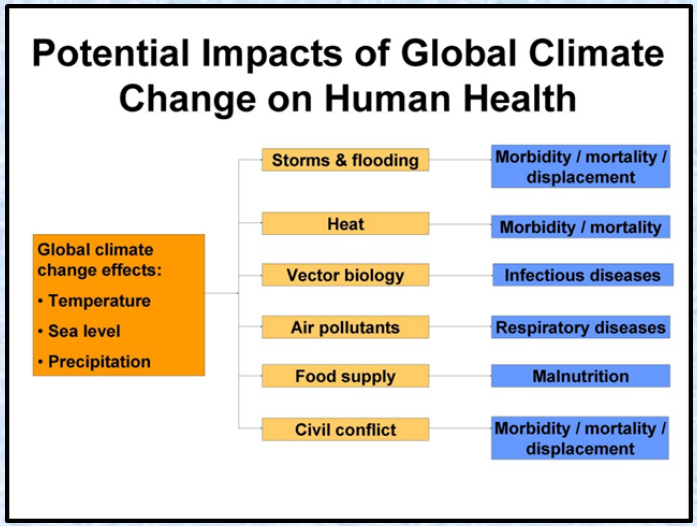
Observed and Predicted Risks

Observations of actual Climate Change impacts can help inform risk assessments for specific sectors and communities.

