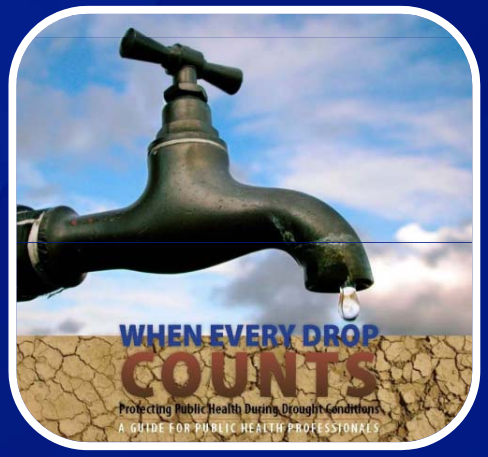
When Every Drop Counts: Initiatives in Indian Country



ITEP's Climate Change Trainings & Resources for Tribes

Sue Wotkyns
Institute for Tribal Environmental Professionals
Northern Arizona University

American Public Health Association Webinar
October 22, 2012

Presentation Overview

- Overview of ITEP
- Tribes—background information
- Challenges for tribes in adaptation planning
- Climate Change Training
- Resources for Tribes

Institute for Tribal Environmental Professionals (ITEP)

- Northern Arizona University, Flagstaff, AZ
- Mission: ITEP serves tribes through outstanding, culturally-relevant education and training that increase environmental capacity and strengthen sovereignty
- In 20 years, ITEP has served over 500/566 tribes nationally
- ITEP Programs: Climate Change, Air Quality, Waste Management, K-16 Environmental Education and Outreach, Tribal Clean Energy Resource Center

San Francisco Peaks, Flagstaff, AZ

Tribes—some background information

- 566 federally recognized American Indian and Alaska Native tribes in US (229 are in AK)
- Population=5.2 million AI/AN (1.7% of total US population)
- Greatest concentrations of AI/AN populations are in West, Southwest, and Midwest
- 19.5% of AK population is AI/AN
- Tribes vary in population and reservation size
- 12% AI/AN homes lack safe and adequate water supply and/or waste disposal facilities

Tribes—some background information

- Tribes manage 95 million acres of land = 4% of land in US
- Close ties to land and natural resources
- Disproportionately impacted by climate variability and change
- High vulnerability and low adaptive capacity

2011 Las Conchas Fire in New Mexico. Source: D. Chavarria, Pueblo of Santa Clara.

Sand dune migration on Navajo Nation. Source: M. Hiza, USGS

Source: Shishmaref Erosion and Relocation Coalition, http://www.shishmarefrelocation.com/index.html

Adaptation Planning: Challenges

- Funding – for impact and vulnerability assessments, development and implementation of adaptation plans
- Tribal support (from tribal leadership and community). How to make climate change a priority (other competing immediate issues)?
- How to get started? Process?
- Limited staff time
- Where to get information--climate projections, impacts, adaptation strategies
- Integrating traditional knowledge and western science

Climate Change Training

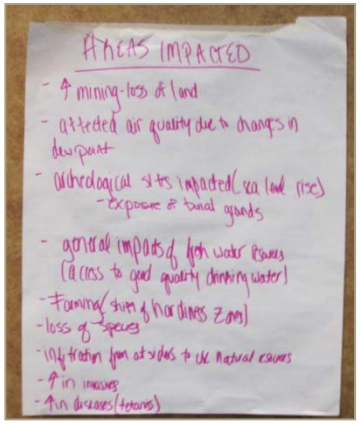
- *Climate Change on Tribal Lands*
- *Climate Change Adaptation Planning*

  Upcoming :

  - February 19-21, 2013, Pueblo of Santa Ana, NM
  - May 14-16, 2013, Glennallen, AK

Climate Change Adaptation Planning
Missoula, MT, September 2012

Climate Change Adaptation Planning
Oneida, WI, June 2012



Climate Change Webinars

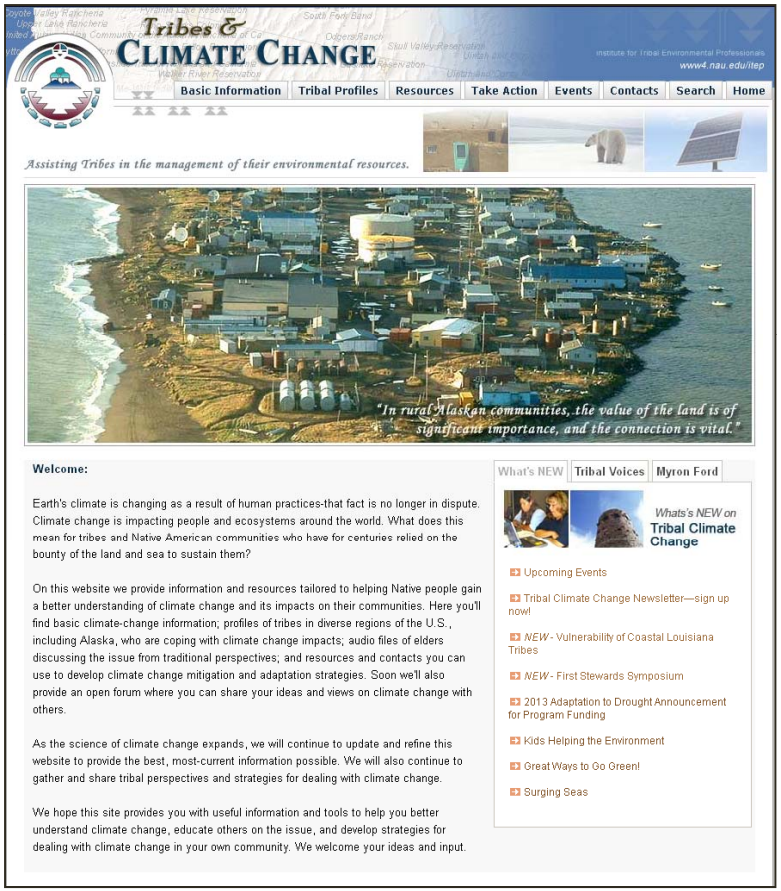
- AK-focused quarterly webinars, in collaboration with USEPA Reg.10
- Other webinars -- general tribal audience
- Archived at: http://www4.nau.edu/itep/climatechange/tcc_webinars.asp



Tribes & Climate Change Website

- Fundamental Information
- Tribal Profiles
- Resource Library
- Take Action
- Upcoming Events

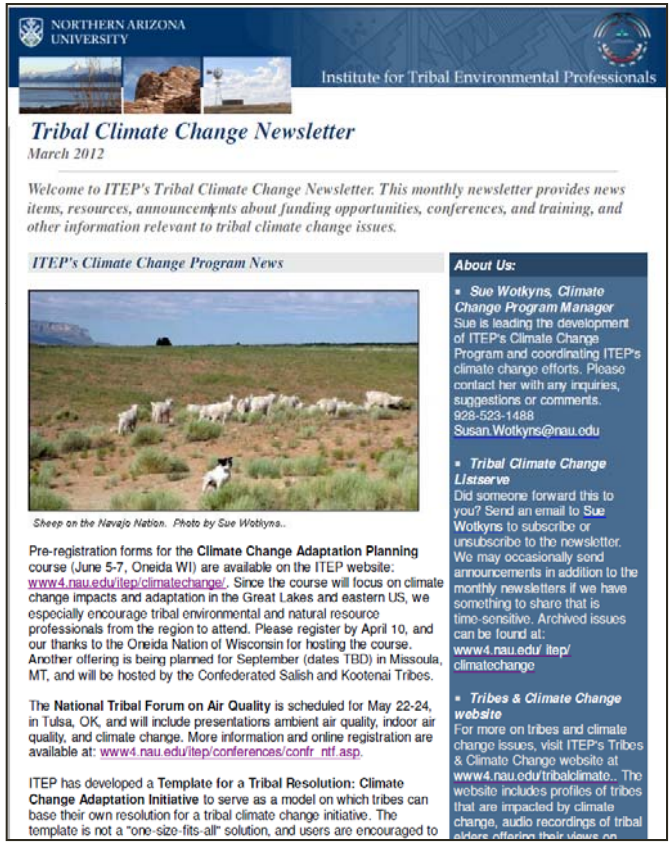
http://www4.nau.edu/tribalclimatechange/



Tribal Climate Change Newsletter

- Delivered monthly by email
- ITEP CC Program News
- In the News
- Technical Resources
- Funding Opportunities
- Upcoming Events

Sign up be sending email to:
susan.wotkyns@nau.edu



NORTHERN ARIZONA UNIVERSITY

Institute for Tribal Environmental Professionals

Tribal Climate Change Newsletter

March 2012

Welcome to ITEP's Tribal Climate Change Newsletter. This monthly newsletter provides news items, resources, announcements about funding opportunities, conferences, and training, and other information relevant to tribal climate change issues.

ITEP's Climate Change Program News

Sheep on the Navajo Nation. Photo by Sue Wotkyns..

Pre-registration forms for the **Climate Change Adaptation Planning** course (June 5-7, Oneida WI) are available on the ITEP website: www4.nau.edu/itep/climatechange/. Since the course will focus on climate change impacts and adaptation in the Great Lakes and eastern US, we especially encourage tribal environmental and natural resource professionals from the region to attend. Please register by April 10, and our thanks to the Oneida Nation of Wisconsin for hosting the course. Another offering is being planned for September (dates TBD) in Missoula, MT, and will be hosted by the Confederated Salish and Kootenai Tribes.

The **National Tribal Forum on Air Quality** is scheduled for May 22-24, in Tulsa, OK, and will include presentations ambient air quality, indoor air quality, and climate change. More information and online registration are available at: www4.nau.edu/itep/conferences/confr_ntf.asp.

ITEP has developed a **Template for a Tribal Resolution: Climate Change Adaptation Initiative** to serve as a model on which tribes can base their own resolution for a tribal climate change initiative. The template is not a "one-size-fits-all" solution, and users are encouraged to

About Us:

- *Sue Wotkyns, Climate Change Program Manager*

Sue is leading the development of ITEP's Climate Change Program and coordinating ITEP's climate change efforts. Please contact her with any inquiries, suggestions or comments.
928-523-1488
Susan.Wotkyns@nau.edu

- *Tribal Climate Change Listserve*

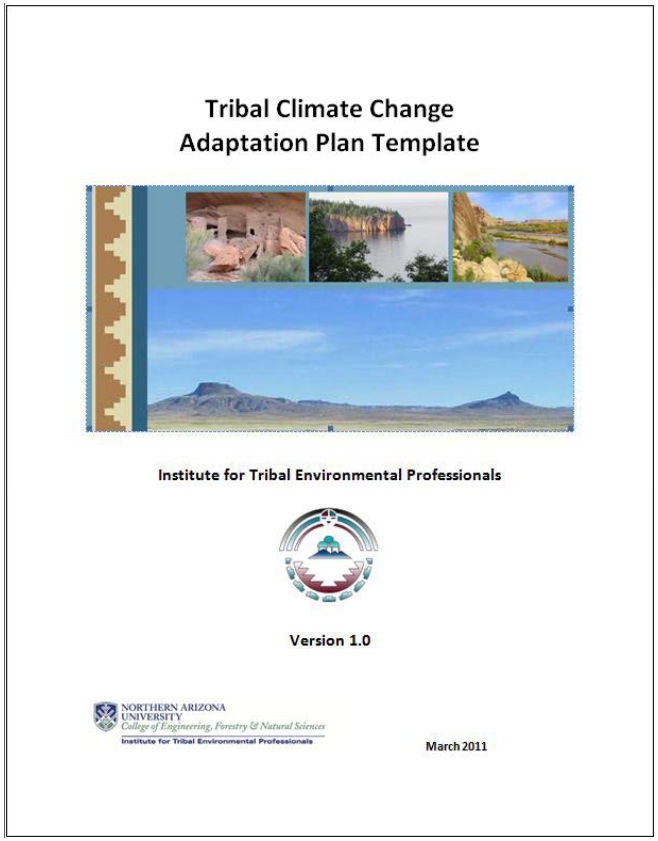
Did someone forward this to you? Send an email to Sue Wotkyns to subscribe or unsubscribe to the newsletter. We may occasionally send announcements in addition to the monthly newsletters if we have something to share that is time-sensitive. Archived issues can be found at: www4.nau.edu/ itep/ climatechange

- *Tribes & Climate Change website*

For more on tribes and climate change issues, visit ITEP's Tribes & Climate Change website at www4.nau.edu/tribalclimate.. The website includes profiles of tribes that are impacted by climate change, audio recordings of tribal

