

# Historical Ecology for Risk Management

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Applied Research in Environmental Sciences Nonprofit, Inc.

**Facebook Journal @arieshermys**

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NOAA Social Coast Forum, 2016



# Historical Ecology for Risk Management

## Background and Context

### 1. Risk Management Program-

- Applied Research in Environmental Sciences Nonprofit, Inc. funded for Student Education, Tribal Outreach, and Symposia Coordination
- Funded by Science and Technology Center of Excellence for Department of Homeland Security CREATE (2006-present)

### 2. Historical Ecology Research Model

Integration of Historical, Social-Natural Sciences

### 3. Historical Ecology for Risk Management-Youth Sustainability (HERMYS)

- Application with and for North Slope Borough RM, AK. 2013-present and long term
- Risk, Capability, and Impact: Community driven projects for participatory research and the RIA Framework



# Applied Research in Environmental Sciences Nonprofit, Inc.

Anne Garland and Kathleen Fischer Research Associates

## MISSION

ARIES is a non-profit research association promoting collaborative research, public education, and public outreach designed to enhance corporate and community based decision making.

[www.ariesnonprofit.com](http://www.ariesnonprofit.com)



# Working Together for a Safer Tomorrow

## Program:

Applied Research in Environmental Sciences Nonprofit, Inc.

Funded for Student Education, Tribal Outreach, and Symposia Coordination

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## Sponsor:

DHS National Center of Risk and Economic Analysis of Terrorism  
Events (CREATE) Center of Excellence for Science and Technology

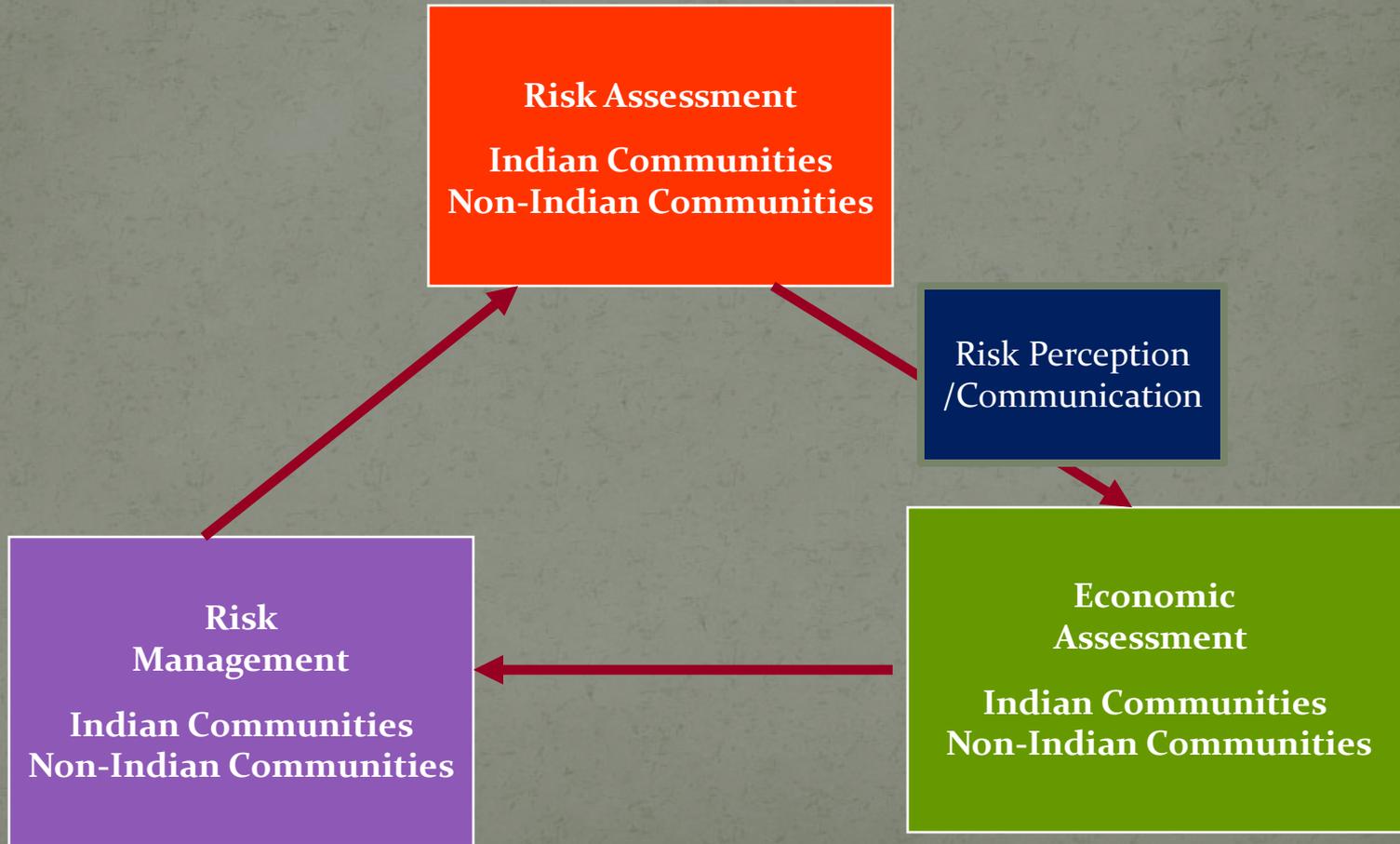
DHS Research Associates: Anne Garland and Lloyd Mitchell , Co-PIs