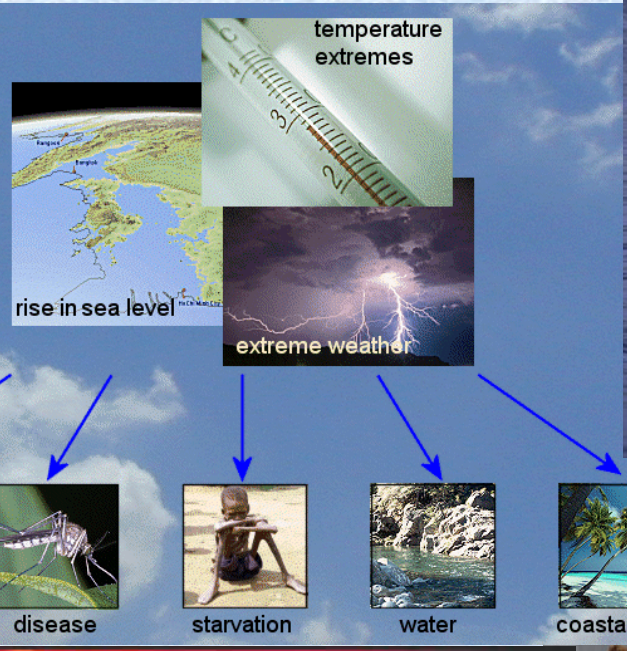


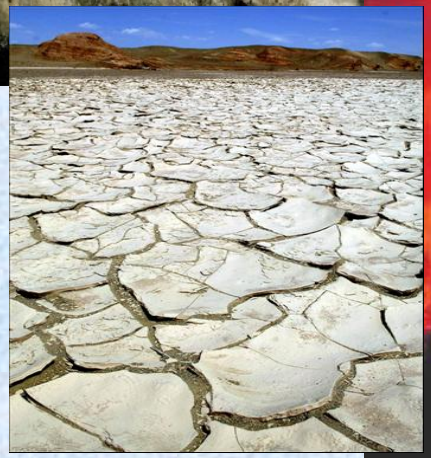




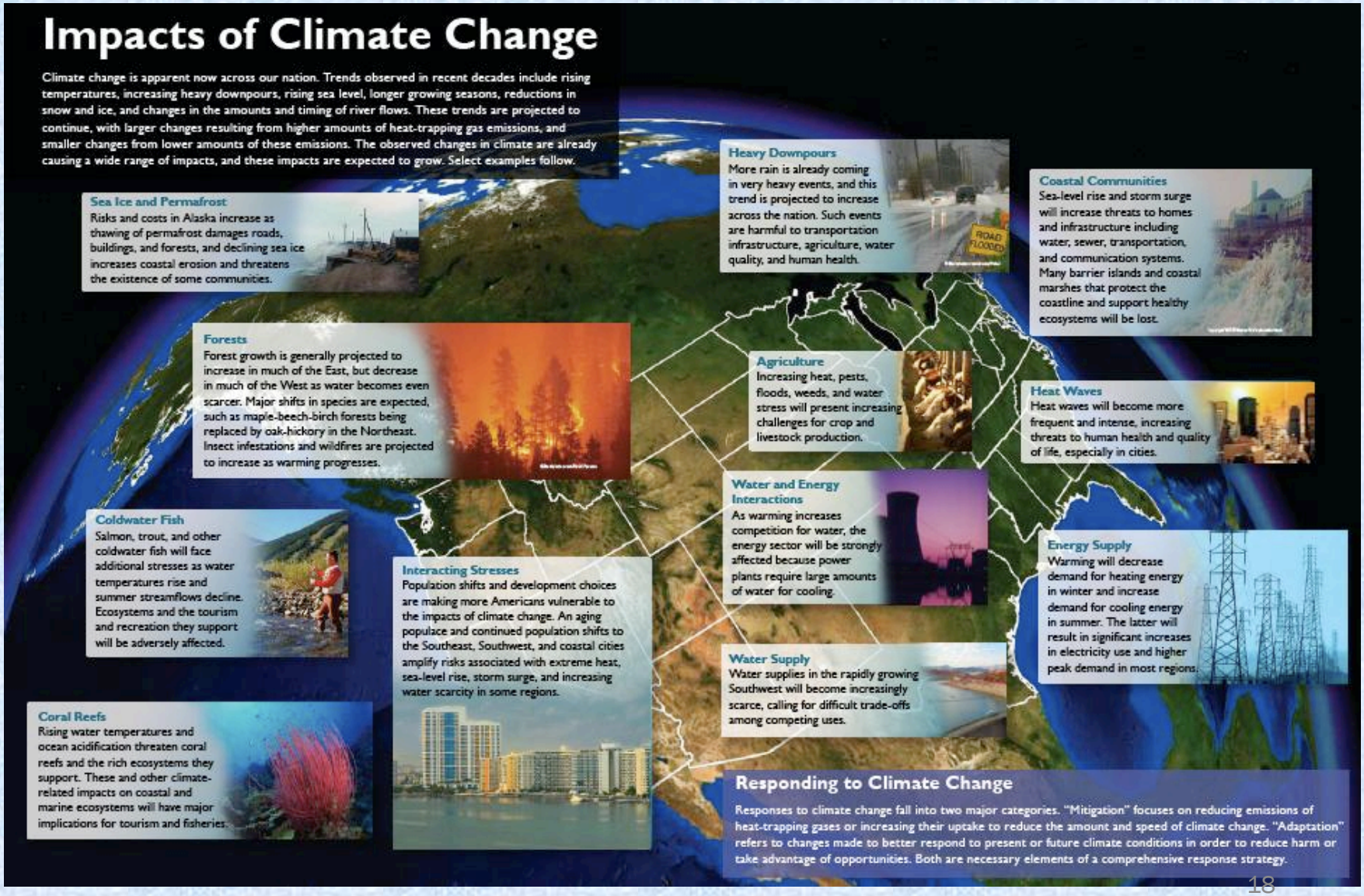


Observed Impacts: Global

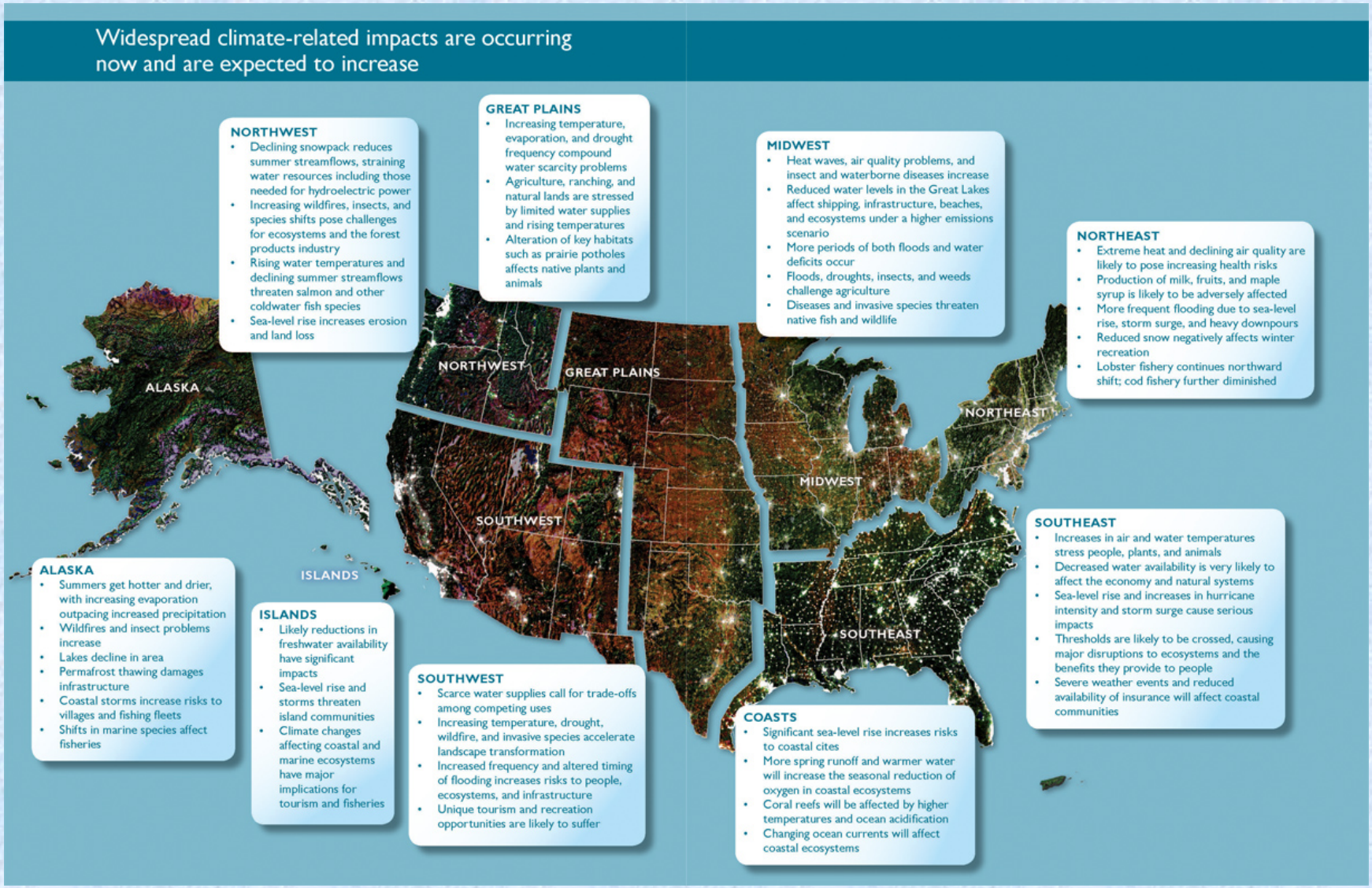




Climate Change Impacts: National

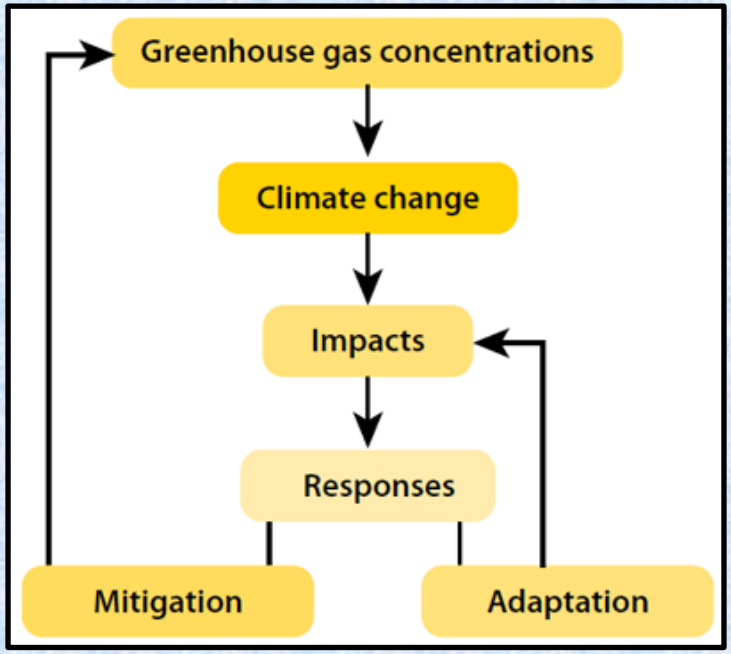


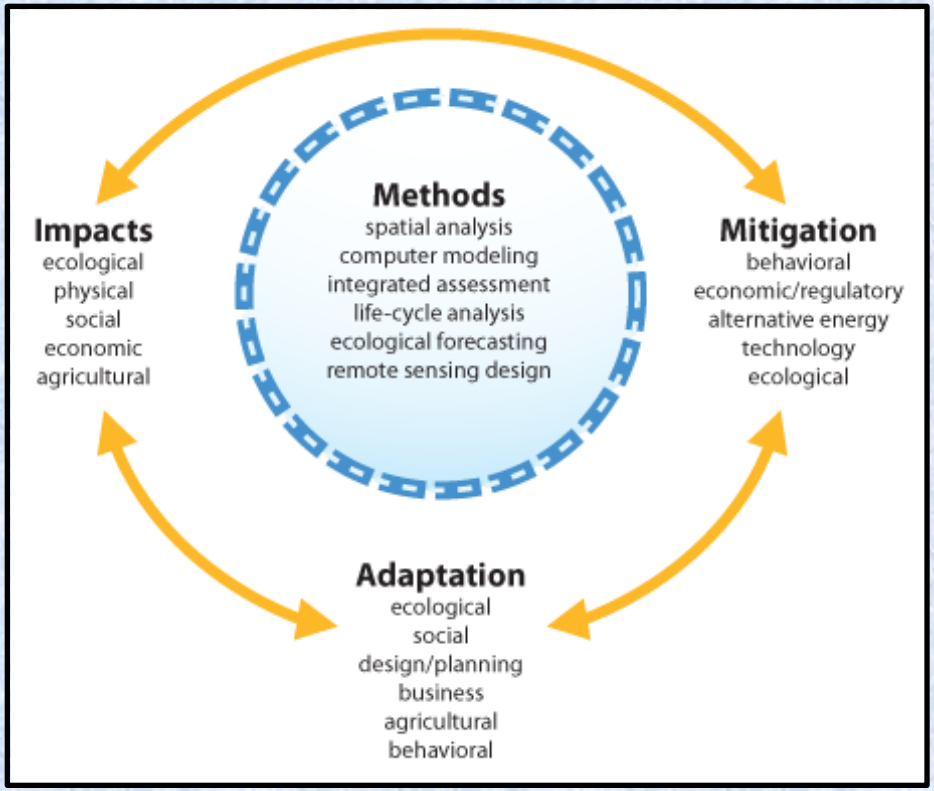
Climate Change Impacts: Regional



Planning for Climate Change

Planning to respond to Climate Change impacts is a complex challenge requiring technological and scientific tools integrated with local knowledge and observations.