Tribal Climate Change Adaptation Plan Template

- Guidelines and suggestions for writing an adaptation plan
- Outline of sections to include
- Key terms, additional resources
- Microsoft Word document
- Available by request: susan.wotkyns@nau.edu



Template for a Tribal Resolution: Climate Change Adaptation Initiative

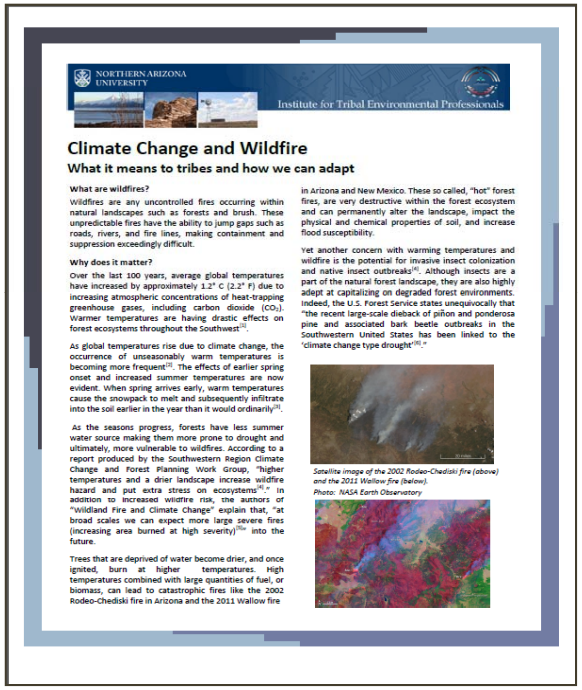
- Template and 4-page guide
- Focused on establishing a climate change adaptation initiative for tribe
- Available by request: susan.wotkyns@nau.edu



Climate Change Outreach Materials

Climate Change Fact Sheets

- 2-page
- Focused on impacts and adaptation strategies
  - Drought
  - Wildfire
  - Invasive Species
  - More being developed in collaboration with University of Oregon
  - Available at: http://www4.nau.edu/itep/climatechange/tcc_SWProj.asp


NORTHERN ARIZONA UNIVERSITY
Institute for Tribal Environmental Professionals

Climate Change and Wildfire

What it means to tribes and how we can adapt

What are wildfires?

Wildfires are any uncontrolled fires occurring within natural landscapes such as forests and brush. These unpredictable fires have the ability to jump gaps such as roads, rivers, and fire lines, making containment and suppression exceedingly difficult.

Why does it matter?

Over the last 100 years, average global temperatures have increased by approximately 1.2° C (2.2° F) due to increasing atmospheric concentrations of heat-trapping greenhouse gases, including carbon dioxide (CO_2). Warmer temperatures are having drastic effects on forest ecosystems throughout the Southwest[1].

As global temperatures rise due to climate change, the occurrence of unseasonably warm temperatures is becoming more frequent[2]. The effects of earlier spring onset and increased summer temperatures are now evident. When spring arrives early, warm temperatures cause the snowpack to melt and subsequently infiltrate into the soil earlier in the year than it would ordinarily[3].

As the seasons progress, forests have less summer water source making them more prone to drought and ultimately, more vulnerable to wildfires. According to a report produced by the Southwestern Region Climate Change and Forest Planning Work Group, "higher temperatures and a drier landscape increase wildfire hazard and put extra stress on ecosystems[4]." In addition to increased wildfire risk, the authors of "Wildland Fire and Climate Change" explain that, "at broad scales we can expect more large severe fires (increasing area burned at high severity)[5]" into the future.

Trees that are deprived of water become drier, and once ignited, burn at higher temperatures. High temperatures combined with large quantities of fuel, or biomass, can lead to catastrophic fires like the 2002 Rodeo-Chediski fire in Arizona and the 2011 Wallow fire in Arizona and New Mexico. These so called, "hot" forest fires, are very destructive within the forest ecosystem and can permanently alter the landscape, impact the physical and chemical properties of soil, and increase flood susceptibility.

Yet another concern with warming temperatures and wildfire is the potential for invasive insect colonization and native insect outbreaks[6]. Although insects are a part of the natural forest landscape, they are also highly adept at capitalizing on degraded forest environments. Indeed, the U.S. Forest Service states unequivocally that "the recent large-scale dieback of piñon and ponderosa pine and associated bark beetle outbreaks in the Southwestern United States has been linked to the 'climate change type drought'[8]."

Satellite image of the 2002 Rodeo-Chediski fire (above) and the 2011 Wallow fire (below).
Photo: NASA Earth Observatory

Powerpoint presentation for outreach

- Climate change impacts
- For tribes to use in their outreach with community
- Not yet available

Questions?




Our Contact Information

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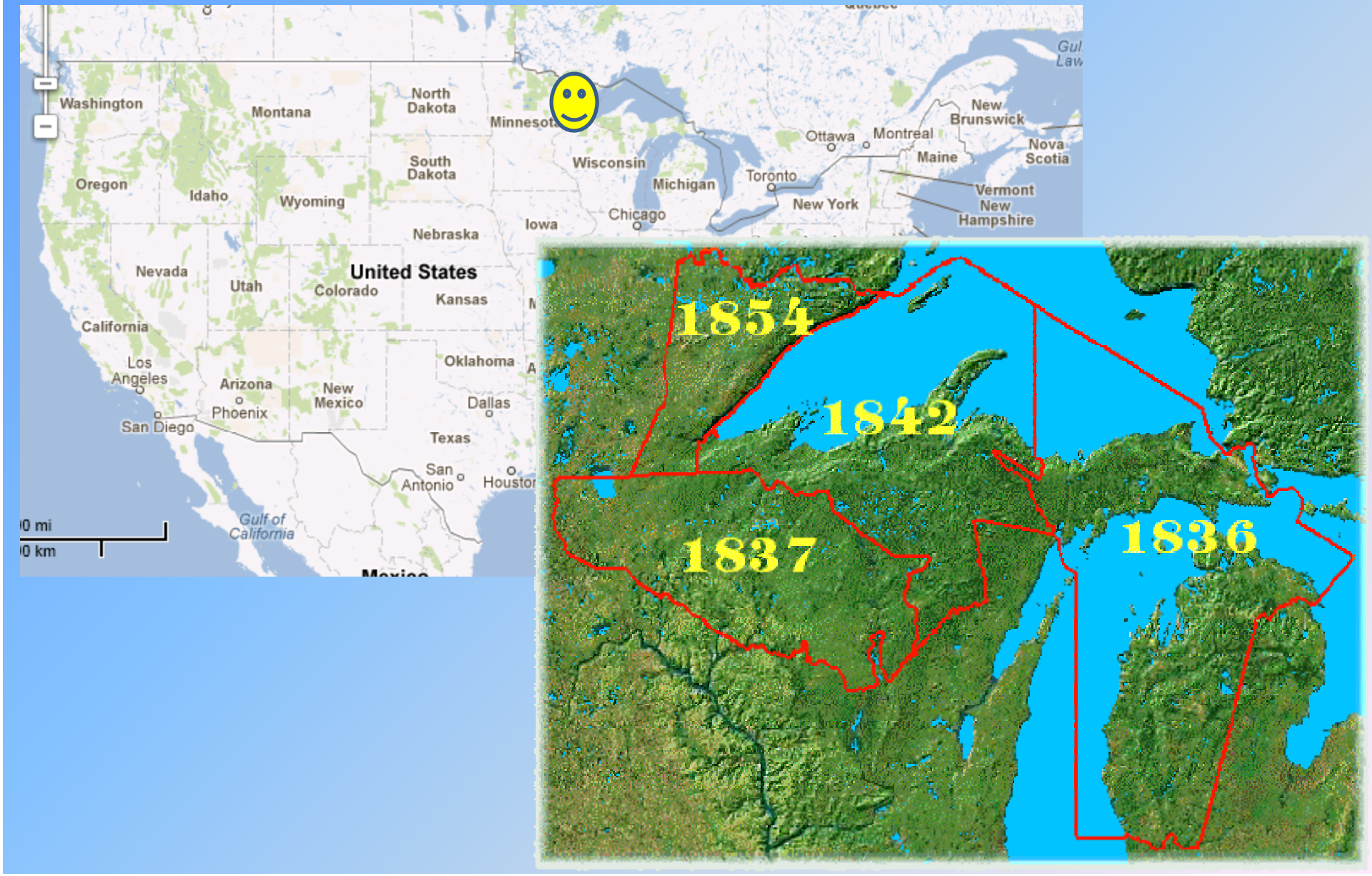
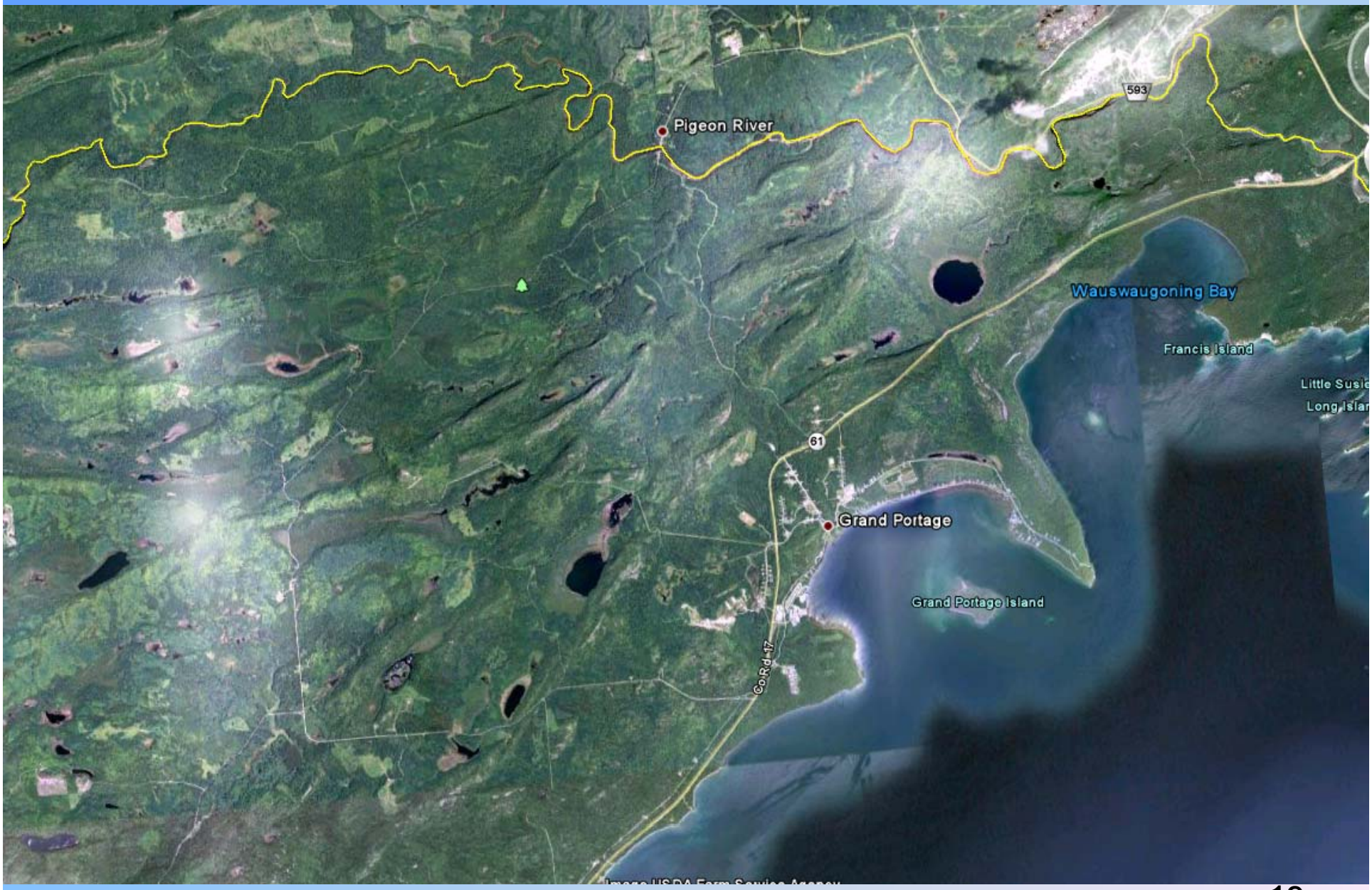
For more information about ITEP, please visit our website:
http://www4.nau.edu/itep/

Grand Portage Climate Change Adaptation Plan, Impacts leading to Adaptation

Seth Moore, PhD
Director of Biology and Environment
Grand Portage Band of Lake Superior Chippewa
samoore@boreal.org
218-475-2022

Where is Grand Portage?