# “Working Together for a Safer Tomorrow”

## Research Framework

(Trially Inclusive Geographic Area-TIGA)



# What is historical ecology?

**Biocomplexity**- *dynamic web of often surprising interrelationships that arise when components of the global ecosystem -- biological, physical, and human –interact. (NSF Coupled Natural and Human Systems Grant)*

**Interactions**-*between societies and environments and the consequences of these interactions for understanding the formation of contemporary and past cultures and landscapes. (W. Balee, Tulane University, 1998)*

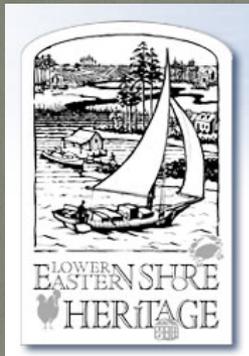
**Integrative and Comparative**- *inclusive of temporal, spatial and cultural dimensions (Carole Crumley, University of North Carolina, 1987)*

**Historical focus** *on the dynamics of change. (Carole Crumley, Uppsala , 2011, IHOPE , <http://ihopenet.org/> )*

**Complexity Theory**- *assists modeling of variabilities that have complex rules. These rules include social and natural variables of interaction. (NSF Task force on the Environment for the 21<sup>st</sup> Century)*

**Applied**-*historical perspectives increase our understanding of the dynamic nature of landscapes and provides a reference for accessing modern patterns and processes” (T. Swetnam, C. Allen and J. Betanour, “Applied historical ecology: Using the past to manage for the future”, 1999. )*

# Essential Infrastructure for Historical Ecology = Eco-Heritage Resources



*Collaborations among historical, social and natural sciences along with various public and private entities are hallmarks of this approach.*



## **Transdisciplinary Approach**

**Stakeholders** - *community groups of all cultural backgrounds, local school systems, municipal governments, state resource management, corporations, and relevant non-profit groups (whole community approach)*

**Outreach Strategies** - *town meetings, community exhibits, workshops, symposia, round-tables, forum panels, websites, local museums, reading materials, technical reports, academic programming (cohort mentoring, project based learning, internships, scholarships), school outreach programs and projects, teacher continued education to apply to learning objectives, and especially, supervised community research and educational programs*

**Best Fit Solutions** - *Sustainable Education and Community Service Learning*

# North Slope Borough AK (NSB) 2007 (IPY) and 2013-2016

- Collaboration with the North Slope Risk Management and Local Emergency Planning Committee for risk workshops (2007-2008 = DHS CREATE)

- Historical Ecology for Risk Management: Youth Sustainability (2013-present = ARIES)

