Tribal Resilience Program

GIS Builds Nationwide Tribal Resilience

Presented by:
Margaret T. Herzog, PE, PMP, PhD
IT / GIS Systems and Services
TRP Presentation Outline

1. Introduction to the Anthropocene
2. Resilience Defined
3. BIA Tribal Resilience Program
4. Tribal Resilience Resource Guide
5. U.S. Climate Resilience Toolkit – Steps & Strategies
6. General Tribal Resources
There are many change Accelerators, exponential since 1950


MAP & DESIGN: Félix Pharand-Deschénes / Globaïa

http://www.igbp.net/globalchange/
Indigenous People Face Disproportionate Impacts of the Anthropocene on Lifeways - exponentially since 1950

Food Like Wild Rice Cannot Grow in Traditional Ranges

Infrastructure Falls Apart and Homes Sink in Alaska

Source of images: 2014 Third National Climate Assessment - Overview

http://nca2014.globalchange.gov
Climate Literacy Principle – Earth’s Balance

Sunlight - heats the land, air, and ocean  
- some is reflected back into space
- atmosphere reradiates a portion of escaping surface energy back as infrared heat

Back Radiation reflected back = Greenhouse Effect – global warming

[Link to Wikipedia: Greenhouse Effect]

[Visualization of Earth-Sun Energy Balance]

[Webpage: http://www.esrl.noaa.gov/gmd/outreach/carbon_toolkit/basics.html]
How do your GIS efforts build Tribal Resilience?

What does Resilience mean in your work context?
Resilience

Different meanings in different GIS context

- capacity to **bounce back** from an unexpected shock
  - GIS for emergency management – report where roads blocked
- prepare for, withstand, recover and adapt to **threats**
  - GIS for the environment – where invasives moving in, vegetative loss
- **minimize damage** to social well-being /economy /ecosystems
  - GIS for health – where health clinic stats show most respiratory ills
- incorporate **multiple lines of defense** against future risks
  - GIS for water management – how protect water supply and quality?
- **not crossing thresholds** beyond community ability to respond
  - GIS for infrastructure – rural area escape routes, grid access, cooling
BIA Tribal Resilience Program

FUNDING

Tools

Tribal Resilience Resources

Contact Us / Provide Feedback

Support
The BIA Tribal Resilience Program (TRP) provides federal-wide resources to Tribes to build capacity and resilience through leadership engagement, delivery of data and tools, training and tribal capacity building. Direct funding supports tribes, tribal consortia, and authorized tribal organizations to build resilience through competitive awards for tribally designed resilience training, adaptation planning, vulnerability assessments, supplemental monitoring, capacity building, and youth engagement. The ocean and coastal management effort supports planning, science and tools, and capacity for coastal tribe's ocean management.

See you at the UC17 TRIBAL TRACK! – guide to the 2017 ESRI User Conference for Tribes & Partners
M7/10-F7/14, San Diego, CA Convention Center with 7AM GIS for Regional Tribal Resilience Sessions Daily
Getting the most out of the Tribal Resilience Resource Guide

- Federal-wide Climate Tools and Resources

http://toolkit.climate.gov/tribal/
Tribal Resilience Resource Guide: **Regions**

To provide more site-specific information, resources are also organized by BIA region, since each Tribe in the U.S. is associated with a BIA service area. Select the region for your tribe to access federal-wide support for that area of interest.

https://www.indianaffairs.gov/WhoWeAre/BIA/climatechange/Resources/Regions/
Select Pacific-area Federal Resources or access area Tribal Dashboards to compare.
Find Your Tribal Resilience Dashboard

1) Choose TRIBES icon

2) Jump to Tribe by entering 3-4 distinct letters from Tribe Name in Quick Filter

3) Choose Tribal Fact Sheet - Resilience Dashboard

https://www.indianaffairs.gov/WhoWeAre/BIA/climatechange/Resources/Tribes/
Tribal Resilience Fact Sheet
Your dashboard to Resources!