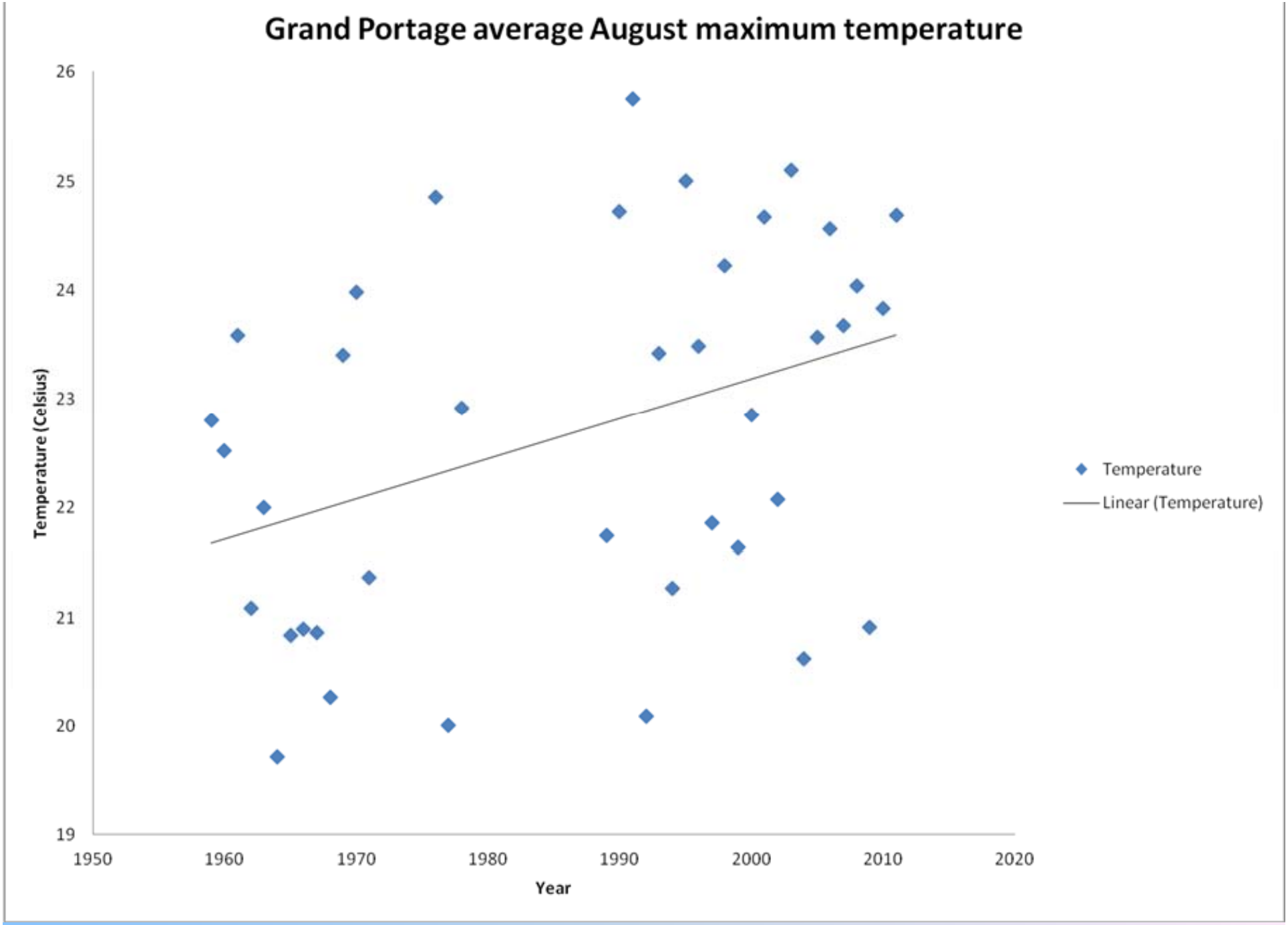

Pigeon River
593
Wauswaugoning Bay
Francis Island
61
Grand Portage
Grand Portage Island
Co Rd 17

What defines Grand Portage?