Climate Change response typically falls into two categories: "*Mitigation*" and "*Adaptation*".

Climate Change and Mitigation

*"Climate change **mitigation** is action to decrease the intensity of radiative forcing in order to reduce the potential effects of global warming. Most often, climate change mitigation scenarios involve reductions in the concentrations of greenhouse gases, either by reducing their sources or by increasing their sinks.*

The UN defines mitigation in the context of climate change, as a human intervention to reduce the sources or enhance the sinks of greenhouse gases.

Examples include using fossil fuels more efficiently for industrial processes or electricity generation, switching to renewable energy (solar energy or wind power), improving the insulation of buildings, and expanding forests and other "sinks" to remove greater amounts of carbon dioxide from the atmosphere."

Source: http://en.wikipedia.org/wiki/Climate_change_mitigation

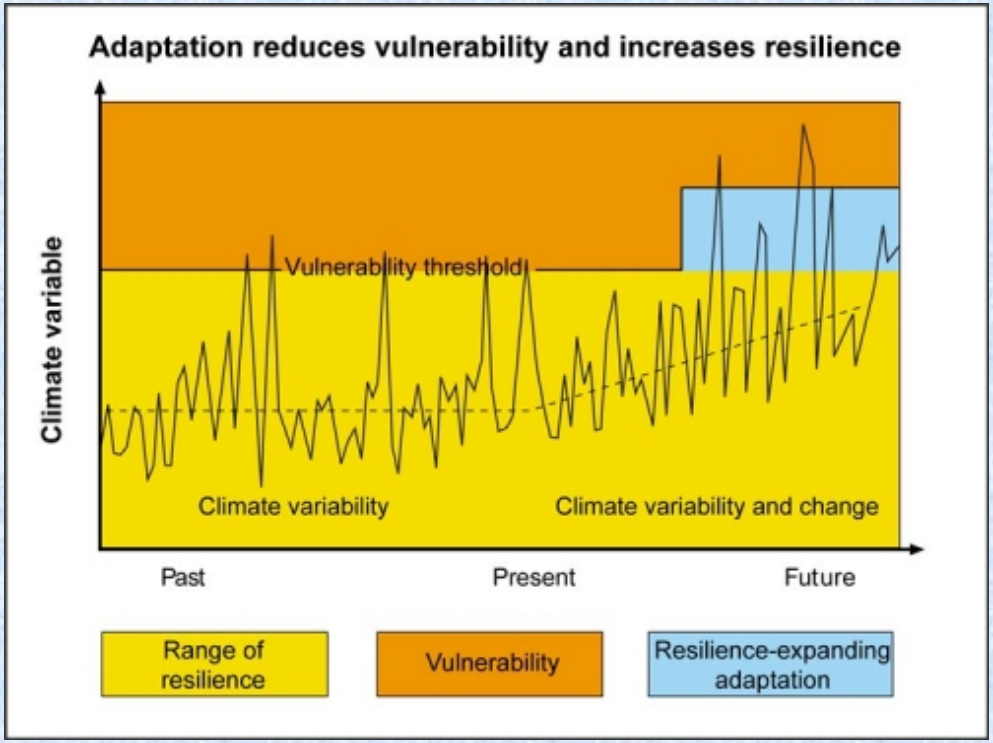
Climate Change and Adaptation

*"**Adaptation** to global warming and climate change is a response to climate change that seeks to reduce the vulnerability of natural and human systems to climate change effects.*

Even if emissions are stabilized relatively soon, climate change and its effects will last many years, and adaptation will be necessary. Climate change adaptation is especially important in developing countries since those countries are predicted to bear the brunt of the effects of climate change.

Adaptation will be more difficult for larger magnitudes and higher rates of climate change."

Source: http://en.wikipedia.org/wiki/Climate_change_adaptation



*"**Resilience** is the capacity of an ecosystem [or community] to respond to a perturbation or disturbance [change] by resisting damage and recovering quickly. "*

Source: http://en.wikipedia.org/wiki/Resilience_%28ecology%29#Climate_change

Climate Change and Yurok

Potential Impacts to Yurok Territory, Communities and Tribal Trust Resources

Climate Change Impacts: Yurok

Some Climate Change Impacts on Yurok Lands and Resources are already observable, other impacts are predicted to occur in the future.

- Sea Level Rise
- Changes in Temperature
- Changes in Precipitation
- Changes in Hydrology
- Changes in Aquatic Resources
- Changes in Terrestrial Resources

Sea Level Rise & Yurok Territory

Global Warming is predicted to result in sea level rise, impacts coastal communities and areas around the globe.

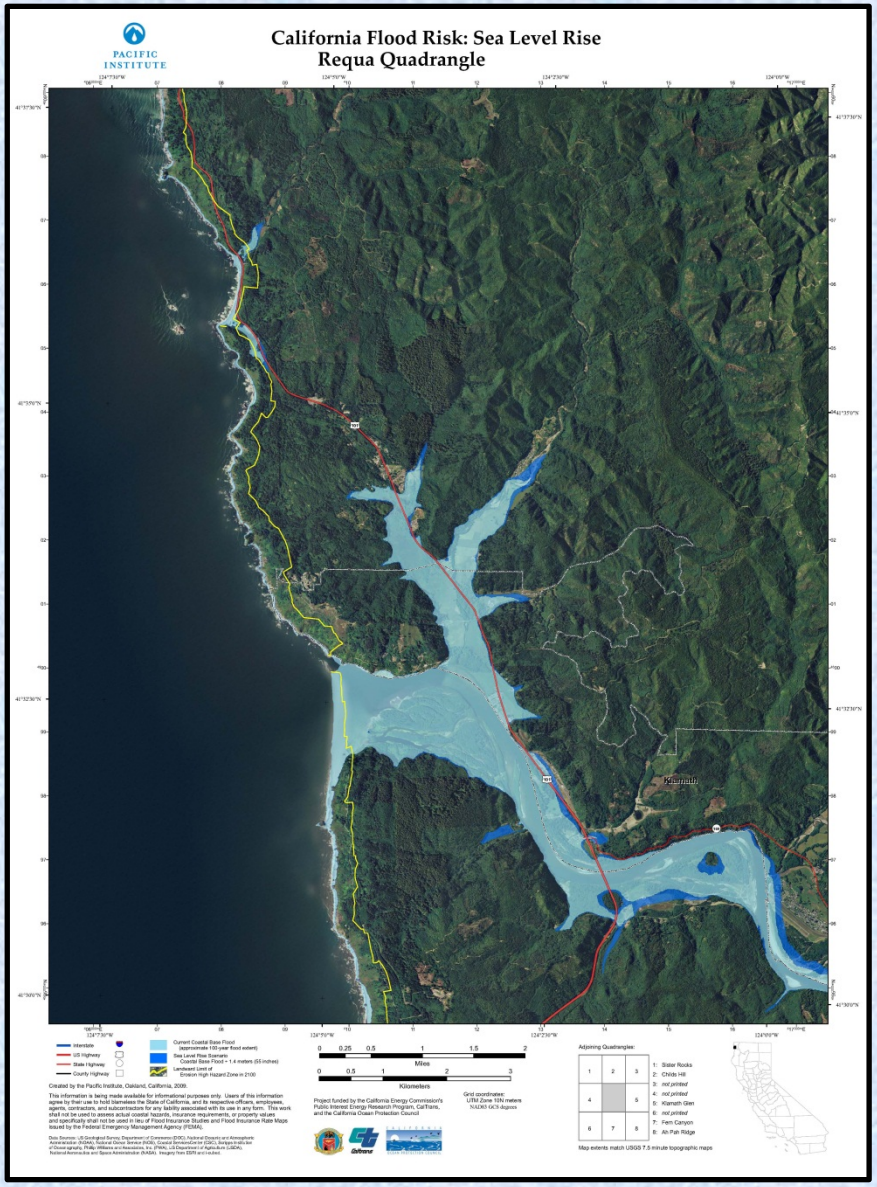
Sea level rise is a result of melting polar ice caps and glaciers, increasing the amount of water in the world's oceans.