- NSB Risk Management Priority = Coastal Erosion Mitigation Study

- Sea level rise
- Storm Surge
- Permafrost Calving

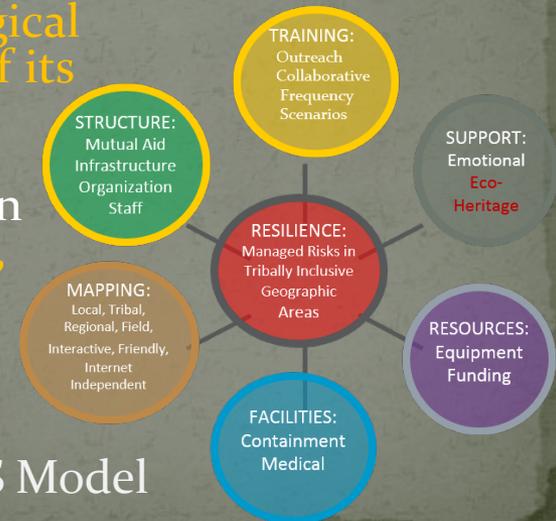


# Historical Ecology for Risk Management: Youth. Sustainability(HERMYS) Abstract

Anne Garland (DHSCREATE, ARIES, Historical Ecology), Fredrick Brower and James Kiloni (NSB Risk Managers), Laura Thomas ( Ilisgavik College Cooperative Extension), Anne Jensen (UIC Senior Scientist, Archaeology), David Ongley (Director Tuzzy Library) , Kathleen Fischer (ARIES, Oceanography), Orson Smith PhD (UAA retired, Coastal Engineer), Michael Brady (Rutgers University, Geographic Economy), Natalya Sousa (Long Island College, Biological Anthropology), Hollis Yenna and Sian Proctor ( PolarTREC HS and CC Teachers)

- Applied Research in Environmental Sciences Nonprofit, Inc., ARIES, the North Slope Borough (NSB) of Risk Management, Cooperative Extension of Ilisgavik College, Tuzzy Library, North Slope Borough School District, and UIC Native Corporation Sciences are collaborating to develop and implement a historical ecology model for the North Slope Coastal Region of Alaska.
- Historical ecology is an applied research program that focuses on interactions of people and their environments (social-ecological systems) in both time and space to gain a full picture of all of its accumulated effects.
- For this program, the emphases align with the ARIES mission that combines research, education and community outreach, and the eco-heritage indicator of the CRIOS model (Cumulative Regional Integrated Operability Scores).

<http://www.ariesnonprofit.com/ARIESprojects.php>



CRIOS Model

# Historical Ecology for Risk Management: Youth. Sustainability(HERMYS) **Abstract**

The research program can be applied to understanding changes among community landscapes that can assist management strategies for the future. This includes applications to:

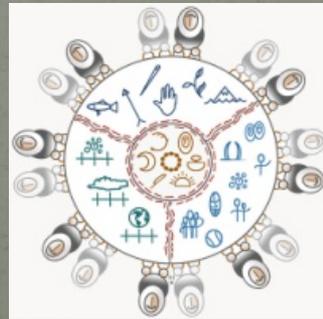
- environmental conservation,
- ecosystem services, and
- **hazard mitigations**

For this program, the emphases align with:

- the ARIES mission that combines research, education and community outreach and NSB School
- **the Inupiaq Learning Framework,**