**Federal Links:** Select the Agency Acronym (blue link) for an Agency Fact Sheet and the orange link to its right for regional contacts or homepage. For more information, hover over a link for agency or program details before making a selection.

| Tribal: Official Website (or groupsite) | BIA Region: Navajo Regional Fact Sheet Navajo Regional Office | DOE: AZ |
| CSC: Southwest AltLink: Consortium | LCC: Southern Rockies | FWS: Southwest |
| USDA CLIMATE HUB: Southwest | USDA NRCS Local, USDA USFS: Southwestern | NOAA: Region, RISA, CLIMAS |
| EPA: R9 | DOT/FWHA: Mountain West | HUD: Southwest |

**Awards**
- FY11 Climate Adaptation Planning
- FY15 Management Internships
- FY15 Travel (Climate)
- FY15 Youth Engagement
- FY16 Climate Adaptation Planning
- FY16 Travel (Climate)
- BIA TCRP FY11-16 Awards Map
- More Climate Funding Options

**Documents Share Results!**
- Connectivity of Habitats on Navajo Nation Lands
- Considerations for Climate Change and Variability Adaptation on the Navajo Nation
- NN CC Vulnerability Assessment for Priority Wildlife Species

**Examples**
- CRT1 Case Study: Navajo Nation: Hotter, Drier Climate Puts Sand Dunes on the Move
- ITEP TCC Profile: Dune Study Offers Clues to Climate Change
- Other Tribal Nations Examples

**Tools**
- Tribal Drought Information for Monitoring, Assessment, and Planning (DRI MAP)
- CRT Tool: Guidelines for Considering Traditional Knowledges in Climate Change Initiatives
- CRT Tool: Tribal Climate Change Guide
- CRT Tool: Tribal Climate Change Adaptation Planning Toolkit
- Other Recommended Climate Tools
- Native One Stop: Federal Programs

**Groups**
- Diné College
- Native American Fish and Wildlife Association (NAFWS)
- Navajo Technical College

**Data & Maps**
- Conservation Planning Atlas
- EPA Climate Impacts by State for: AZ
- HUC8: 15020013 - Polacca Wash Resource Links
- NN Zoo: Facts on Desert Bighorn Sheep and Other Species
- NOAA NCEI AZ State Climate Summary
- Toolkit Climate Explorer 2.0: Projected Temperature & Precip - Apache County
- Toolkit Climate Explorer 2.0: Projected Temperature & Precip - Coconino County
- Tribal Nations Geospatial Data
- Tribal Nations Map Gallery
- BIA GIS Software Training & Support

**Find Regional Partners & TCUs!**

**Request Personal Tour!**

**Contact Us / Provide Feedback**
New County-Level Temperature and Precipitation Projections

Access from the Data & Maps section of your Tribal Resilience Dashboard!

BIA ArcOnline: Interactive Story Maps

Access to TCR Resources from Interactive Map or from Data & Maps of each Tribal Dashboard.
Arctic & Tribal Nations Theme: Data

Organizes climate data by theme for easy access

https://www.data.gov/climate/tribal-nations/data-page
Tribal Nations Theme: Map Gallery

The Tribal Nations Map Gallery includes printable PDF wall-map versions (24×36) of the Indian and Ceded Lands Web Services found in the data tab. The Map Gallery also includes interactive maps from federal partners, intertribal groups, and a tribal climate map showcase of example work products to inform climate resilience efforts of tribes, Alaska Natives, and other diverse communities nationwide.

Interactive data access and printable maps
Can add region-specific climate maps here or keep private!

https://www.data.gov/climate/tribal-nations/tribal-nations-maps
Sea-level Rise Effects on Coastal Wetlands

In the Northwest, coastal wetlands support a wealth of ecosystem services, including providing habitat for fish and wildlife and protection from floods. The tidal marshes,
BIA GIS Web Portal: Awards Map

Access Awards Map in list of Tools at the top of the BIA TRP homepage! Access each Tribal Dashboard from this interactive Awards Map and back from Awards section to map from each Tribal Resilience Dashboard.

https://biamaps.doi.gov/tribalresilience/
Getting the most out of the 
Tribal Nations in the U.S. Resilience Toolkit

- **Tools and Stories** [https://toolkit.climate.gov/topics/tribal-nations](https://toolkit.climate.gov/topics/tribal-nations)

**Tribal Nations**

Climate change increasingly impacts places, foods, and lifestyles of American Indians. In Alaska—home to 40 percent of federally recognized tribes—reduced sea ice and warming temperatures threaten traditional livelihoods and critical infrastructure.

**Key points:**

- Climate change impacts are projected to be especially severe for many of the 567 federally recognized tribes in the United States that depend on traditional places, foods, and lifestyles.

- Observed and future impacts from climate change threaten indigenous communities’ access to traditional foods such as fish, game, and wild and cultivated crops, which have provided sustenance as well as cultural, economic, medicinal, and community health for generations.