The Pacific Institute developed maps for the purposes of illustrating sea level rise along the California Coast.

Current scientific observations indicate that sea level rise is happening faster than previously predicted.

Predicted impacts are coastal erosion (yellow line) and coastal inundation (the blue areas).

The Lower portions of the Yurok Reservation will experience the most impacts from sea level rise.



Sea Level Rise & Yurok Territory

Predicted Sea Level rise along the coastal areas of Yurok Territory would impact coastal lagoons, communities and numerous Trust Resources around these ecosystems.

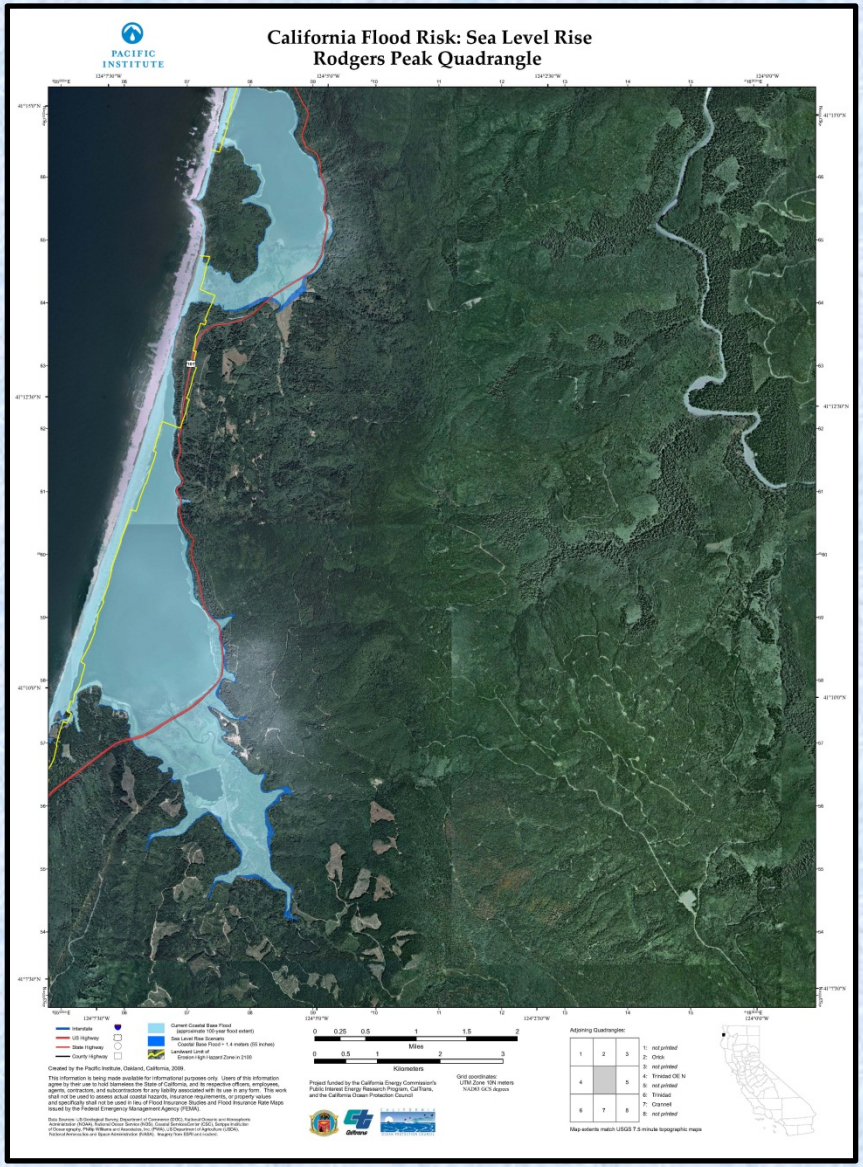
Coastal lagoons and resource areas will be inundated by the Pacific Ocean .

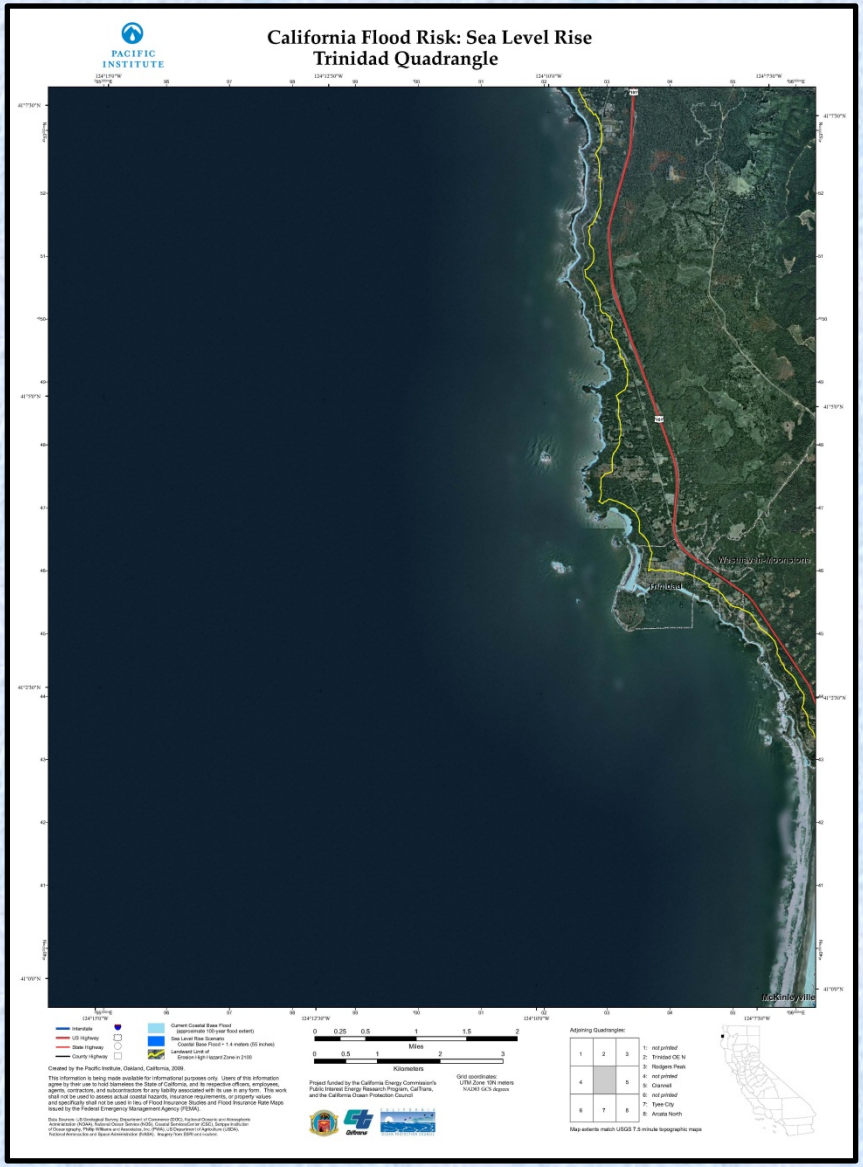
Numerous Cultural and Subsistence Resources and Use Areas will be impacted.