Environment

Community

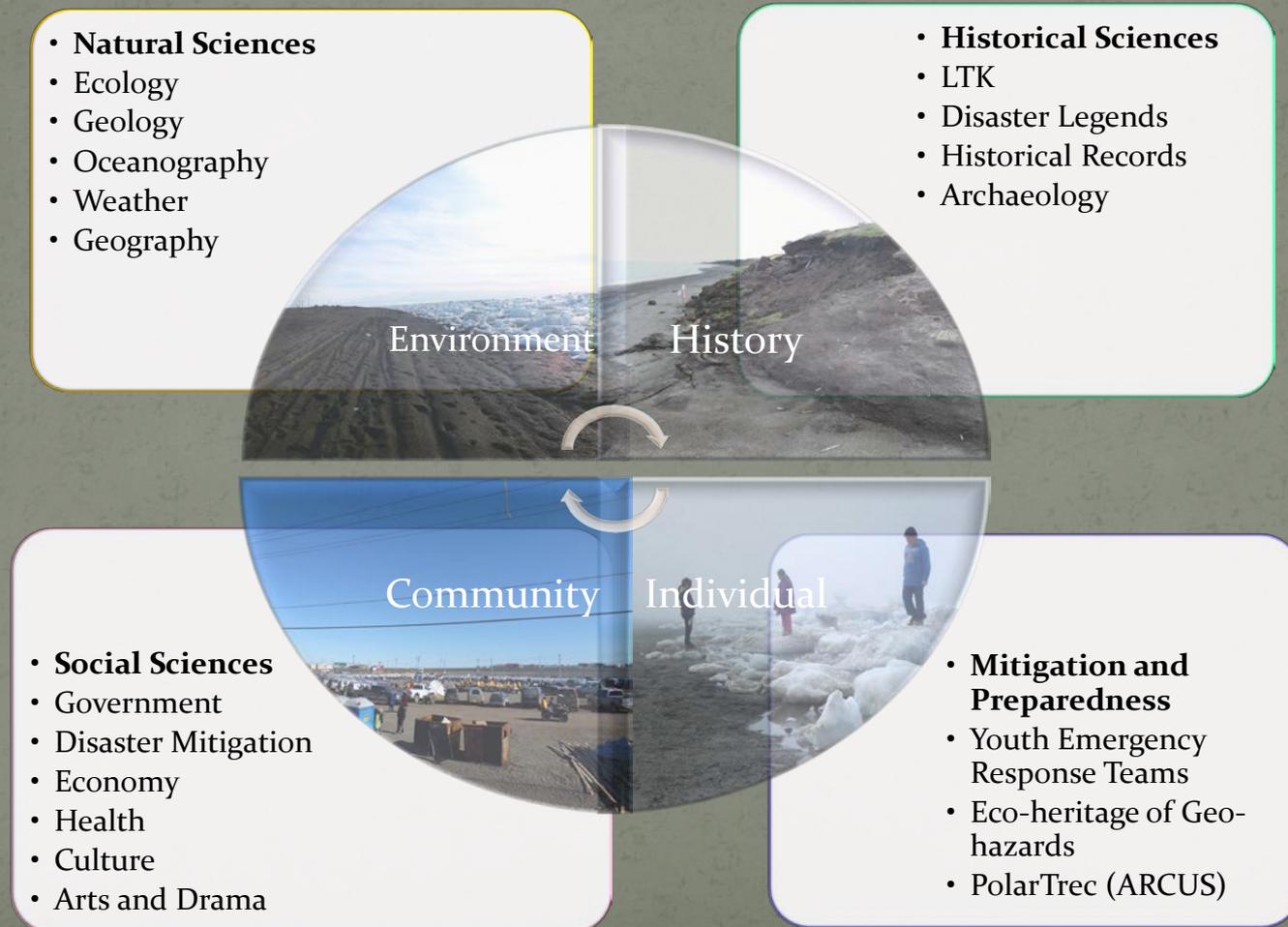


History

Individual

**Inupiaq Learning Framework-Social-Ecological Model  
Of the North Slope Borough School District**

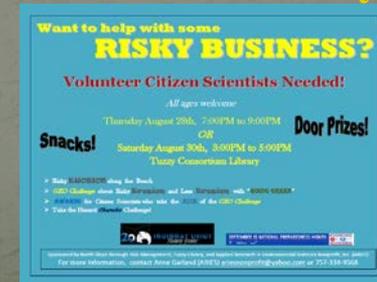
# Historical Ecology for Risk Management: Youth Sustainability (HERMYS) Model



# Historical Ecology for Risk Management: Youth Sustainability(HERMYS) **Goals**

The emphases are the following:

- compile a bibliographic database of relevant historical resources of both social and natural sciences,
- conduct an historical examination of the shoreline to provide a time-series baseline,
- develop and test simulation models to demonstrate socio-natural cycles of change for the North Slope shoreline,
- perform a historical ecology study of the shoreline, with interactive mapping and a database available as a web-based resource to assist academia, industry, regional government, and local communities for socio-cultural and environmental management purposes, (Partners: Barrow Area Information Database BAID, [www.barrowmapped.net](http://www.barrowmapped.net))
- **assemble an integrated team who can work with interested researchers, industry, community planners, Native corporations, and NSB Risk Management to extract historical ecology data for models and tools that apply to risk mitigation to assist community based decision making, and**
- **provide eco-heritage opportunities that include community participation in research, educational products, age-level appropriate activities, and outreach tools for community service learning.**



# Historical Ecology for Risk Management: Youth Sustainability (HERMYS)

## Community Service Learning **Goals**

### RIA Framework and Participatory Research Emphasis:

(Risk Interpretation and Action <http://www.irdrinternational.org/projects/ria/>):