- Of the 567 federally recognized tribes in the United States, 40 percent (229 tribes) live in Alaska Native communities. The rapid pace of rising temperatures, melting sea ice and glaciers, and thawing permafrost in Alaska is having a significant negative impact on critical infrastructure and traditional livelihoods in the state.

- Some native coastal communities are being forced to relocate to higher ground after experiencing more extreme storm surges, flooding, and sea level rise, which can impact cultural integrity and access to vital resources.

- In building climate resilience, sovereign Tribal Nations often work with a variety of partners in innovative ways to integrate traditional knowledges with technology tools and diverse research methods to effectively address climate change and related impacts in a culturally appropriate community context.

*Adapted from the Third National Climate Assessment.*
Six Tribal Nations Subtopics

Strategies for Building Climate Resilience

http://toolkit.climate.gov/topics/tribal-nations

1. Assessment and Planning
2. Adaptation
3. Mitigation
4. Disaster Risk Reduction
5. Relocation
6. Capacity Building
7. TRIBAL HEALTH

(new topic under consideration)

Jump from Tribal Dashboard to Tribal Nations by selecting an Example or Tool!

http://toolkit.climate.gov/tribal/

Tribal Climate Resilience Resource Guide

Organizes Tools and Taking Action Stories of Resilience
Tribal Nations Taking Action Cases

Taking Action

Communities and businesses are taking action to reduce their vulnerability to climate-related impacts and to build resilience to extreme events. The stories below illustrate the application of the process and tools featured in this Toolkit. Browse the stories, or filter by topic, step to resilience, and/or region in the boxes above. To expand your results, click the Clear Filters link.

Yukon Delta Villages Document Baseline Environmental Data
Students and community residents of four remote Alaskan villages measure environmental data to identify their climate vulnerabilities. Read more

Looking to the Future on Alaska’s North Slope
As ice retreats and energy resources along Alaska’s North Slope become more accessible, diverse stakeholders consider potential futures and develop a science-informed view of the implications of development in the region. Read more

Quinault Indian Nation Plans for Village Relocation
As the threats of tsunami and sea level rise are joined by real and potential climate impacts, the Quinault community looks to move the lower village of Taholah to higher ground. Read more

Relocating Kivalina
Rising seas and coastal erosion are eating away at the barrier island on which the Alaska Native Village of Kivalina rests. Residents and others are making concerted efforts to move the community to safety. Read more

Navajo Nation: Hotter, Drier

Preparing to Respond to Oil

Suquamish Build Resilience

Confederated Salish and

Case Studies of Resilience in Action!
Nationwide, any Tribe or Tribal Group can share to encourage others!!
Tribal Nations Cases – Sidebar Links

Steps to Resilience:
- Step 1: Identify the Problem
- Step 2: Determine Vulnerabilities
- Step 3: Investigate Options
- Step 4: Evaluate Risks & Costs
- Step 5: Take Action

Tools:
- Guidelines for Considering Traditional Knowledges in Climate Change Initiatives
- Local Environmental Observer (LEO) Network
- Scenarios Network for Alaska + Arctic Planning (SNAP) Tools
- Seven Generations–Community-Based Environmental Planning

Topic:
- Arctic: Arctic Oceans, Sea Ice, and Coasts
- Coastal Flood Risk: Coastal Erosion
- Tribal Nations: Disaster Risk Reduction, Relocation

Relocating Kivalina
Rising seas and coastal erosion are eating away at the barrier island on which the Alaska Native Village of Kivalina rests. Residents and others are making concerted efforts to move the community to safety.

Additional Resources:
- ANTHC | Climate Change in Kivalina, Alaska: Strategies for Community Health (PDF)
- Re-Locate Kivalina | Re-Locate Receives 2015 ArtPlace America Grant
- Alaska Community Coastal Protection Project | Kivalina Project Page
- U.S. Army Corps of Engineers | Relocation Planning Project Master Plan for Kivalina, Alaska (PDF)

Partners:
- Native Village of Kivalina
- Kivalina Relocation Planning Committee
- U.S. Army Corps of Engineers | Alaska District
- U.S. Bureau of Indian Affairs

Sidebar links to each Case provide Rich Resources
Stage of progress, Topical Cross-links, Resources, Data, & Partners
5-Step Adaptation Workflow from the U.S. Climate Resilience Toolkit

- Implement plan & monitor progress toward your goals
- Adjust your plan as necessary and iterate as often as needed
- Share your story; keep in mind failures and setbacks are also useful for others to learn

Step 1: Identify the Problem
Step 2: Assess your vulnerability
Step 3: Identify options to build resilience
Step 4: Evaluate the risk and choose the best option
Step 5: Implement – Take Action!

https://toolkit.climate.gov/#steps
1. Climate Adaptation Planning & Assessment – *Best Tribal GIS Practices*

https://toolkit.climate.gov/topics/tribal-nations/assessment-and-planning

- Take advantage of self-determination and sovereignty to build innovative data collection methods and ways of using maps

- Partner with federal, academic, state, local, non-profit and tribal groups to gather data at different scales and analyze results

- Leverage resources in community and from without systematically by mapping routes, gaps, storage, etc.