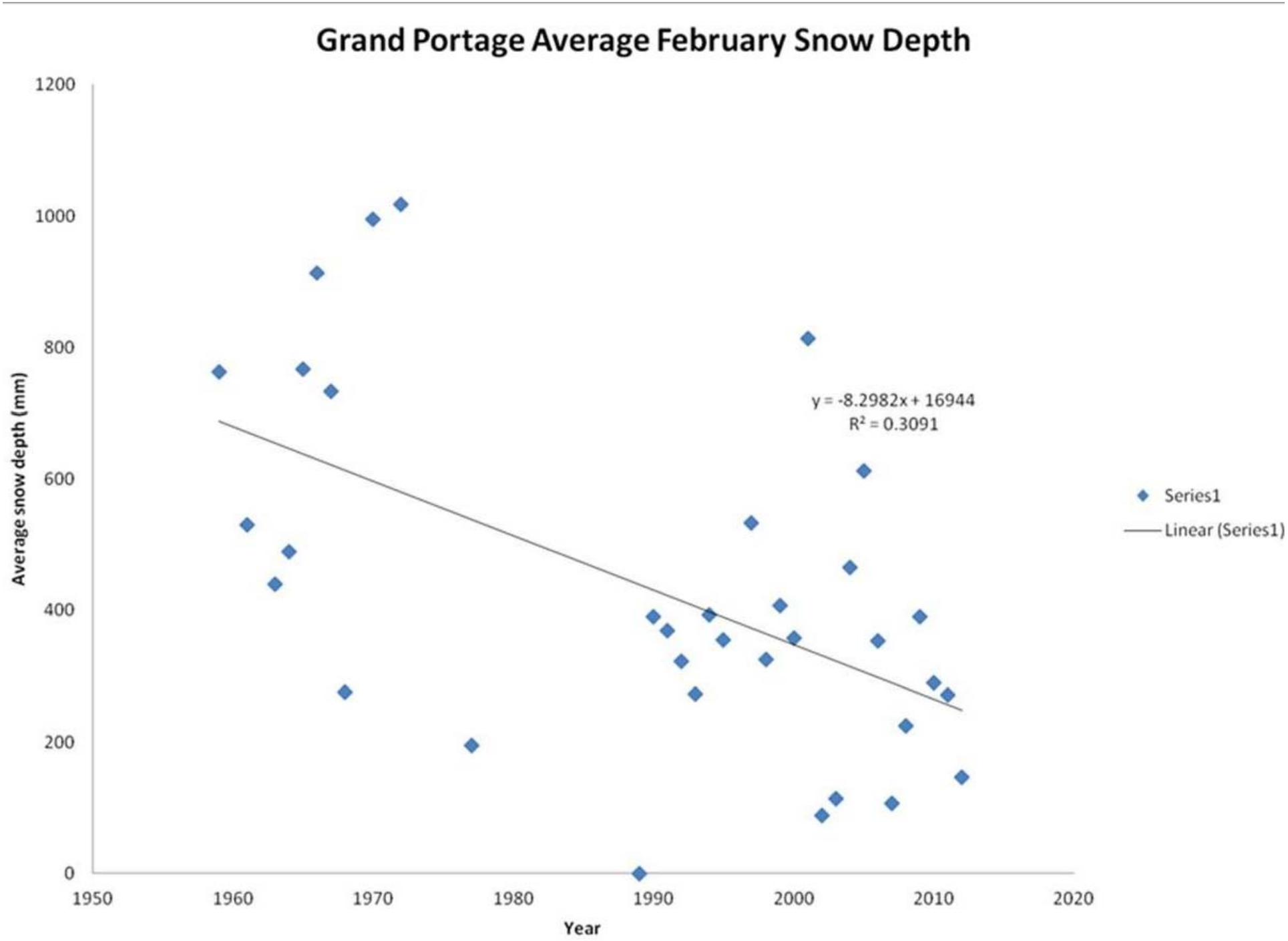

MOORE

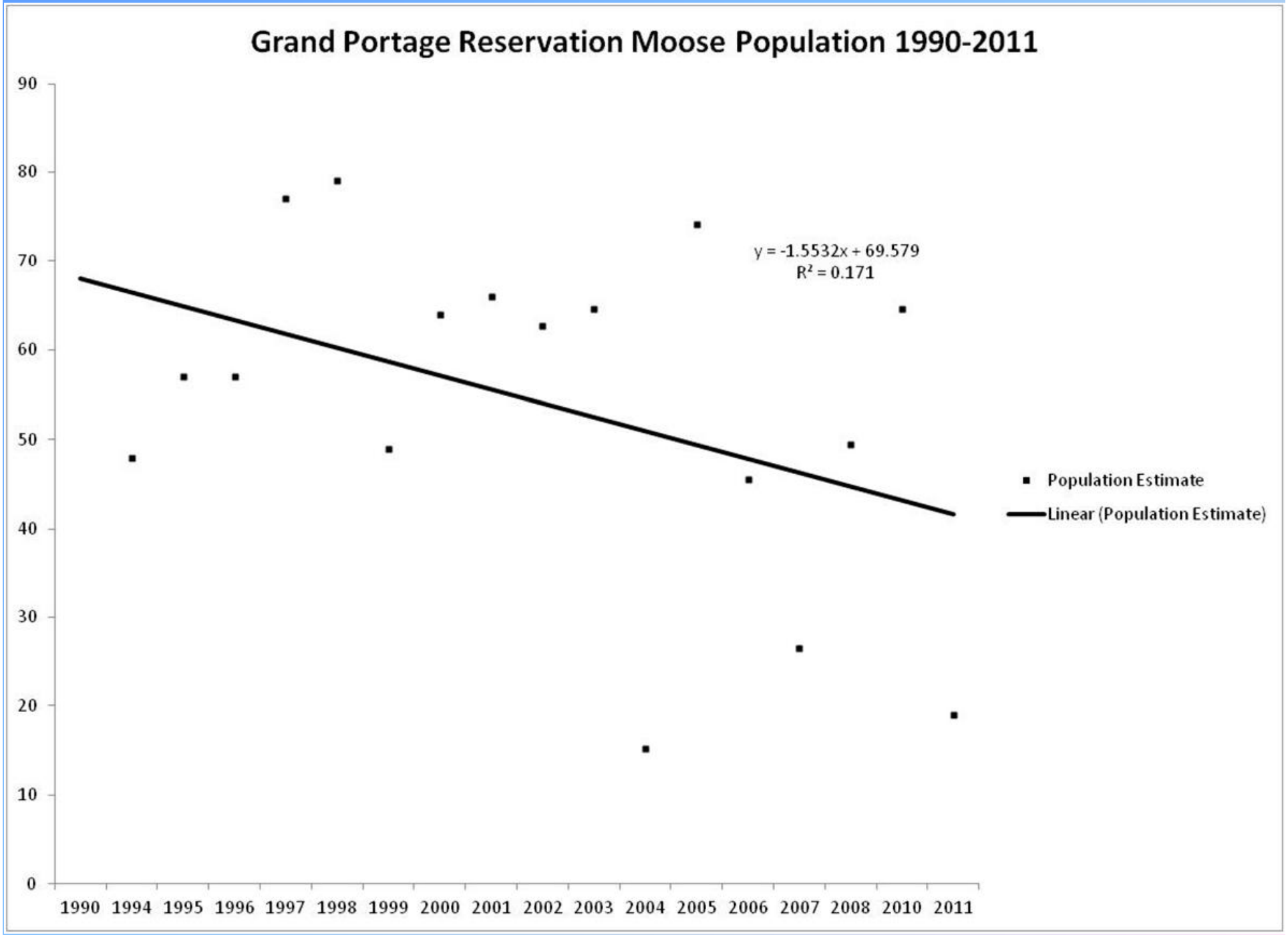

PACIFIC TRAIL

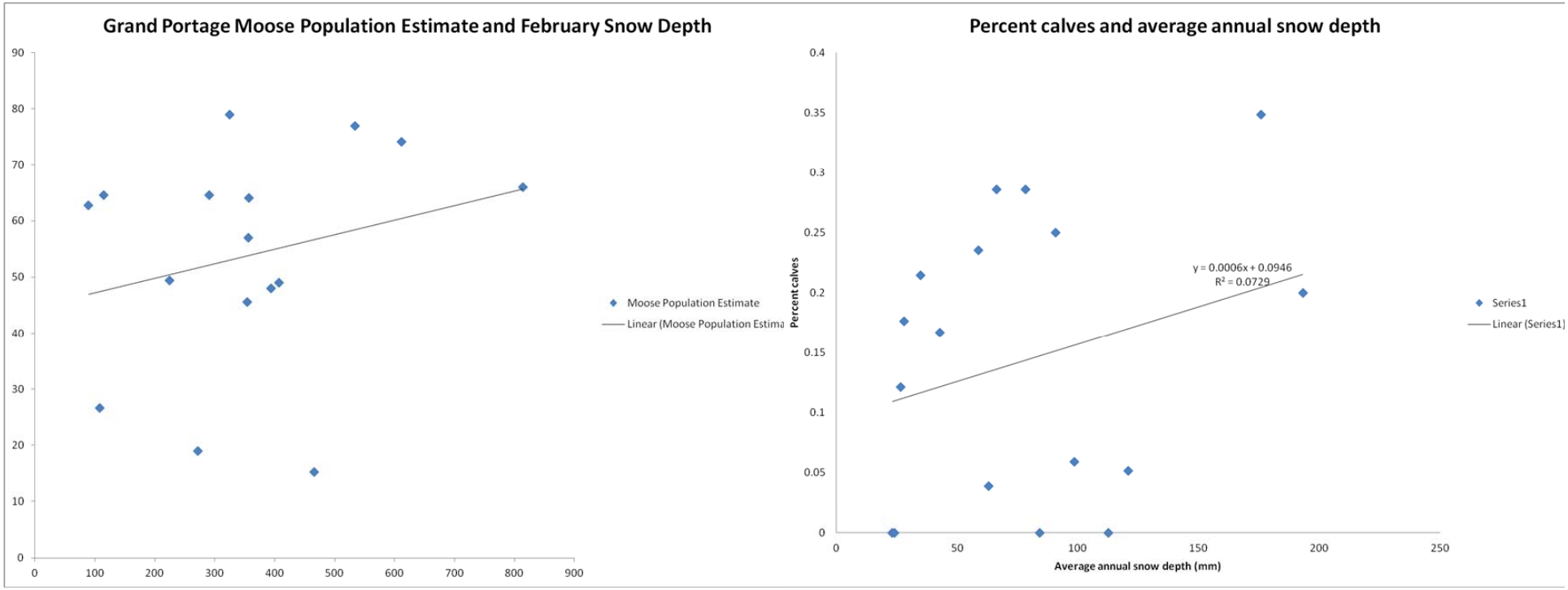
Is climate change happening in Grand Portage?

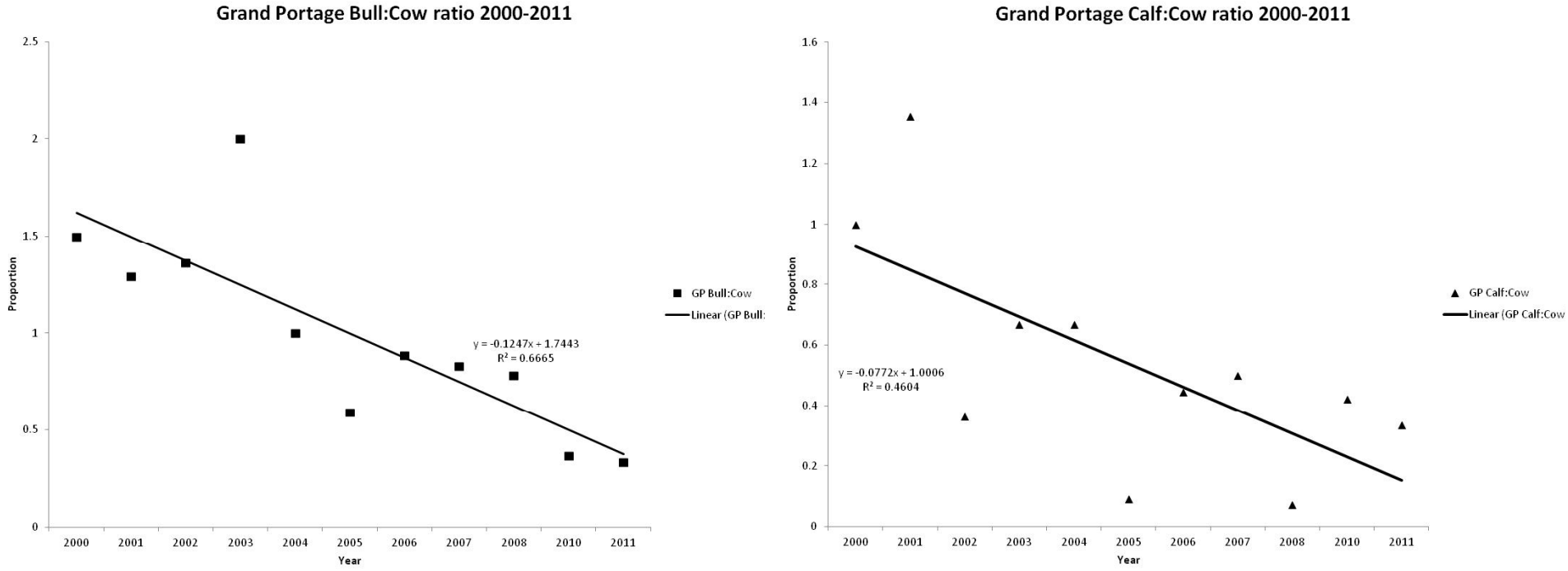


Data from Grand Portage Weather station, provided by NOAA


Grand Portage Average February Snow Depth
1200
1000
800
600
400
200
0
Average snow depth (mm)
1950
1960
1970
1980
1990
2000
2010
2020
Year
y = -8.2982x + 16944
R² = 0.3091
Series1
Linear (Series1)

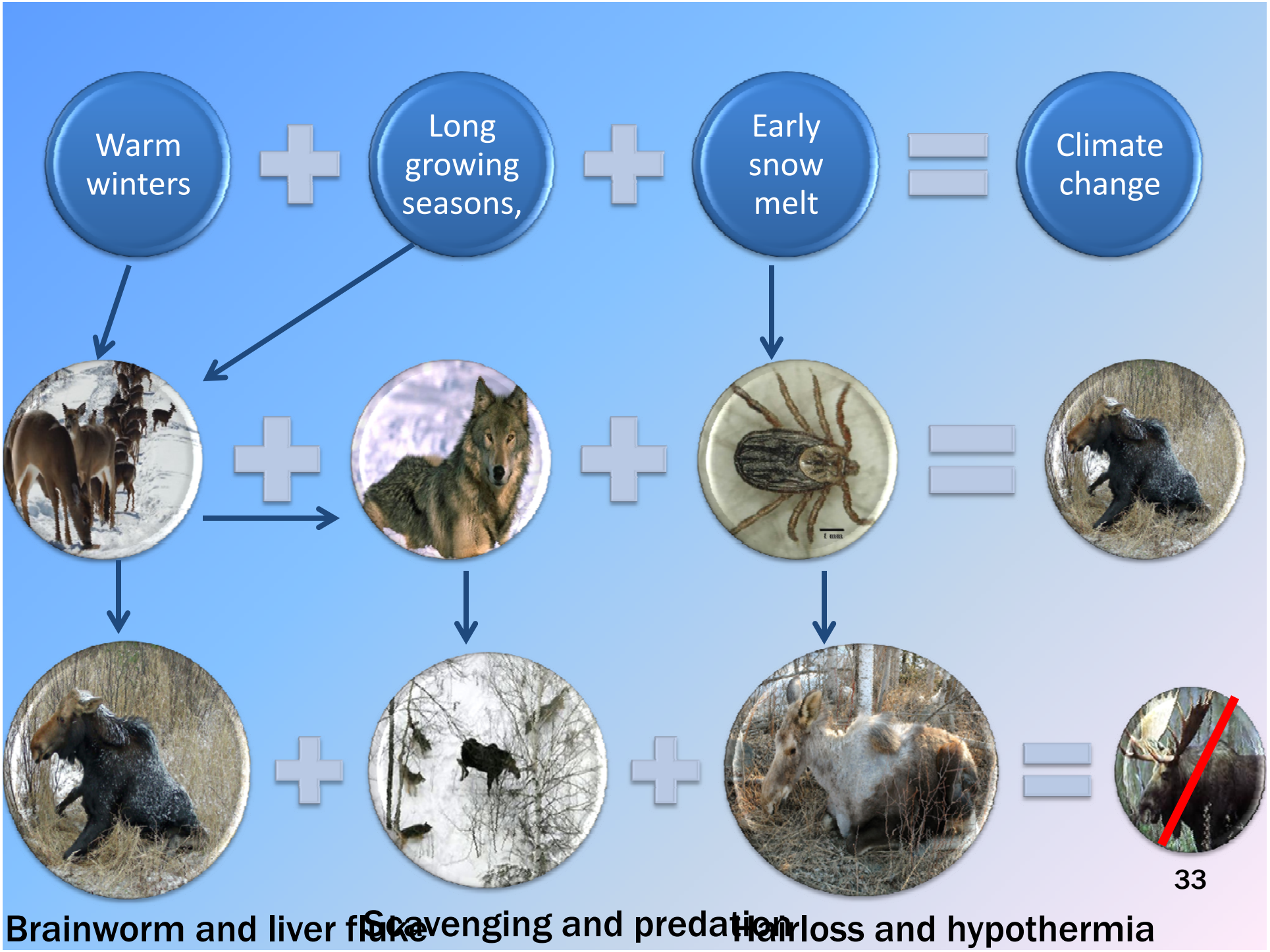

Grand Portage Reservation Moose Population 1990-2011
90
80
70
60
50
40
30
20
10
0
1990 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2010 2011
y = -1.5532x + 69.579
R² = 0.171
Population Estimate
Linear (Population Estimate)


Grand Portage Moose Population Estimate and February Snow Depth
Moose Population Estimate
Linear (Moose Population Estima
Percent calves and average annual snow depth
Percent calves
Average annual snow depth (mm)
y = 0.0006x + 0.0946
R² = 0.0729
Series1
Linear (Series1)


Grand Portage Bull:Cow ratio 2000-2011
Proportion
Year
y = -0.1247x + 1.7443
R² = 0.6665
GP Bull:Cow
Linear (GP Bull:
Grand Portage Calf:Cow ratio 2000-2011
Proportion
Year
y = -0.0772x + 1.0006
R² = 0.4604
GP Calf:Cow
Linear (GP Calf:Cow

Vectors for moose population decline

Climate change + Fire frequency = Moose population decline


Warm winters
Long growing seasons,
Early snow melt
Climate change
Brainworm and liver fluke
Scavenging and predation
Hairloss and hypothermia
33