Plant and animal communities that inhabit these unique ecosystems may be lost, or forced to migrate to more suitable habitats.

Flooding and erosion of coastal areas threatens coastal communities, including places where many Yurok People live.

Sea Level Rise & Yurok Territory



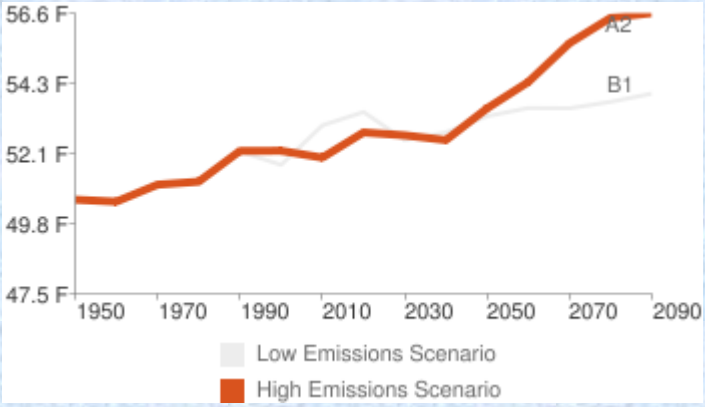


Temperature Change & Yurok

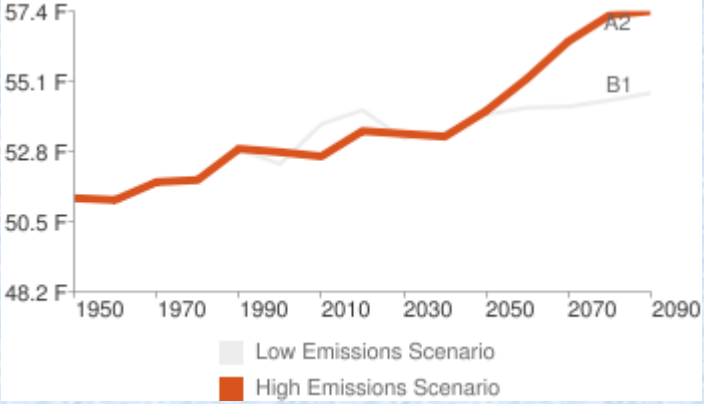
California has developed Climate Change Models to predict temperature changes over time. Source: http://cal-adapt.org/

Changes in temperature will impact water temperature, aquatic and terrestrial species and associated habitats.

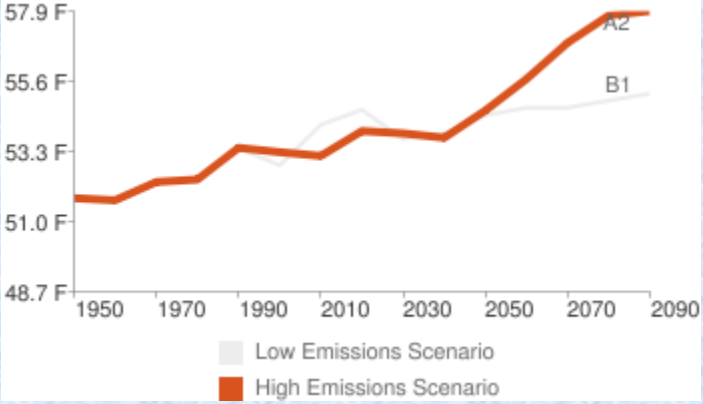
Klamath Area: Predicted Temperature Change



Freshwater Area: Predicted Temperature Change



Weitchpec Area: Predicted Temperature Change



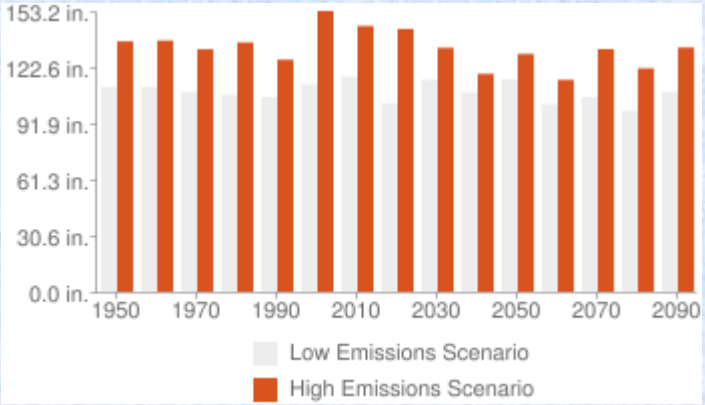
Precipitation Changes & Yurok

California has developed Climate Change Models to predict potential impacts. Source: http://cal-adapt.org/

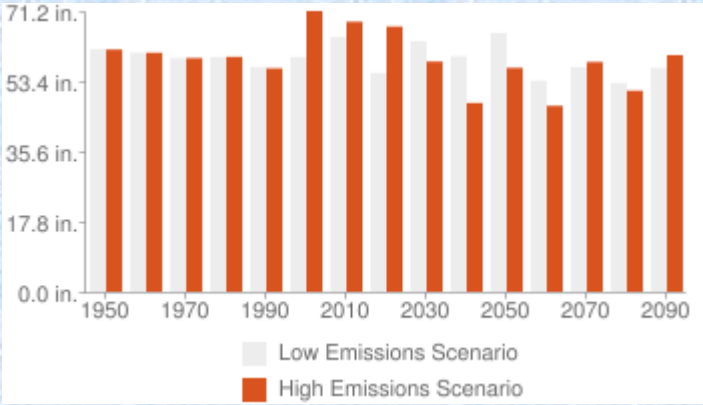
The graphs illustrate the predicted changes in precipitation throughout Yurok Territory.

Changes in precipitation may be in the amount of precipitation or the type (rain or snow).