- Map subsistence and cultural resources privately

- Focus on community health – vectors, air quality, surroundings

- Community-based climate education and valuation with maps

- Elders involved in map development to incorporate traditional beliefs, value systems, tech, and protect holders
How To Develop an Unmanned Aircraft Systems Program

Capability
• Get the approvals to start an aviation capability
• Move money through an IAA or FID for UAS procurement
• Identify people to train (take the Part 107, IAT online classes, A-450 Basic Operator)

Planning
• Plan your project area – make sure you can fly in those areas (COA, MOA, Part 107)
• Choose the UAS (3DR Solo)
• Sensor needed (mounts required)
• Get Range Approvals
• Project Aviation Safety Plan

Logistics
• Travel
• UAS Hardware Preparation
• Mission Flight Planning
• Ground data

Data
• Acquire Data
• Process Data
• Manage Data
• Archive & Disseminate Data

https://uas.usgs.gov
Tribal UAS Users Group

Tribal Interest Group for UAS discussed:
- Current Tribal UAS operations and support functions for those present
- Opportunities to share best practices and lessons learned in this domain
- Areas of interest from the Tribal communities and possible common missions
- STEM opportunities and paths forward

To Join: Contact John "JC" Coffey,
Executive Director, Unmanned Systems, Cherokee Nation Technologies
john.j.coffey@noaa.gov, O: 301-734-1104, C: 904-923-1709

Interested in Setting up a BIA or Tribal UAS program?
Contact “Dave” Underwood:
- ewing.underwood@bia.gov, (505) 563-3103
- https://www.bia.gov/nifc/aviation/index.htm
Citizen Science and Community Monitoring

http://citsci.org

http://citizenscienceassociation.org

Citizen Science Association
A community of practice for the field of public participation in scientific research.

http://citizenscienceassociation.org
EPA New! ArcGIS Story Maps for CREAT

https://epa.maps.arcgis.com/home/item.html?id=3805293158d54846a29f750d63c6830

Climate Scenarios Projection Map
Storm Surge Inundation Map

Water Utility Climate Resilience Support Projects

Climate Resilience Evaluation and Awareness Tool (CREAT) Exercises
CREAT Training Events
Language Apps and Mapping, Labeling, Stories

http://libguides.unm.edu/langapps/

James Rattling Leaf - Great Plains Trial Water Alliance Inc. (GPTWA)

http://denverro.maps.arcgis.com/apps/MapTour/index.html?appid=60ac74d36ae34ce181e88fbee56831
Local Environmental Observer’s Network

https://www.leonetwork.org – Make an unusual observation, share it to network, get expert help
EnviroAtlas provides interactive resources that allow users to discover, analyze, and download data, maps, and other information. EnviroAtlas can be used to inform decision-making at multiple scales. Our resources are organized around the benefits people receive from nature or "ecosystem services".

EJ Screen  https://ejscreen.epa.gov/mapper/
2. Tribal Adaptation Efforts
http://toolkit.climate.gov/topics/tribal-nations/adaptation

- Climate impacts occurring and projected are already “locked in”, so tribes are doing their best to adapt despite constraints
- Methods favored
  - Shifting Species – substitution, assisted migration, seed banks
  - Invasive Species – removal, management, reuse, acceptance
  - Cultural Resources – coastal & stream bank protection, THPO
  - Cultural Continuity – STEM students with language & culture
  - Elders and Knowledge Integration – methods to use power of deep observation and understanding of connectivity, nature-based/honoring, ecological / technological progress (CSKT)
  - Networks and Partnerships – Inter-Tribal policy through consultation, standing groups, and NCAI / NARF nationwide
Tulalip / Landowner / Ocean Partnerships
Lands Swap and Energy from Ranching Waste

- Provide uplands to farmers in exchange for riparian

Tribe converts cattle manure through Waste-to-Energy process to reduce water quality impacts. Ranchers receive the cheaper energy back!