Fire suppression

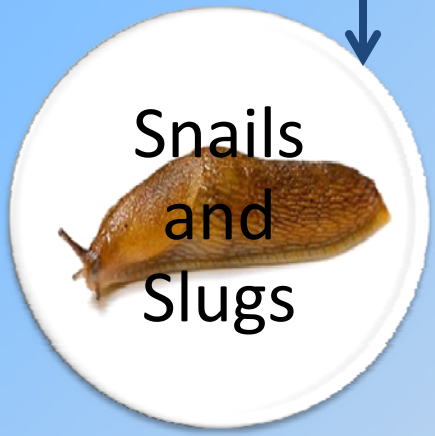
+

logging

=

Altered wildfire frequency

+



=

Moose mortality

Hairloss and hypothermia

+

Brainworm

+

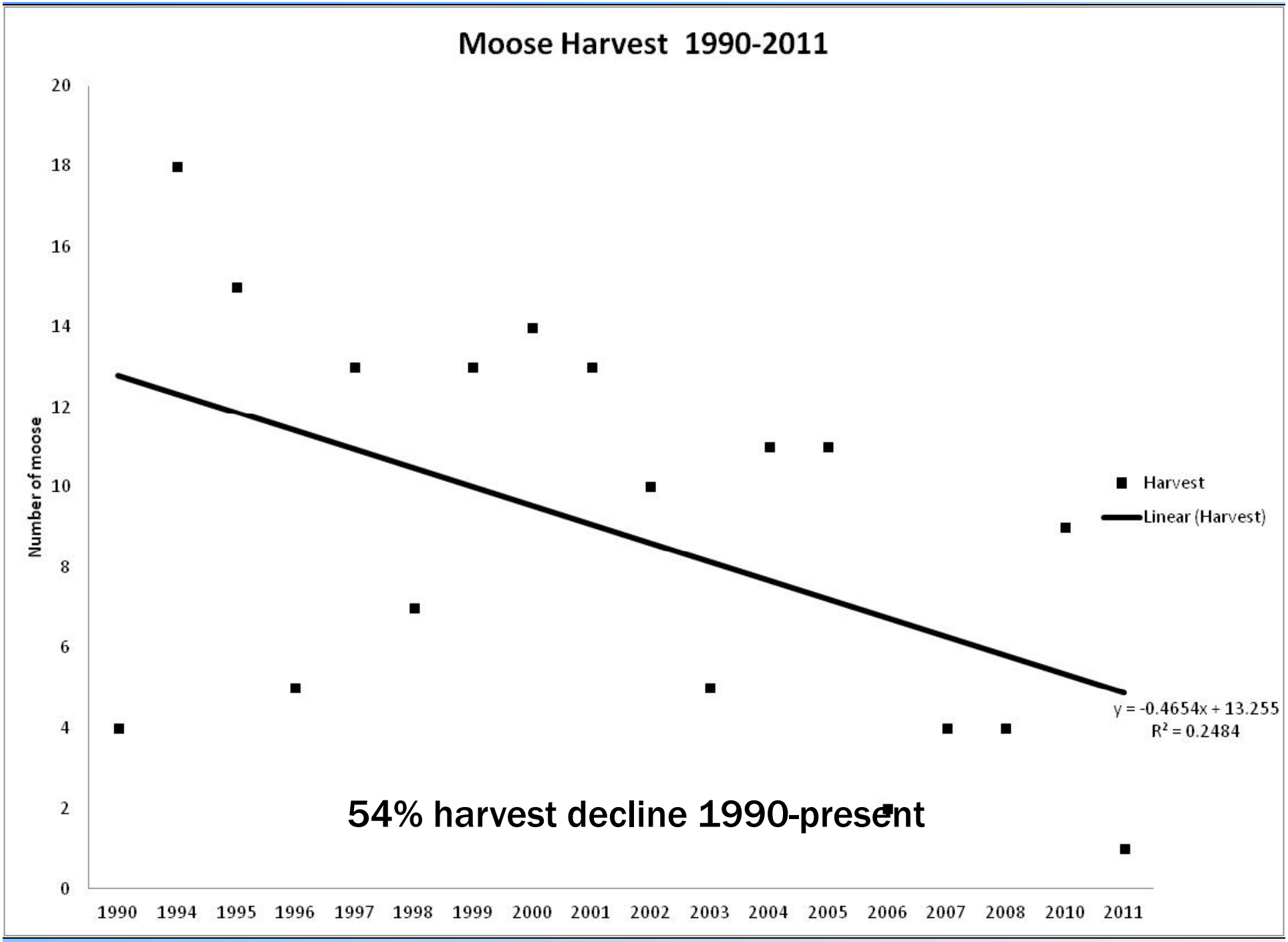
Liver flukes

=

What are climate change impacts to subsistence lifestyles and traditional practices?

Are there impacts to access to nutritional foods?

Are we seeing effects of extreme weather conditions?


Moose Harvest 1990-2011
Number of moose
20
18
16
14
12
10
8
6
4
2
0
1990
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2010
2011
Harvest
Linear (Harvest)
y = -0.4654x + 13.255
R² = 0.2484
54% harvest decline 1990-present

Grand Portage
History of the climate change plan

- Began in 2008
- Request of Trust Lands Administrator to create a white paper on climate change
- Set up a team
- Monthly meetings for a year
- Interview elders
- Air quality, water quality, forestry, fisheries and wildlife, solid waste, food and energy sustainability
- One chairperson

Structure of our plan

- Executive Summary

Chapter 1 - White paper on climate change

- Guiding Principles
- History
  - Native Cultures Worldwide
  - Grand Portage Band
- Evidence of climate change

  - Global

  - Local

  - Recommendation for adaptation

Chapter 2 Strategic planning for resource management

- Air
- Water
- Forestry
- **Fisheries**
- **Wildlife**
- **Food Sustainability**
- **Alternative energy**

Components of our plan

Guiding Principles

1. Look Seven Generations Ahead
2. Incorporate Ojibwe Worldview
3. Protect Existing Resources
4. Restore on the Basis of Sound Science

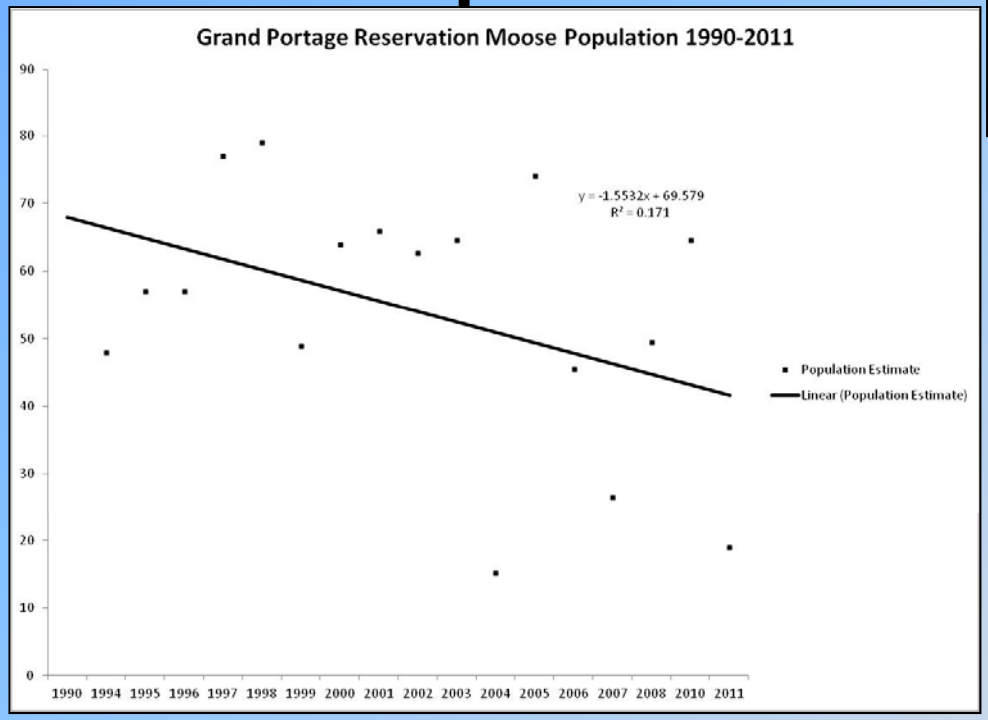
- Improve and Protect Impacted Resources
- Plan for Future Change
- Establish Rigorous, Long-Term Monitoring Programs
- Critically Evaluate Management and Regulation of Natural Resources
- Coordinated Research to Fill Critical Gaps in Knowledge
- Include a Long-Term Integrated Strategic Plan for Restoration, informed by the best science and management practice

Hurdles and impediments

- Staffing – commitment/funding
- Scope of plan
- What to plan for: forestry, wildlife, water, air, energy, food sustainability
- Seven voices
- How do we plan?

Examples of trigger points

- **Acute**
- **Paradigm shift**
- **A few examples**



Acute - Wildfire in Airshed

- When BAM monitor exceeds 41-65 ug/m^3 unsafe for sensitive parts of population, 65-150 ug/m^3 unhealthy
- Alert school, Clinic, Community Center, Headstart, Elder complex
- Put up flyers, mass email, call public radio station, newspaper
- Continue monitoring and updates, similar notification when level drops

Acute trigger points – Trout Lake Fishery

- **When brook trout population exceeds Catch Per Unit Effort (CPUE) of 15 fish/electrofishing hour - do nothing**
- **When brook trout population falls between 5-15/e-fishing hour**

  - aggressive restoration – supplemental stocking, limit harvests
- **When brook trout CPUE falls to 0-5 for three years**

  - shift to warm water fish assemblage

Case study, Trout Lake

- Historically a brook trout lake
- Populations diminished
- Supplemental stocking
- Decision to shift to warm water

  fish assemblage
- Yellow perch 2004
- Walleye 2006
- Last brook trout 2007
- Presently self sustaining

  perch/walleye

Paradigm shifts..

- **Regional mining compounded with warming temperatures may lead to higher atmospheric mercury deposition, increased runoff, and pollution issues near mines**
  - **Increase AQ and WQ presence in permit and EIS review, ensuring mining companies adhere to applicable state and federal laws**
  - **Increase annual monitoring of fish mercury levels**

Food Sustainability

- Increasing dependence upon conventional food systems that are rapidly growing more unstable
  - Intense weather extremes: drought, flooding, extreme temperatures, hail
- Conventional Ag is rapidly increasing its dependence upon fossil fuels
  - Average piece of food has traveled 1500 mi.
- Grand Portage is in a “food desert”
- Fossil fuels price increases = food price skyrocketing; places like GP will be the hardest hit
- GP can add resiliency to the community by becoming food sustainable

Plan for Food Sustainability

- Creation of a community garden
  - started in 2008
  - tripled in size
  - currently used by 20 families
- Development of a bison ranch
  - Feasibility study underway
  - Land parcels being evaluated
  - Grazing specialist this June
  - Seeking grant funding

Where are we now?

- Initial Draft of Plan nearly complete
- Must be vetted/edited
- Present to council
- Will request resolution to adopt plan

Public Health Implications of Extreme Weather Conditions in Tribal Communities
October 22, 2012

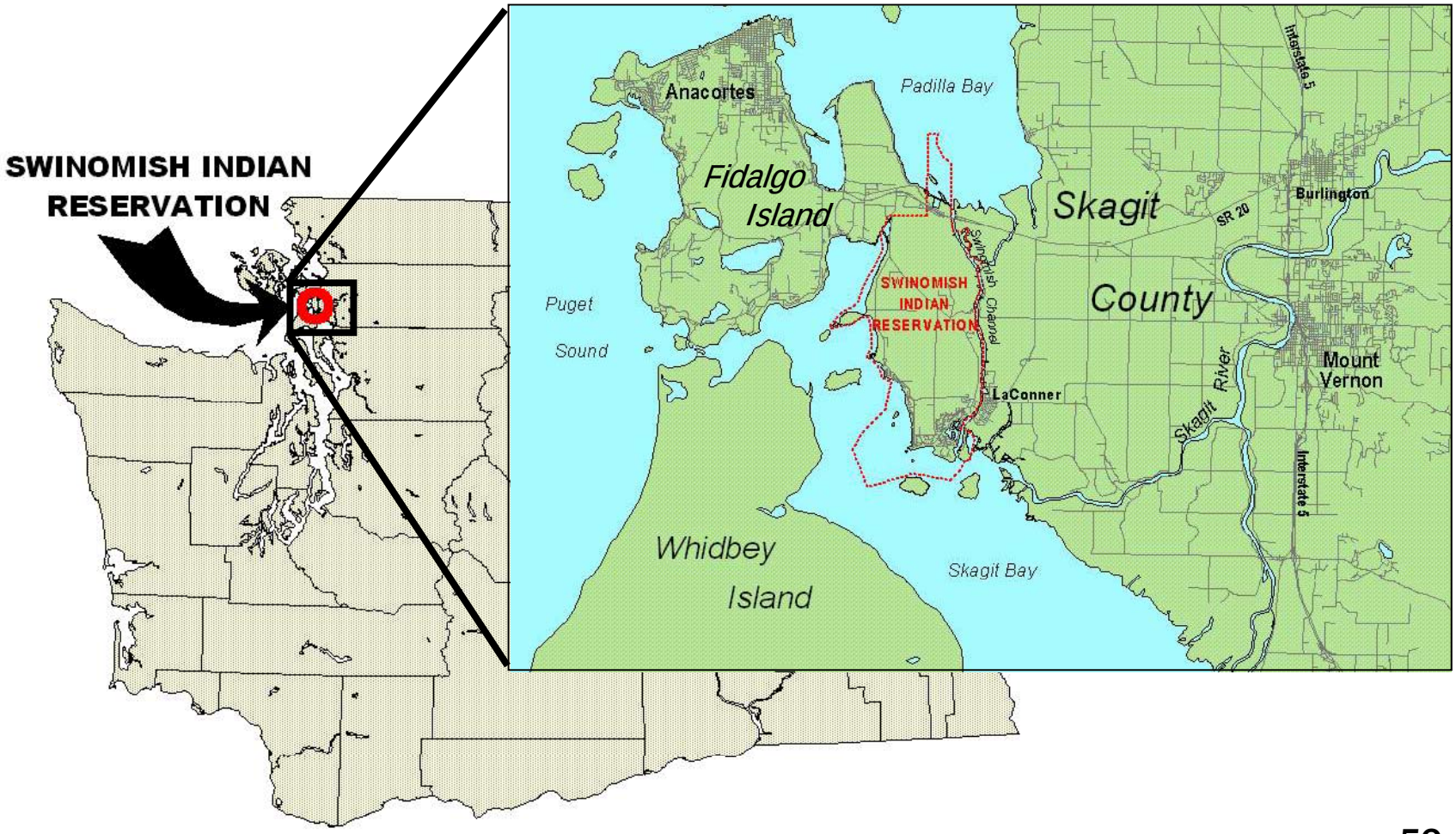
Local Response to Climate Change:

Swinomish Case Study

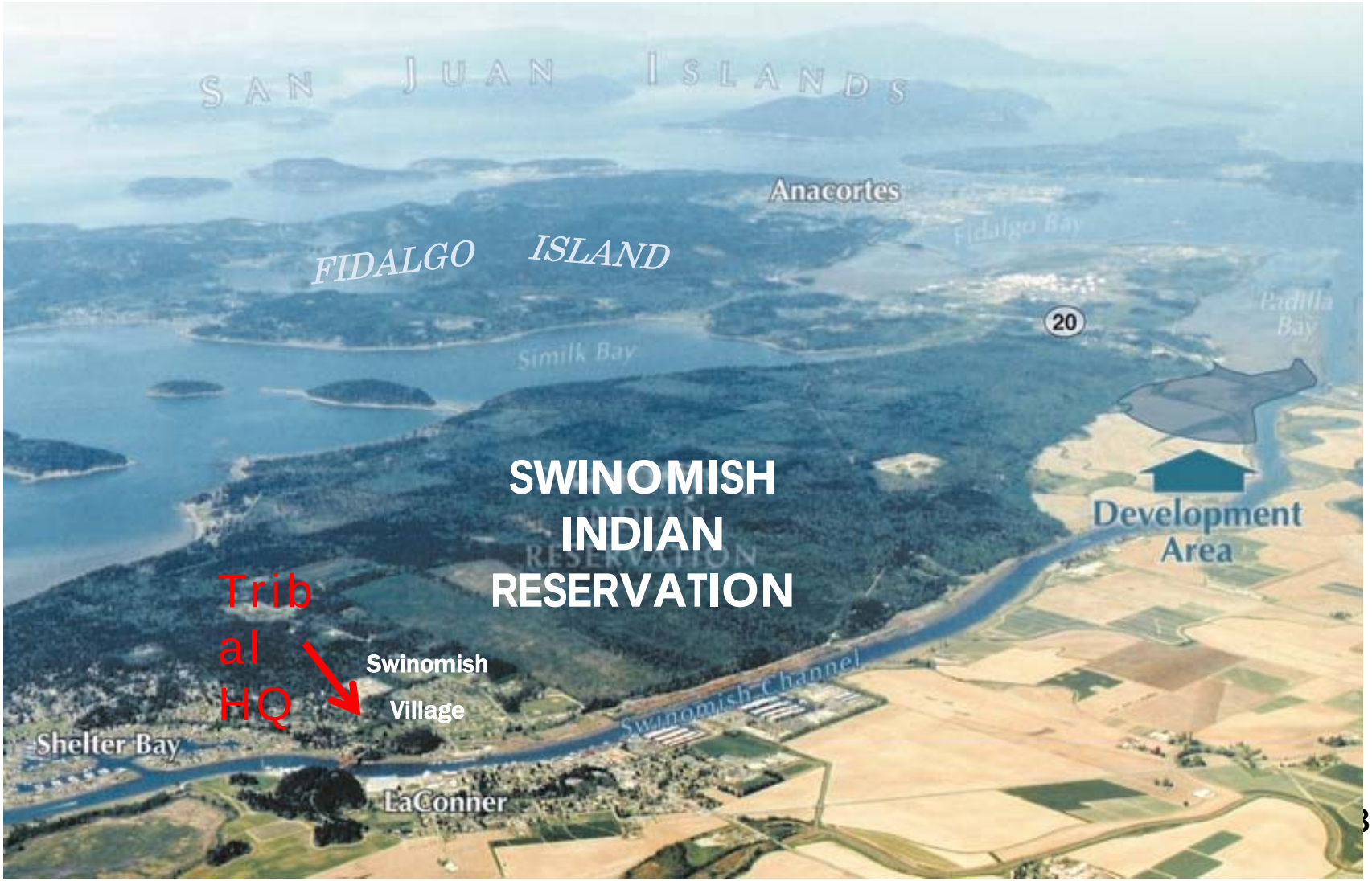
Ed Knight, AICP, Senior Planner

Swinomish Indian Tribal Community

Location of Swinomish Indian Reservation



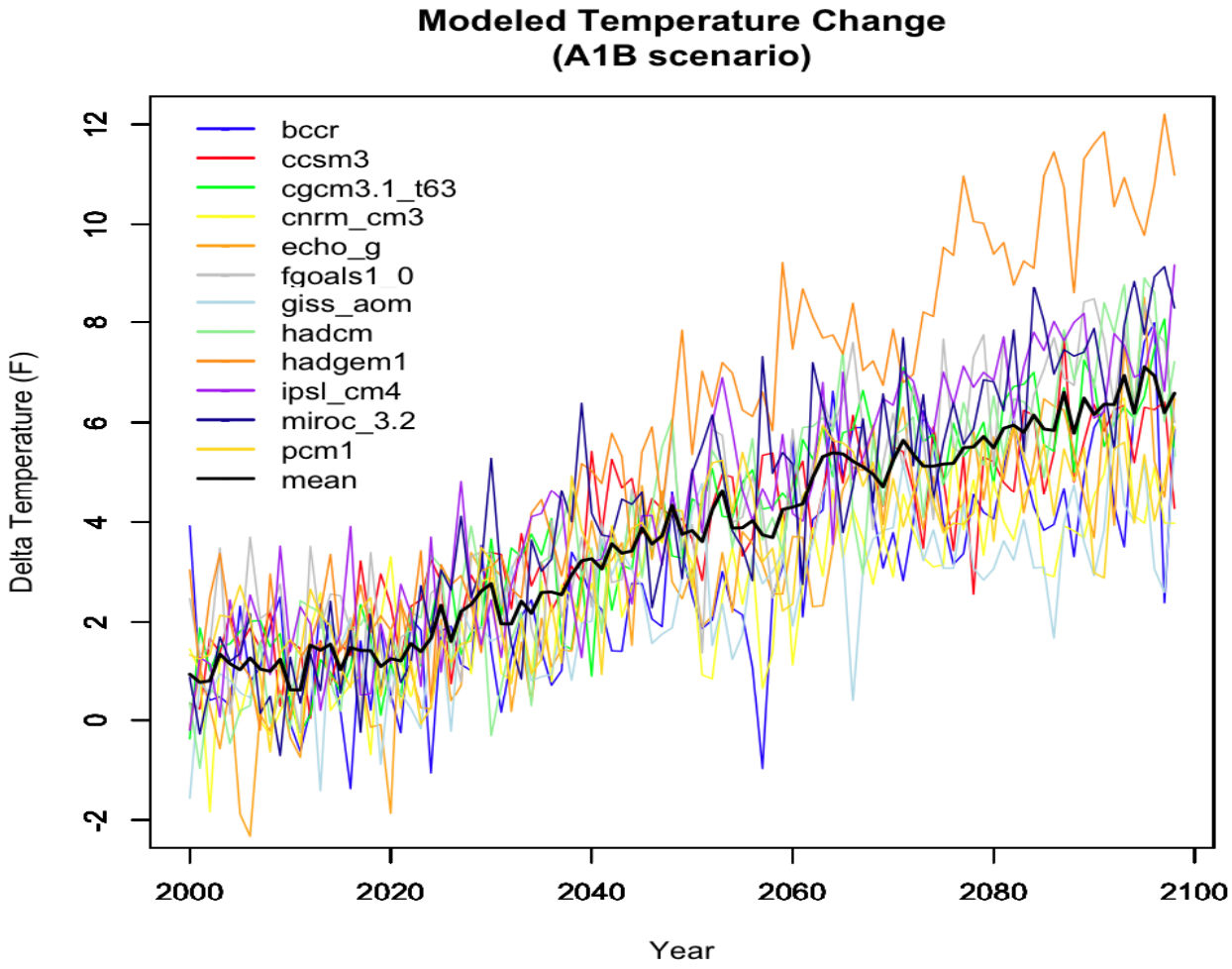
Swinomish Indian Reservation



Some Terms & References

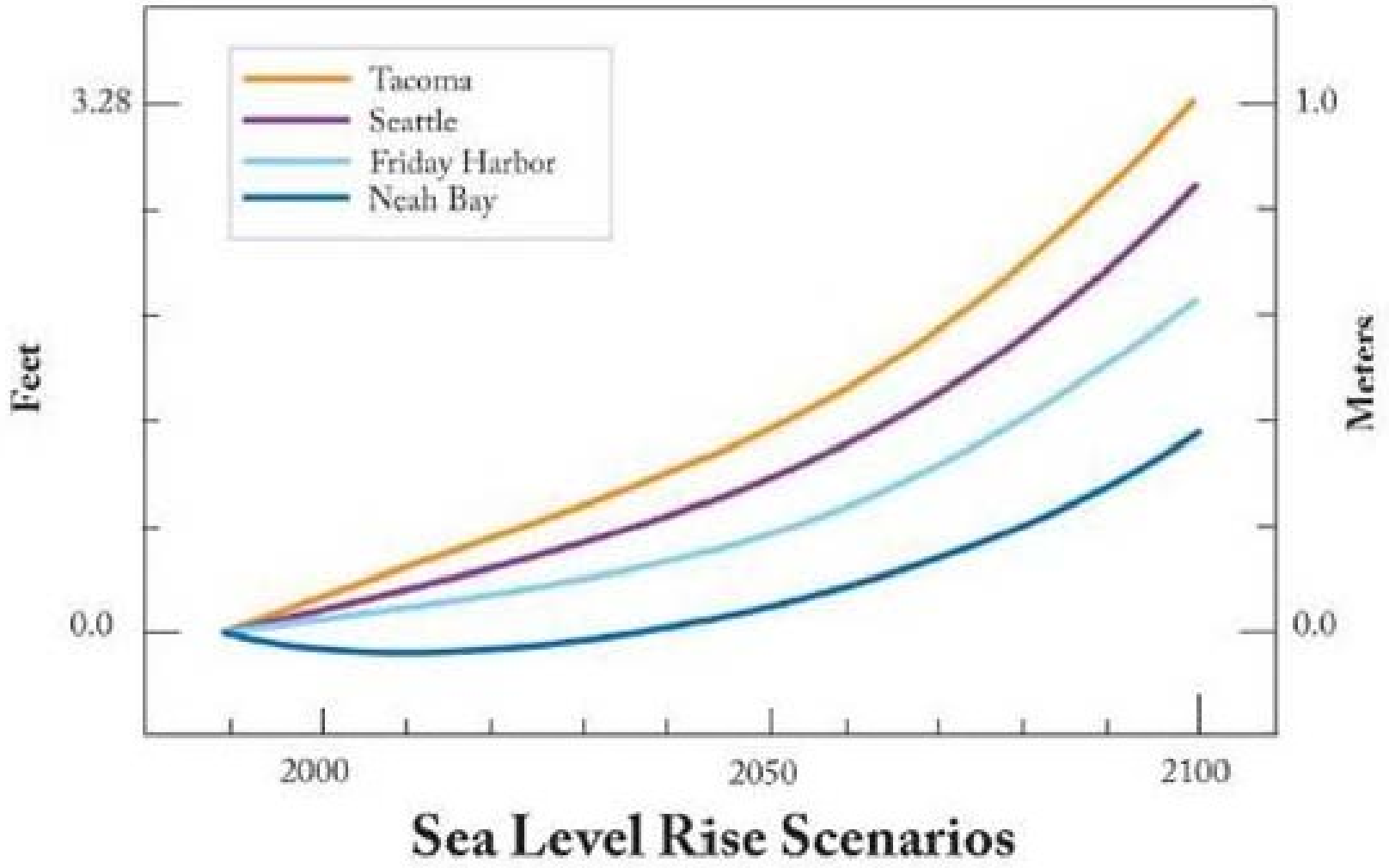
- **IPCC: Intergovernmental Panel on Climate Change (United Nations)**
- **CIG: Climate Impacts Group, University of Washington**
- **Mitigation: Dealing with the causes of climate change**
- **Adaptation: Dealing with the effects of climate change (actual or projected)**