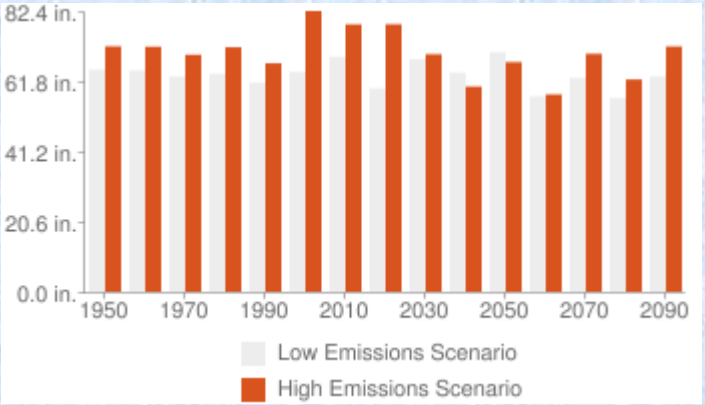
Klamath Area: Predicted Changes in Precipitation



Freshwater Area: Predicted Changes in Precipitation



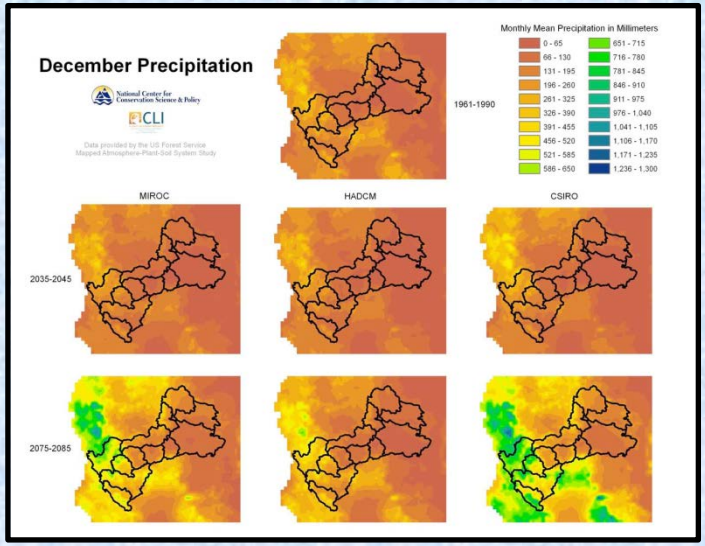
Weitchpec Area: Predicted Changes in Precipitation

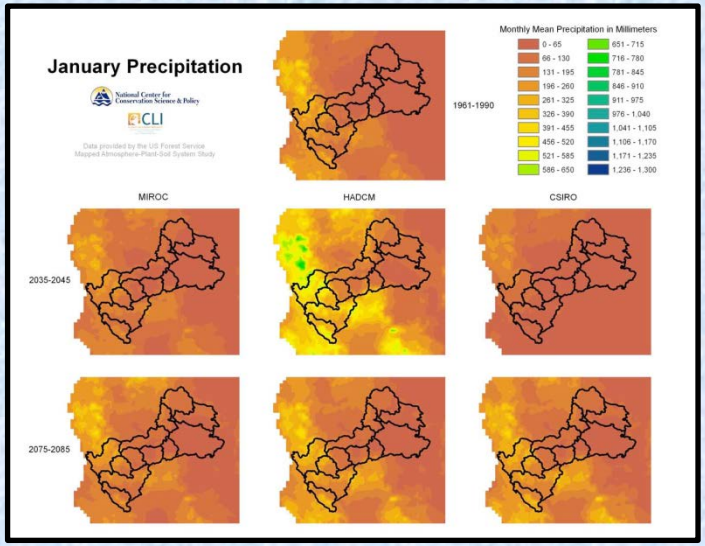


Precipitation Changes & Yurok

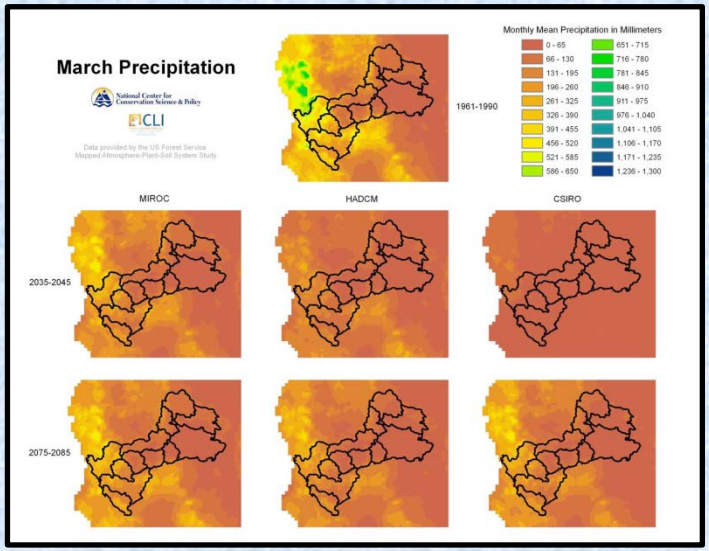
Klamath Basin

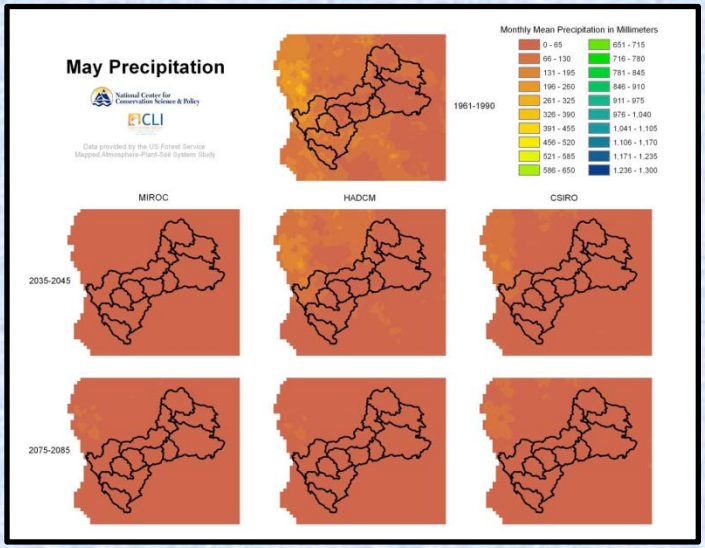
Three Climate Scenarios have been used to predict future changes in monthly precipitation in the Klamath Basin.





Changes in precipitation will impact snow pack and water availability, timing and intensity of rain events (ie: floods), stream flows and temperatures.