Estuary Development Partners with:
http://globaloceanhealth.org

Used NOAA Tool:
https://coast.noaa.gov/slr/

The Nature Conservancy Coastal Resilience Suite:
http://maps.coastalresilience.org/pugetsound/

Climate Central:

Changes in Ocean Chemistry Affects Many Species

Suquamish Case Study – CRT Assessment Subtopic:

NRDC OA Hotspots 2016:
https://www.nrdc.org/resources/ocean-acidification-hotspots-data-sources
Assessment of Connectivity and Enhancement of Adaptive Mgmt Capacity on Navajo Nation Lands
NOAA Fish Habitat Mapper

http://www.habitat.noaa.gov/protection/efh/efhmapper/index.html

NW Indian Fisheries Commission

http://nwifc.org

Ocean Maps

https://nwifc.maps.arcgis.com/apps/Cascade/index.html?appid=8ee7967fbb5f43948a803438b07938b8

CLIMATE CHANGE IMPACTS TO TRIBAL RIGHTS AND RESOURCES

http://nwtreatytribes.org/climatechange/
GIS should be used to obtain the state-level crop cover and water use data and analyze towards Tribal improvements focused on land cover and defragmentation.

- **USDA Climate Hubs** - [https://www.climatehubs.oce.usda.gov](https://www.climatehubs.oce.usda.gov)
- **NIACS Climate Action Framework** - [https://forestadaptation.org](https://forestadaptation.org)
- **National Agroforestry Center** - [https://nac.unl.edu](https://nac.unl.edu)
- **Soil Health Institute** - [http://soilhealthinstitute.org](http://soilhealthinstitute.org)
- **USDA Soil Health**:
- **Cover Crop Plan Guides**:
- **EQIP GRANT! High Tunnel Systems Initiative**:
- **First Nations Development Institute Native Foods**:
  [http://www.firstnations.org/programs/foods-health](http://www.firstnations.org/programs/foods-health)
- **Intertribal Ag Council Tech Support** - [http://www.indianaglink.com](http://www.indianaglink.com)
3. Tribal Mitigation Efforts

http://toolkit.climate.gov/topics/tribal-nations/mitigation

- Reduce causes of future climate change, esp. CO₂
- Less adaptation needed, if less heating occurs
- Methods favored:
  - Casinos and administrative building – zero net energy (FDLC)
  - Food waste composting from casinos, schools and farms (Tulalip)
  - Energy efficient, zero-net buildings, school greenhouse 2 elders
  - Solar roof-top installations and micro-grid applications (BLR)
  - Tribal governments set their own policies, beat COP21 goals!
  - Electrical vehicle plug-in stations and rebates, mass transit
  - Climate education integrated with native language and ways
  - Partner with government agencies: DOE, HUD, USDA, EPA
  - Save money by paying less in long-term energy costs
  - Not dependent on outside utility or strong partnership with it
  - Less affected by extreme weather and economic downturns
Levelized Cost of Energy Calculator

The levelized cost of energy (LCOE) calculator provides a simple calculator for both utility-scale and distributed generation (DG) renewable energy technologies that compares the combination of capital costs, operations and maintenance (O&M), performance, and fuel costs.

Note that this does not include financing issues, discount issues, future replacement, or degradation costs. Each of these would need to be included for a thorough analysis.

To estimate simple cost of energy, use the slider controls or enter values directly to adjust the values. The calculator will return the LCOE expressed in cents per kilowatt-hour (kWh).

The U.S. Department of Energy (DOE) Federal Energy Management Program (FEMP) sponsored the distributed generation data used within this calculator.

If you are seeking utility-scale technology cost and performance estimates, please visit the Transparent Cost Database website for NREL's information regarding vehicles, biofuels, and electricity generation.
IEED Tribal Toolkit / TEEI Clearinghouse
http://www.bia.gov/WhoWeAre/AS-IA/IEED/DEMD/TT/index.htm

The Tribal Energy and Environmental Information Clearinghouse (TEEIC) provides information about the environmental effects of energy development on tribal lands.

The site includes information about energy resource development and associated environmental impacts and mitigation measures; guidance for conducting site-specific environmental assessments and developing monitoring programs; information about applicable federal laws and regulations; and federal and tribal points of contact.