Projected Temperature Increase (F)
(CIG, 2009)



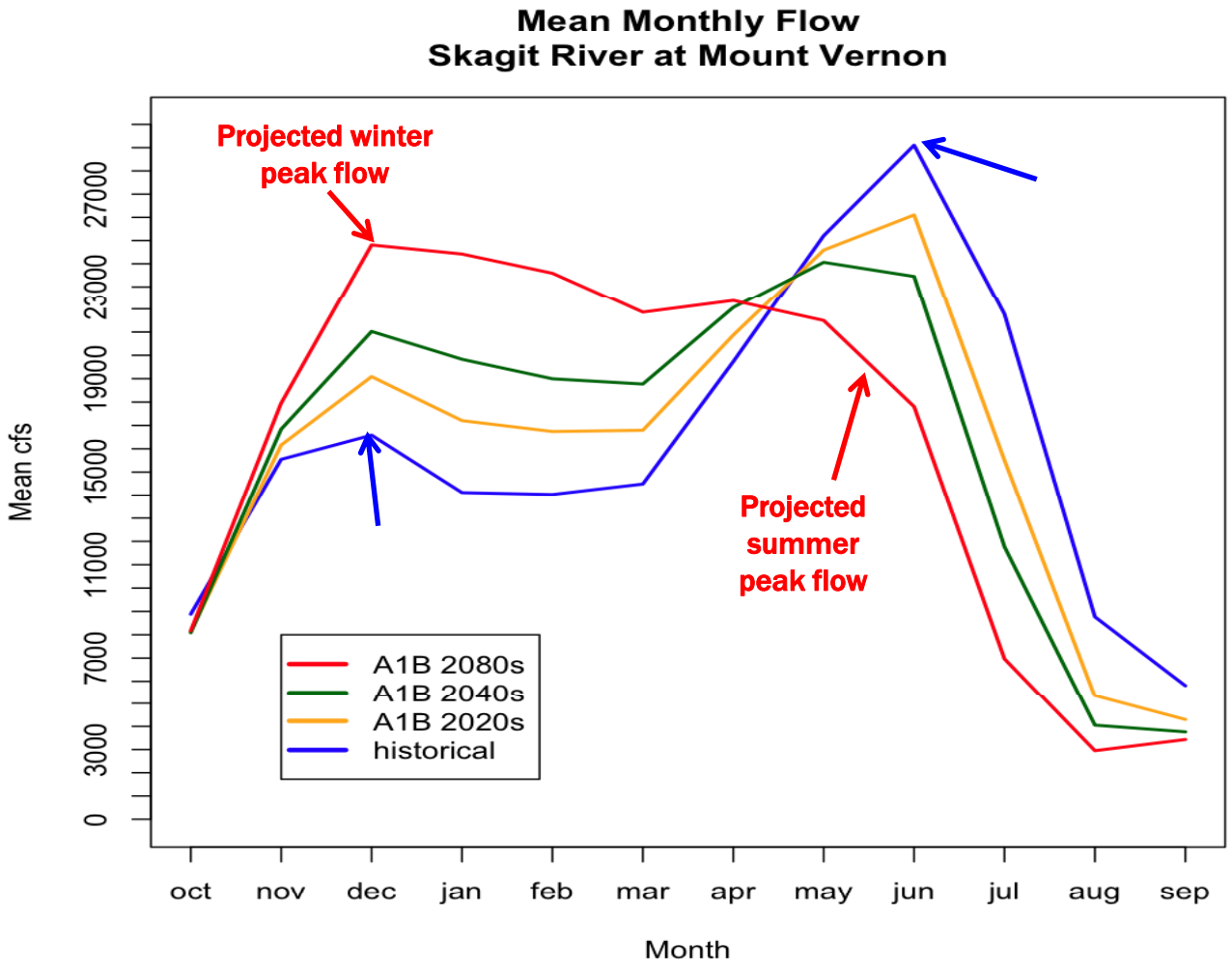
3˚ -8˚ F change in mean temperature by 2100

Projected Sea Level Rise
Puget Sound & WA Coast
(CIG, 2006)



Tidal surge, Swinomish Reservation, 2006

Changing / Declining River Flows
(CIG, 2009)



since 1948

Adaptation Planning Challenges

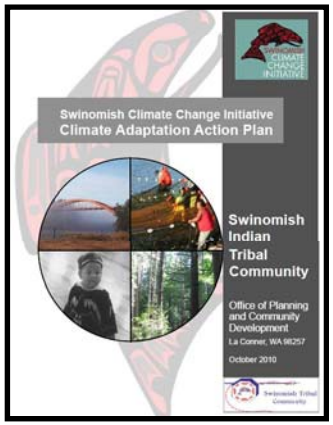
- Many disciplines, many moving parts
- Data uncertainties and gaps
- Complex issues, changing circumstances
- Public perceptions and communication
- Funding options, sources, availability
- Long, indefinite timeframes for impacts; shorter, finite project timelines

Swinomish Climate Change Initiative

(Guidance: CIG/King County guidebook)

- 2-year, $400,000 project (80% federal, 20% tribal)
- Partners: UW-CIG, Town of LaConner, Skagit Co.

- Year 1 – Technical Report (2009):
  - Impact assessment
  - Vulnerability assessment
  - Risk analysis



- Year 2 – Action Plan (2010):
  - Review strategies, criteria
  - Assess requirements
  - Develop/prioritize recommendations

Project Participants
Swinomish Climate Change Initiative

- **Interdisciplinary core staff team**
- **Univ. of WA Climate Impacts Group (CIG), science advisors**
- **Advisory Partners: Town of LaConner, Skagit County, Shelter Bay Community**
- **Community engagement group (Tribal leaders, elders, youth, staff)**

Impact Scoping Matrix

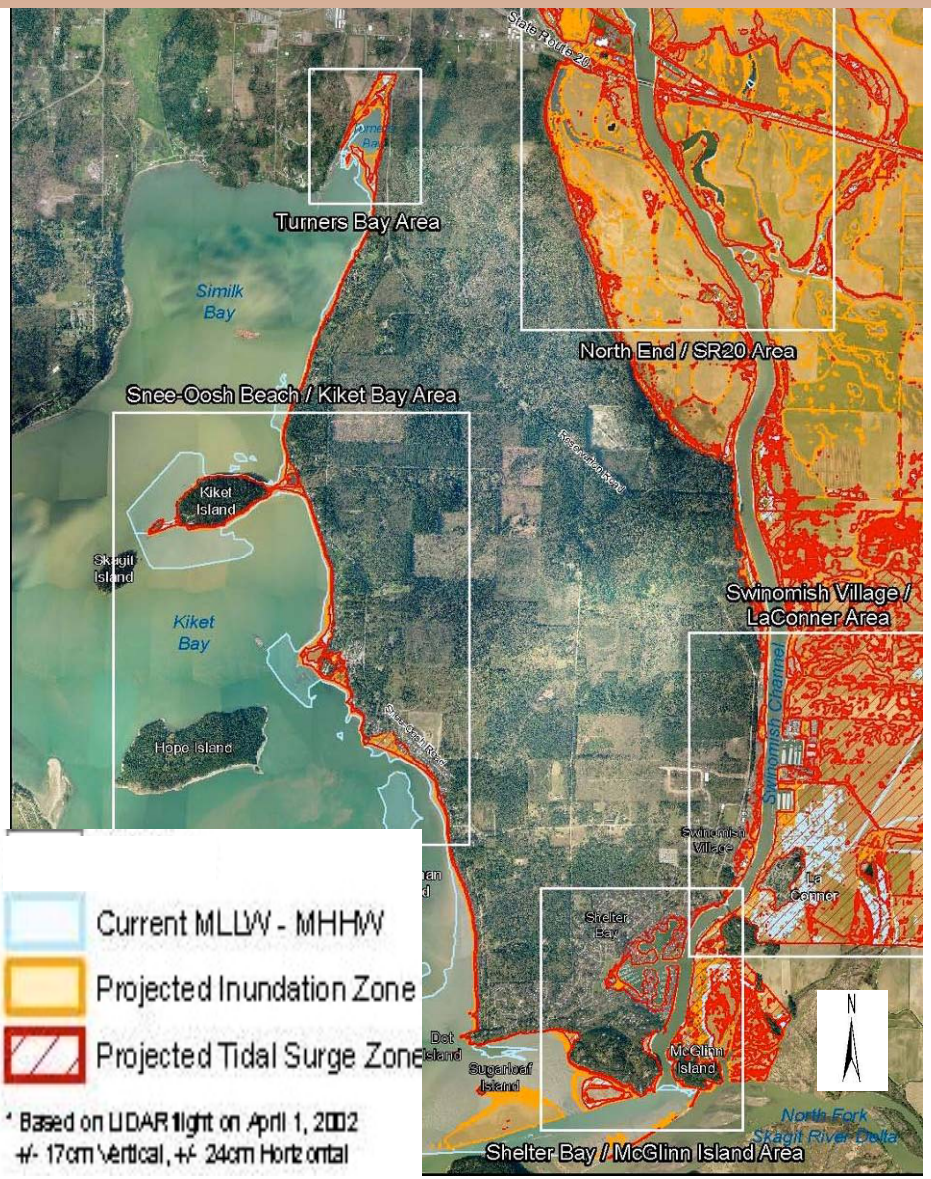
Swinomish Climate Change Initiative

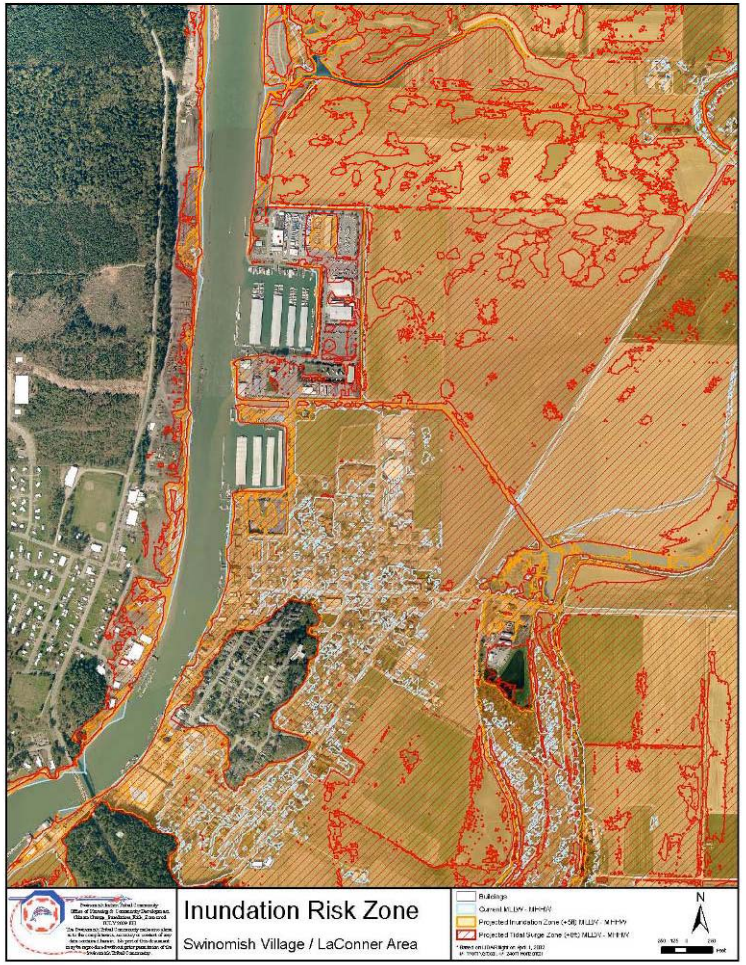
POTENTIAL CLIMATE CHANGE IMPACTS BY POLICY SECTORS					20 - 50 YR PROBABILITY:		HIGH <----	----------	--> POSSIBLE	(UNSHADED: NOT LIKELY
SWINOMISH INDIAN RESERVATION VICINITY					50-100 YR PROBABILITY:		HIGH <----	----------	--> POSSIBLE	(UNSHADED: NOT LIKELY