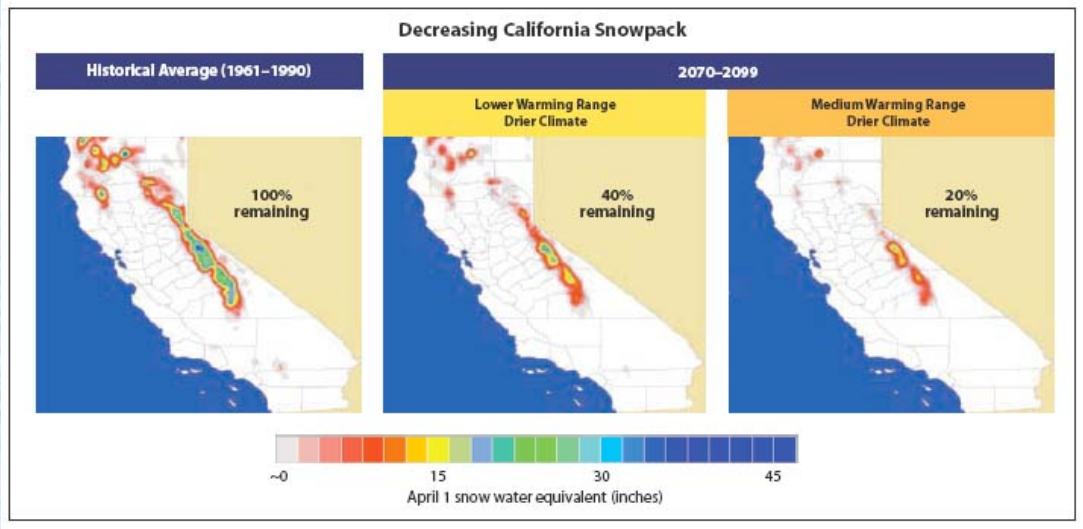


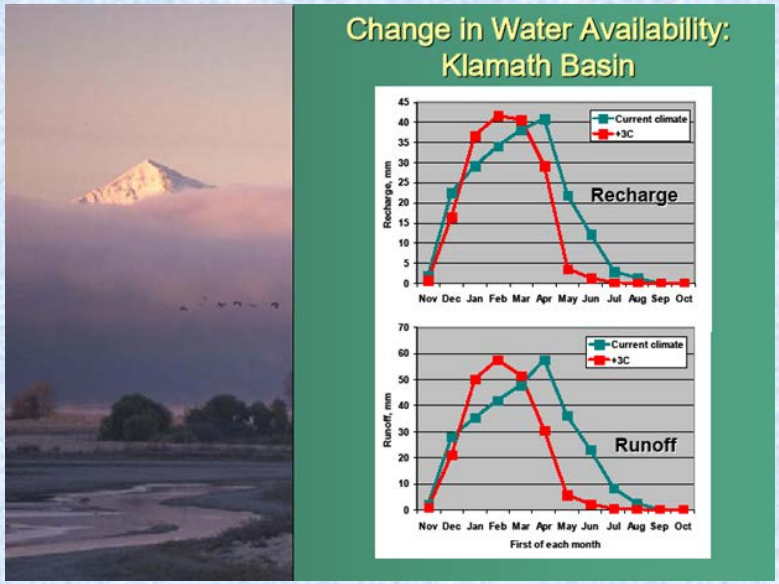
Hydrological Changes & Yurok

Predicted hydrological changes in the Klamath Basin may result from changes in the timing, type (snow versus rain) and intensity of precipitation throughout the entire basin.

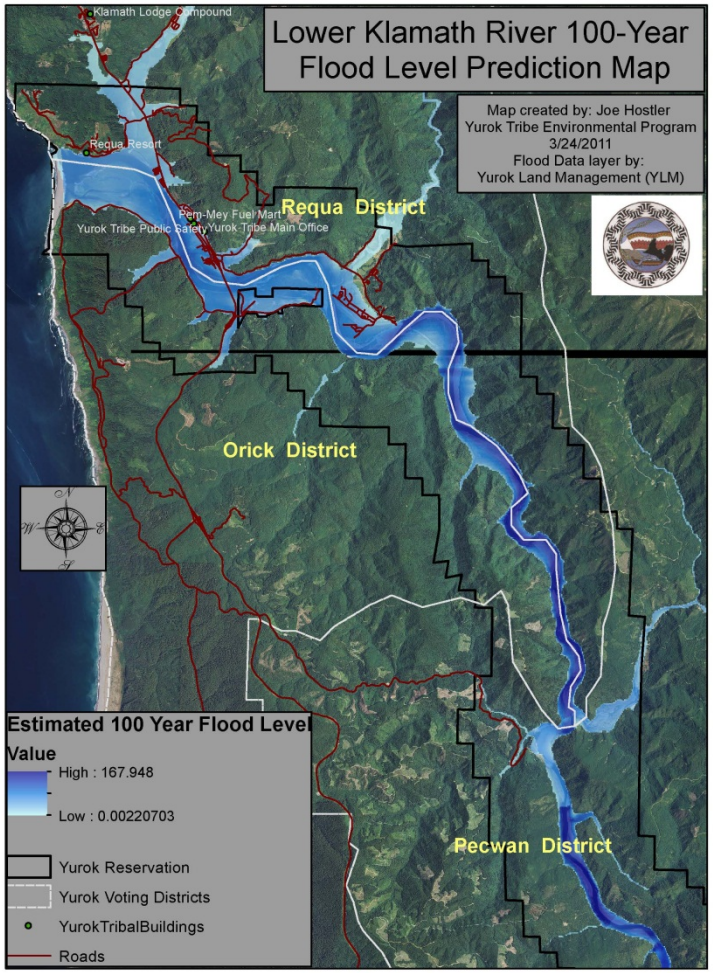
These changes may result in more rain/less snow in winter months, higher winter flows and increased flooding, and lower flows and warmer water temperatures in summer months. Flood events, typically every 100 years, are predicted to occur more frequently.

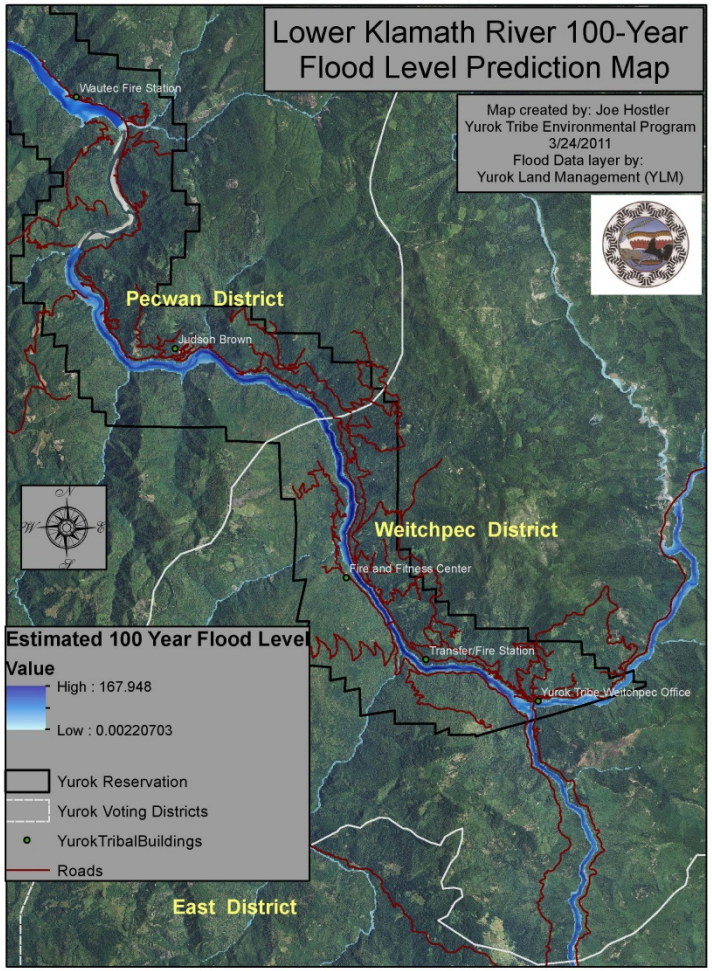
Changes in hydrology may impact the timing and abundance of subsistence species such as salmon, pacific lamprey and sturgeon.