Energy Resources
- Energy resource development, environmental impacts, legal requirements, mitigation measures, programs/incentives, and case studies.
  - Biomass
  - Carbon Sequestration
  - Coal
  - Geothermal
  - Hydrokinetic
  - Low-Head Hydropower

Assessments & Monitoring
- How to prepare project-specific impact assessments, identify appropriate mitigation measures, and develop monitoring programs.
  - Site-Specific Assessments
  - Monitoring Programs

Laws & Regulations
- Federal laws and regulations applicable to energy development on tribal lands.
  - Acoustics (Noise)
  - Air Quality
  - Cultural & Paleontological Resources
  - Ecological Resources
  - Energy Resource Development
  - Environmental Justice
  - More...
Renewables, Improving Storage, Smart Grids

- World Leaders
- States, Cities & Tribal Nations
- Business Leaders
- Scientists and Researchers
- GIS Analysts – our communities
- TOGETHER we can speed the transformation to net zero!

Source: Western Electricity Coordinating Council

---

**SOLAR DEPLOYMENT AND COST**

- GW INSTALLED
- MODULE PRICE ($/WATT)

**WIND DEPLOYMENT AND COST**

- GW INSTALLED
- TURBINE PRICE ($/KWH)
Blue Lake Rancheria – Slash to Biochar

- Process takes woody waste and creates soil enhancer by-product while producing energy
- Whitehouse Climate Champion!
- Off-grid, county-wide emergency hub

Housing and Urban Development (HUD)
http://bia.gov/WhoWeAre/BIA/climatechange/Resources/Agencies/AgencyFactSheet/index.htm?ag=hud

Healthier Tribal Housing – combining best of old & new
http://ehp.niehs.nih.gov/120-a460/ natural, place-based

Office of Native American Programs (ONAP)

Resources for Tribal Leaders – build skills & vision

Community Relocation Resources (Strategy 3 of 7 covered)
http://toolkit.climate.gov/topics/tribal-nations/relocation

Newtok Example: Cold Climate Housing Research Center (CCHRC - http://www.cchrc.org) collaborations with Alaska Native Health

4. Disaster Risk Reduction (DRR) Efforts

http://toolkit.climate.gov/topics/tribal-nations/disaster-risk-reduction

- Extreme weather already disproportionately affects marginalized populations, while climate change will cause more frequent, more devastating impacts

- Methods favored:
  - Discouraging new development or post-disaster redevelopment in vulnerable areas to reduce losses (GIS analysis required)
  - Planning for transportation, including roads and bridges
  - Effective evacuation planning, including the deployment of early warning systems, drought planning triggers
  - Creating multiple evacuation routes and supplies
  - Coordination across jurisdictional boundaries
  - Increasing leadership training and community support
  - Hazard mitigation planning (pre-approved FEMA plan best)
Navajo Nation Stabilizes Sand Dunes

http://www7.nau.edu/itep/main/eeop/ – Students use Mongolian method of seed balls with berms to capture water
Introduction

The Tribal Affairs Branch of the Federal Emergency Management Agency (FEMA) Office of External Affairs is pleased to offer this pocket guide to help federally recognized tribes (hereafter referred to as “tribes”) quickly reference information about FEMA programs and the agency’s engagement with tribes.

FEMA is committed to engaging with tribes as part of its government-to-government relationship that recognizes tribal sovereignty. FEMA is a resource for tribes in their efforts to prepare for, protect against, respond to, recover from, and mitigate against emergencies and disasters that impact Indian Country.

This pocket guide answers questions about how FEMA engages with tribes, explains FEMA’s tribal policies, and provides contact information for FEMA team members who are working with tribal nations. In this pocket guide, there are also brief descriptions of FEMA programs and how they can help affected tribes.
BIA BRANCH OF WILDLAND FIRE MANAGEMENT +++

https://www.bia.gov/nifc/index.htm
- Provides custom mapping support for fires
- Manages GIS fuel treatment data
- Assists with GPS data collection efforts

• USGS Land Change in Western U.S. and other trends

• LANDFIRE – 20 national geo-spatial layers:  https://www.landfire.gov/

• Geospatial Multi-Agency Coordination:  https://www.geomac.gov/

• Monitoring Trends in Burn Severity:  http://www.mtbs.gov/

• Wildland Firefighters – fire incident info:  http://www.wildlandfire.com/

• USFS Geospatial / Remote Sensing Apps:  https://www.fs.fed.us/gstc/

• Incident Information System:  https://inciweb.nwcg.gov/

• JFSP Fire Science Regional Networks:
  http://www.firescience.gov/JFSP_exchanges.cfm

• U.S. Forest Change Assmt Viewer:  https://forwarn.forestthreats.org/fcav/
Manage Floods & Droughts as Single Issue