IMPACT TYPE:	Inundation	Tidal Surge	Severe Storm	Erosion	Salinization	Temp Δ	Heat Stress	Precip Δ	Nutrient Δ	Habitat Δ	Species
SECTOR/ELEMENT:											
NATURAL SYSTEMS											
Shoreline/Beaches											
Tidelands/Marine Habitat											
Fish & Wildlife:											
Shellfish											
Salmon											
Forage fish											
Waterfowl/shorebirds											
Upland wildlife & habitat											
Water resources:											
Freshwater											
Groundwater											
Wetlands											
Forest resources											
Air Quality											
HUMAN/BUILT SYSTEMS											
Land uses:											
Near-shore development											
Housing/Residential											
Commercial/Industrial											
Stormwater management											
Hazardous Sites/Materials											
Agriculture											
Recreation											
Public/Private Utilities:											
Water											
Wastewater											
Communications											
Energy/Power											
Waste management/disposal											
Emergency Services:											
Police											
Fire											

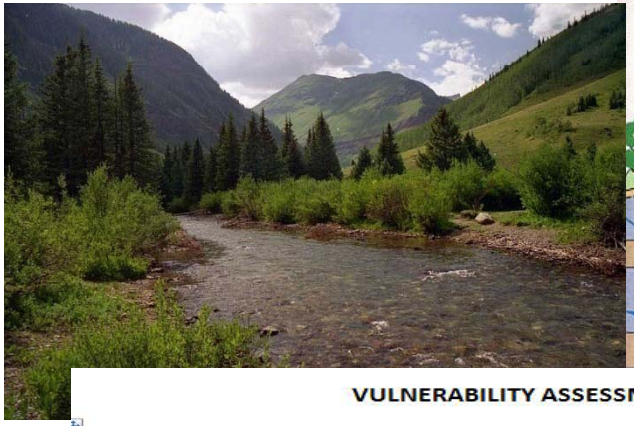
Inundation Risk Zones, SLR & Tidal Surge

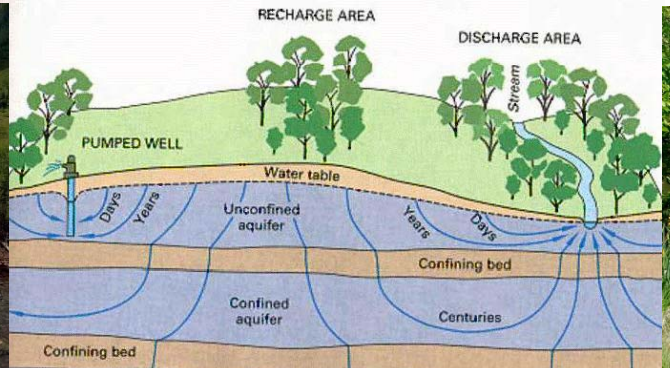
Swinomish Climate Change Initiative

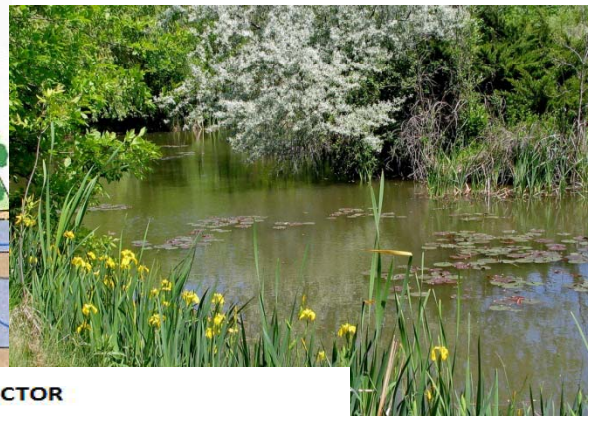




Impact Assessment
Swinomish Climate Change Initiative







VULNERABILITY ASSESSMENT OF POTENTIAL CLIMATE CHANGE IMPACTS BY SECTOR

Sector	Element	Potential Impacts	Impact Sensitivity (exposure/ susceptibility)	Adaptive Capacity	Complicating Factors	Vulnerability (impact level)
Water Resources	Freshwater	Declining consistency/ volume of in-stream flows, earlier peak runoff	Medium-High, greater as temperature rises	Low	More acute in snow-to-rain dominant transition areas	Medium-High
	Groundwater	Increasing salinization from salt water intrusion	Medium-High, wells near shoreline zones	Low	Greater drawdown exacerbates issues	Medium-High
	Wetlands	Increasing inundation from higher tides, storm surges (estuarine)	High, greater for estuarine, freshwater wetlands	Low	Conversion/loss proportional to inundation	High
		Decline/degradation of upland wetlands from reduced flow input	High, greater with increasing temperature and declining precipitation	Low	Increased loss may contribute to higher wildfire potential	High

RISK ANALYSIS OF POTENTIAL CLIMATE CHANGE IMPACTS BY SECTOR

Sector	Element	Potential Impacts	Vulnerability	Probability	Estimated Risk
Water Resources	Freshwater	Declining consistency/volume of in-stream flows, earlier peak runoff	Medium-High	Medium	Medium-High
	Groundwater	Increasing salinization from salt water intrusion	Medium-High	Medium	Medium-High
	Wetlands	Increasing inundation from higher tides, storm surges (estuarine)	High	High	High
		Decline/degradation of upland wetlands from reduced flow input	High	Medium	Medium-High

Impacts on Tribal Resources

TOO MUCH WATER:

Beach seining

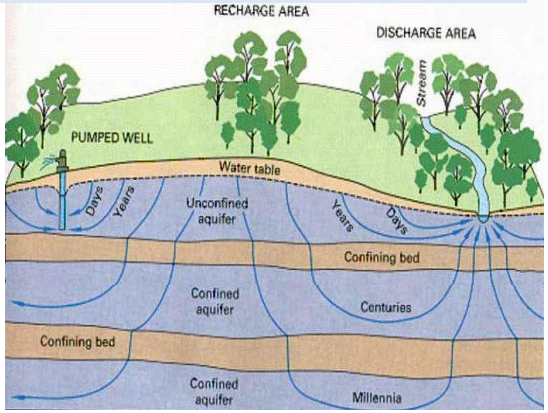
Fishing facilities

Shellfish

TOO LITTLE WATER:

Streamflows

Wetlands

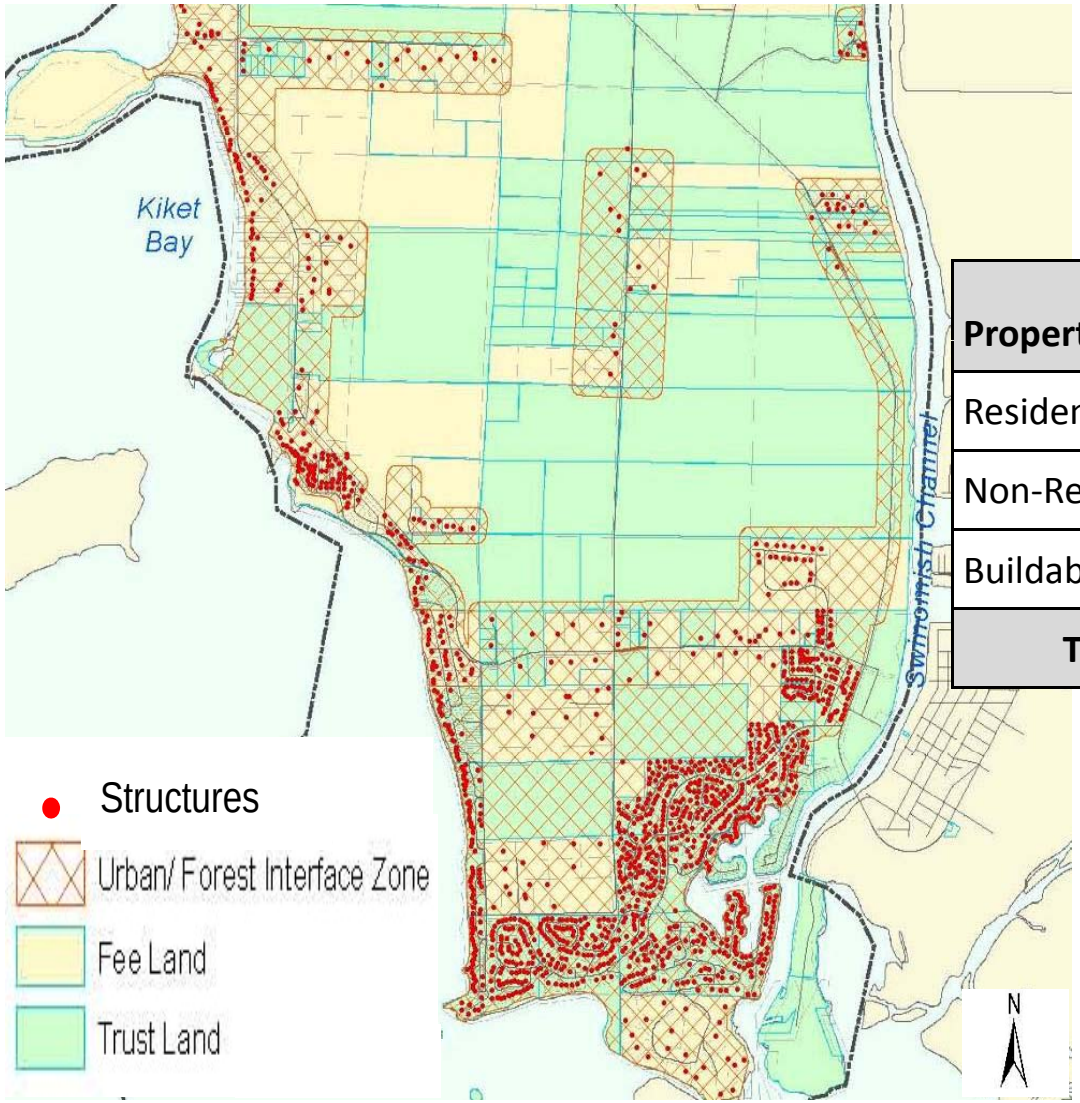


Groundwater recharge

Water Resource Issues

- Increasing demand/shrinking resource
- Surface water/groundwater balance
- Local/non-local supply dependence
- Regional water supply allocation/planning
- Control over vulnerability, protection
- Conservation/usage restrictions

Wildfire Risk Zone
Swinomish Climate Change Project



Property Type	Number	Acres	Approximate Value
Residential	1,368	1,995	$ 493,688,000
Non-Residential	9	143	$ 4,806,000
Buildable Lots	183	80	$ 19,918,000
TOTAL	**1,560**	**2,218**	**$ 518,412,000**

Impacts on Human Health

- Heat-related illness (exhaustion, stroke)
- Respiratory problems (asthma, air quality)
- Opportunistic viruses (West Nile, flu)
- Emerging health threats (fungal, viral)
- Food-borne/pollution related threats (toxins, water quality)

Strategy Evaluation Criteria

- **Comprehensiveness –**
  Address range of impacts and risk
- **Sustainability –**
  Long-term solution, not band-aid fix
- **Dynamic approach –**
  Respond to changing facts, circumstances
- **Fiscal impact / feasibility –**
  Consider financial commitments, term
- **Community goals –**
  Align with desires / needs of the community

Community Outreach / Awareness

Events:

- School Science Fair
- Annual Tribal Clam Bake
- Earth Day Activities

Communications:

- Tribal Newsletter
- Community Meetings
- Individual Interviews

Implementing Action Plan Priorities
($ = relative estimated cost per $1000)

- **Coastal zone protection ($$$?)**
- **Dike maintenance / repair ($$$$)**
- **Regional access preservation ($$$$$)**
- **Wildfire control (Firewise) ($)**
- **Local emergency planning ($)**

Implementation Challenges

- Competing priorities, political realities
- Funding options, sources, availability
- Identifying/forging partnerships
- Monitoring, criteria for evaluation
- Flexibility, adaptive approaches
- Institutionalizing planning, efforts

Credits and References

- Swinomish Climate Change Initiative supported by a grant from the U.S. Department of Health & Human Services, Administration for Native Americans.
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- Zervas C (2005) ***Response of extreme storm tide levels to long-term sea level change.*** NOAA Center for Operational Oceanographic Products and Services.
- Photos: Channel Town Press (Doug Cole), Feb. 2006; Swinomish Indian Tribal Community.
- Presentation preparation/contact: Ed Knight, AICP, Senior Planner, Swinomish Indian Tribal Community, LaConner, WA, 360-466-7304, **eknight@swinomish.nsn.us**.
  Information and complete copies of reports available on the Swinomish Climate Change web site,
  www.swinomish-nsn.gov/climate_change/project/reports.html


Land
Air
Water