Lower Klamath: 100 Year Flood Model





Potential Climate Change Impacts and Aquatic Resources

- Water Sources
- Water Quality
- Water Temperature
- Wetlands
- Klamath River Estuary
- Fisheries Resources
- Coastal and Marine Resources
- Water Borne Diseases & Pathogens

Potential Climate Change Impacts and Terrestrial Resources

- Species Loss
- Species Migration
- Invasive Species
- Increased Wildfire
- Drought
- Diseases
- Ecosystem Changes
- Habitat Loss

Yurok Trust Resources & Climate Change

Some Yurok Trust resources may be at risk to the impacts of Climate Change.

Some species may change distribution, or timing and location of migration. Some may go extinct.

Ecologically sensitive species important to Yurok include:

Salmon, Pacific lamprey (eel), Green Sturgeon, freshwater and ocean mussels, seaweed, Redwood, Tan Oak, Roosevelt Elk, and numerous other plants and animals used for subsistence, ceremonies, cultural practices (such as basketry) and traditional medicines.

Yurok Climate Change Priorities

Key findings from Community Scoping with Tribal Council, Tribal Membership, and Tribal Staff and Departments

Priority 1: Protecting and Preserving Yurok Lifeways, Culture and Traditions

Priority 2: Protecting Yurok People and Yurok Communities

- Community Health
- Community Services
- Infrastructure and Development
- Transportation Systems
- Emergency Response
- Educational Services
- Cultural Resources and Use Areas
- Cultural Practices and Traditions

Priority 3: Protecting and Preserving Yurok Traditional Ecological Knowledge

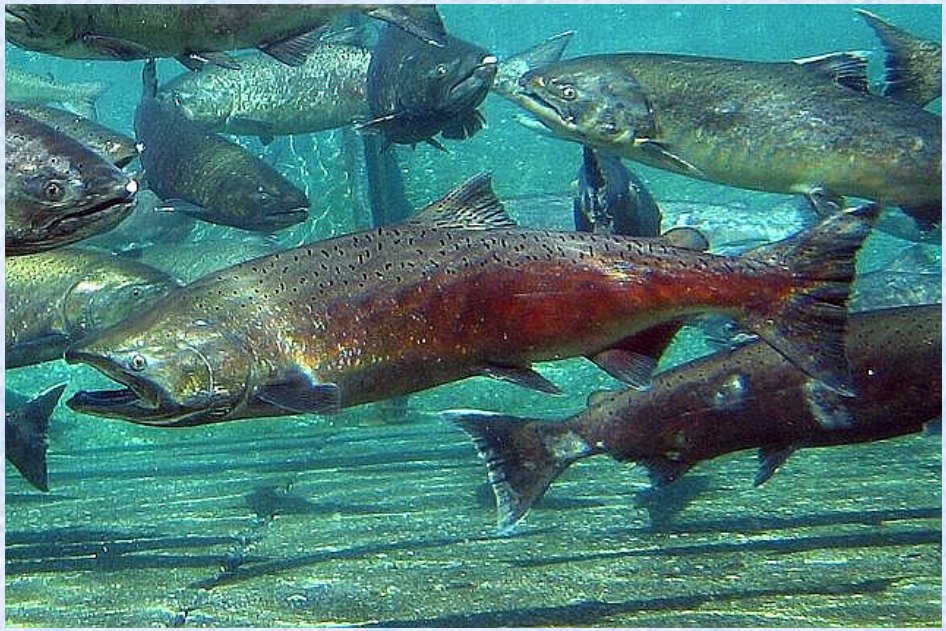
- Oral Traditions
- Yurok Stories
- Elder Wisdom
- Yurok Language
- Yurok Youth
- Cultural Restoration
- Education
- Traditional Resource Management

Priority 4: Protecting Water Resources

- Klamath River Watershed
- Streams & Tributaries
- Wetlands
- Estuary
- Water Quality
- Cold Water Sources
- Pacific Ocean
- Coastal Waters

Priority 5: Protecting Aquatic Species

- Salmon
- Sturgeon
- Pacific Lamprey
- Other Freshwater Species
- Marine and Coastal Species
- Fisheries Management & Restoration
- Habitat Protection and Restoration



Priority 6: Protecting Terrestrial Species

- Redwood
- Tan Oak
- Basketry Plants
- Roosevelt Elk
- California Condor
- Traditional Medicines
- Traditional Foods

Next Steps

Future goals and needs for Yurok to respond and plan for Climate Change

Next Steps and Goals

- Secure Dedicated Climate Change Funding
- Continue Advocacy on Climate Change EJ Issues
- Increased engagement with agency and governmental Climate Change planning efforts
- Fill Data Gaps and Information Needs
- Conduct Comprehensive Vulnerability Assessment
- Identify and Protect Areas of Resiliency
- Develop Adaptation Plans
- Develop Mitigation Plans
- Implement Climate Change Plans
- Continued Community Outreach and Education

Additional Climate Change Resources

FEDERAL AGENCIES:
US Global Change Research Program: http://www.globalchange.gov/
US EPA: Tribal Communities: http://www.epa.gov/statelocalclimate/tribal/index.html
USEPA Climate Showcase Communities: http://www.epa.gov/statelocalclimate/local/showcase/index.html
USDA Climate Change Program : http://www.usda.gov/oce/climate_change/
US Forest Service: Climate Change Resource Center: http://www.fs.fed.us/ccrc/
US Forest Service Climate Change Research: http://www.fs.fed.us/research/climate/
NRCS Global Climate Change Website: http://soils.usda.gov/survey/global_climate_change.html
NOAA Climate Service: Climate Service: http://www.climate.gov/#climateWatch
http://www.noaa.gov/climate.html http://www.research.noaa.gov/climate/
Army Corps of Engineers: http://www.corpsclimate.us/about.cfm
Center for Disease Control: http://www.cdc.gov/climatechange/
IHS: http://www.usgcrp.gov/usgcrp/nacc/education/native/native-edu-4.htm
NIEHS: http://www.niehs.nih.gov/about/od/programs/climatechange/index.cfm
DOI: Climate Science Centers: http://www.doi.gov/whatwedo/climate/strategy/CSC-Map.cfm
DOI: Climate Change Adaptation Initiative in 2011: http://www.doi.gov/budget/2011/11Hilites/DH011.pdf
DOI: Landscape Conservation Cooperatives: http://www.doi.gov/lcc/index.cfm
Bureau of Land Management: http://www.blm.gov/wo/st/en/prog/more/climatechange.html
US Fish and Wildlife: Climate Change Strategy: http://www.fws.gov/home/climatechange/response.html
US Fish and Wildlife: Regional Climate Change Information: http://www.fws.gov/pacific/Climatechange/index.html
US Fish and Wildlife: Climate Change Learning Center: http://training.fws.gov/CSP/Resources/csp_climate_change_series/index.htm
US Geological Survey: Climate and Land Use Change Research Programs: http://www.usgs.gov/climate_landuse/
National Park Service: Climate Change Response Program: http://www.nature.nps.gov/climatechange/

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Alaska Native and American Indian Climate Change Working Group: http://aianclimatechange.com/index.html
Columbia River Inter Tribal Fish Commission: http://www.critfc.org/wana/climate.html
Honoring Our Natural Resources: http://www.ournaturalresources.org/
National Congress of American Indians: http://www.ncai.org/Climate-Change.433.0.html
Institute for Tribal Environmental Professionals: http://www4.nau.edu/tribalclimatechange/tribes/index.asp
ITEP homepage: http://www4.nau.edu/itep/climatechange/
ITEP Tribes & Climate Change website: http://www4.nau.edu/tribalclimatechange/
National Wildlife Federation: http://www.tribalclimate.org/

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