- Too much and too little water on the landscape must be approached as a single, inter-related, management issue
- More Intense Floods rip up / overflow banks and uproot vegetation
  - leads to sand mobilization and soil / bank erosion, sedimentation
  - water quality degradation, damages WT/WWTF infrastructure
- Methods Favored
  - Plant TREES! esp. in urban areas!!
  - Reconnect fp, wetlands, veg and structures to capture every drop
  - Reduce downstream flooding with upstream storage (rights)
  - Store snowmelt that is now or will soon become rain, control ET
  - Store higher on landscape to trickle down in later dry season
  - Do not drain directly to stream or culvert, plan buffer strips
  - Low-Impact Development (LID) – UDFCD Volume III manual
  - Implement policies and tech for rain-water harvesting (Tuscon)
  - Examples: Hopi Raincatchers & Navajo Sand Dune Restabilization
Many Tools to Study Hydrology and Water Quality

National Weather Service Advanced Hydrologic Prediction Service (AHPS)

Federal Support Toolbox for Integrated Water Resources Management
http://watertoolbox.us

USGS National Water Information Mapper
https://maps.waterdata.usgs.gov/mapper/index.html

Water Harvesting Assessment Toolbox
https://wrcc.arizona.edu/DWHI/toolbox

SNOTEL Snow Data
https://www.wcc.nrcs.usda.gov/snow/

Download the Community-Based Water Resiliency (CBWR) Tool

https://www.epa.gov/communitywaterresilience
Coastal Sea Level Rise, Flooding, and Storm Surge Mapping
http://sealevel.climatecentral.org
http://coastalresilience.org

Surging Seas
Sea level rise analysis by CLIMATE CENTRAL

Surging Seas RISK FINDER
St. Petersburg, FL, USA

Summary
Warming oceans and melting ice sheets are raising global sea levels. St. Petersburg area waters could rise 15 inches by 2050, and 4 feet or more by 2100, localizing from the intermediate high sea level scenario in the latest U.S. National Climate Assessment. Jump to more projections & details.

This pathway suggests a 16% risk of flooding over 5 ft between today and 2030, and 46% between today and midcentury.

Some of what sits below St. Petersburg today (rounded figures):
- Population: 49,000
- High social vulnerability population

RISK FINDER & MAP
Choose a completed state ▼ GO

About | Video Tutorial | Tools Comparison | Custom Analysis | Science | Case Studies
5. Tribal Relocation Efforts
https://toolkit.climate.gov/topics/tribal-nations/relocation

- Sea Level will rise due to thermal expansion and melting ice sheets, sea ice, and glaciers
- Storm surge and higher tides – sunny day flooding, salt water intrusion, lake push-up flooding, salt topping

- Methods favored:
  - Discouraging new development or post-disaster redevelopment in coastal areas
  - Beach nourishment – cost increasing and sand becoming scarce
  - Seawalls, pumps, dikes, berms, breakwaters – sand collects
  - Raise buildings or move them back
  - Restore natural estuaries, coves, mangroves, sea grass
Sea Level Rise, Storm Surge, Tsunami, and Subduction
Quinault Case Study – CRT Relocation Subtopic


National Assessment of Coastal Vulnerability to Sea Level Rise
https://woodshole.er.usgs.gov/project-pages/cvi/

National Sea Grant Resilience Toolkit
http://seagrant.noaa.gov/WhatWeDo/ResilienceToolkit.aspx
Relocating Kivalina

Costs up to $1M / person to try to move these small villages


https://toolkit.climate.gov/case-studies/relocating-kivalina
6. Tribal Capacity Building Strategy

http://toolkit.climate.gov/topics/tribal-nations/capacity-building

• Economically, Historically, Physically and Circumstantially Tribes are disproportionately vulnerable to climate shocks and surprises

• Methods favored
  - Use all federal, state and local government programs at the Tribes disposal (Mescalero example, CMN SDI example)
  - Casino tribes typically have more resources and networks
  - Provide culturally-appropriate opportunities for outsiders
  - Build coalitions among environmentalists and/or landowners that share common interests (Rooted in the Mountains, Tulalip)
  - Elders must be continually involved in expanded youth action
  - Youth must serve the elderly with school produce and meals
  - Systematically learn and apply the principles of Network Weaving: http://www.orgnet.com/BuildingNetworks.pdf
Climate change—a threat and an opportunity

Climate change poses a threat to the traditional livelihoods and the sustainably managed forestlands of the Menominee Nation. However, climate change also presents an opportunity—a chance to apply indigenous knowledge to adapt and sustain native communities, and for the Menominee Nation to share its understandings with others seeking to address this global issue.

Related Video: “Through Tribal Eyes: Change on the Menominee Nation” from the College of Menominee Nation’s Sustainable Development Institute (15:02)

The Sustainable Development Institute (SDI) at the College of Menominee Nation works with both tribes and non-tribal communities on issues related to sustainability. The Institute combines Western-style research methods with indigenous knowledge to develop a variety of research projects and outreach initiatives, with a focus on the inclusion and development of students—both from indigenous and other communities—to prepare the next generation of scientists and practitioners to become responsible community members.

An indigenous-based theoretical model of sustainability

Steps to Resilience:

- Step 1: Identify the Problem
- Step 2: Determine Vulnerabilities
- Step 3: Investigate Options
- Step 4: Evaluate Risks & Costs
- Step 5: Take Action

Tools:

- Adaptation Workbook for Natural Resources
- Guidelines for Considering Traditional Knowledges in Climate Change Initiatives

Topic:

- Tribal Nations
- Assessment and Planning
- Capacity Building

Additional Resources:

- The SDI Theoretical Model of Sustainability
- Center for First Americans Forestlands

General Tribal Resilience Support Programs

- **Climate Adaptation Knowledge Exchange**
  [http://www.cakex.org](http://www.cakex.org)

- **Georgetown Adaptation Clearinghouse**
  [http://www.adaptationclearinghouse.org](http://www.adaptationclearinghouse.org)
ITEP Resilience Outreach and Communication
http://www7.nau.edu/itep/main/tcc

Tribes & Climate Change Website

• Training / Monthly Newsletter
• Tribal profiles
• Tools and Resources
• Take Action
• Events
• Contacts

Nikki Cooley, Program Manager
Nikki.Cooley@nau.edu, 928-523-7046
In addition to monthly network calls, contact the program for **specific support** by request!

Example: Tribal Profiles to support proposal development

**Co-located with incoming SW BIA Tribal Climate Liaison!**
PNW Tribal Climate Change Project

• Building an understanding the impacts of climate change on tribal culture and sovereignty and fostering opportunities for tribes to engage in regional and national climate initiatives.

• Pacific Northwest Tribal Climate Change Network:
  - Regular email bulletins with information on climate programs, policies and events
  - Monthly Network call on the third Wednesday of each month at 10 am Pacific.

• Resources
  - Tribal Climate Change Profiles
  - Online Tribal Climate Change Guide
  - Research and Policy Publications

Online Tribal Climate Change Guide
http://tribalclimateguide.uoregon.edu/
Guidelines for Considering Traditional Knowledges in Climate Change Initiatives

https://climatetkw.wordpress.com/guidelines/

- An informational resource for tribes, agencies, and organizations across the United States interested in understanding traditional knowledges in the context of climate change.

- A framework to increase understanding of issues relating to access and protection of traditional knowledge in climate initiatives and interactions between holders of traditional knowledges and non-tribal partners.

“Ways of knowing, encompassing culture, experiences, resources, environment, and animal knowledge, and passed down from elder to youth through oral histories, stories, ceremonies, and land management practices, are collectively referred to as traditional knowledges.”
Guidelines for Considering Traditional Knowledges in Climate Change Initiatives

1. Understand Traditional Knowledges
2. Recognize the Right of Indigenous Peoples NOT to participate
3. Understand and communicate risks
4. Establish an institutional interface
5. Training for federal agency
6. Provide protocols to uphold TK protections
7. Recognize multiple knowledge systems
8. Develop guidelines for review of proposals
2017 SOUTHWESTERN TRIBAL CLIMATE CHANGE SUMMIT

SAVE THE DATE!
SEPTEMBER 19-21, 2017
UNIVERSITY OF SAN DIEGO

SOUTHWESTERN TRIBES FIRST PREFERENCE • REGISTRATION REQUIRED • LIMITED SEATS AVAILABLE

Funding provided by the BIA Tribal Climate Resilience Program
7AM GIS for Tribal Resilience
Sessions By Region

• M 7/10 7AM 27A - Northwest / Northern Great Plains Tribes

• T 7/11 7AM 27A - Eastern, Midwest, Great Lakes Tribes

• W 7/12 7AM 27A - Southwest / Southern Great Plains Tribes

• R 7/13 7AM 27A - Alaska Native Communities

See the *UC17 Tribal Track* for more opportunities!
Available from the BIA Tribal Resilience homepage

https://www.indianaffairs.gov/WhoWeAre/BIA/climatechange/