- Community Based Monitoring for Beach and Sea Ice Metrics-Coastal Observers of Barrow (COB CBM)
- Community Archaeology of Threatened Sites from Coastal Erosion (UIC Sciences)
- Teen Community Emergency Response Team (CERT) <https://www.fema.gov/teen-community-emergency-response-team>
- PERCIAS Applied Theater (Perceptions of Risk Communication, Interpretation, & Action in Social-Ecological Systems) Disaster Legends, Table Top/Role Plays, Interactive Scenarios, Shadow Puppet Theater, Creative Drama
- Youth Habitat Corps for Arctic and Tundra Gardens (College Coop Extension=Food Security and Public Health Dietitian)
- **PolarTREC Teachers (NSF)** assist with disaster preparedness among the “Next Generation”
- NSB Risk Management Risky Business Camps (4-5<sup>th</sup>, Middle and High School)
- North Slope Borough Preparathons for North Slope School District (STEAM Challenge)
- New Project 2016=ArcticTEACH (Teachers in Arctic Collaboration about Hazards)

Want to Help with Risky Business? Join the STEAM Challenge

The North Slope Preparation September 2015!

MEET the challenge post a STEAM product (Science, Technology, Engineering, Art, and Math) on the Fb @North Slope Teen CERT

\*Post the arts (photos, any artwork), media (music, video/audio/PSA), drama (dance, skits, role plays) or language arts (read history, stories, slogans, posters) by Team or Individual

\*Reach out to your peers and friends about North Slope RISKX and how to prepare for the HAZARDS

\*Eligible for the awards by the NSB Risk Management who can use your work in NSB risk education efforts. (Your permission and credits to use your creative property will be respected as you wish.)

\*Plus for a Talent Show and Exhibit! Depending on the number of entries, there may be enough for a TALENT SHOW, too! More details later!

DON'T WAIT. COMMUNICATE. MAKE YOUR EMERGENCY PLAN TODAY!

SEPTEMBER IS NATIONAL PREPAREDNESS MONTH!

AMERICA'S PrepareAthon! Ready



DON'T WAIT. COMMUNICATE. MAKE YOUR EMERGENCY PLAN TODAY.



SEPTEMBER IS NATIONAL PREPAREDNESS MONTH!

FEMA AMERICA'S PrepareAthon! Ready



# ARCTIC RISK MANAGEMENT NETWORK

## ARMNET TEAM:

HINA KILIONI, DISASTER COORDINATOR, AND FREDERICK BROWER, RISK MANAGER

(NORTH SLOPE BOROUGH RISK MANAGEMENT)

ANNE GARLAND, PHD

APPLIED ANTHROPOLOGY/HISTORICAL ECOLOGY

KATHLEEN FISCHER PHD

OCEANOGRAPHY

(APPLIED RESEARCH IN ENVIRONMENTAL SCIENCES  
NONPROFIT, INC. [WWW.ARIESNONPROFIT.COM](http://WWW.ARIESNONPROFIT.COM))

LIANE BENOIT, M.P.A., F.R.C.G.S

SAR/EM POLICY RESEARCHER

(BENOIT & ASSOCIATES)



Barrow AK 8.4.2015

# ARMNET GOALS

**WHO:** RISK MANAGEMENT PRACTITIONERS AND RESEARCHERS LINKED ACROSS THE ARCTIC REGIONS OF CANADA AND ALASKA

**WHY:** TO IMPROVE RISK, EMERGENCY AND DISASTER PREPAREDNESS AND MITIGATION THROUGH COMPARATIVE ANALYSIS AND APPLIED RESEARCH

**WHAT, HOW, WHEN, WHERE:** ASSESSMENTS FROM PRACTITIONERS AND ARCTIC RESEARCHERS

[HTTP://WWW.ARIESNONPROFIT.COM/P9.PHP](http://www.ariesnonprofit.com/p9.php)

COASTAL OBSERVERS OF BARROW

COMMUNITY BASED MONITORING



**CURRENT PARTNERS:** NORTH SLOPE BOROUGH (NSB) RISK MANAGEMENT, APPLIED RESEARCH IN ENVIRONMENTAL SCIENCES NONPROFIT, INC. (ARIES), CANADIAN RISK AND HAZARDS NETWORK (CRHNET), BENOIT & ASSOCIATES

**CURRENT FUNDING SPONSORS:** US EMBASSY (OTTAWA), ARIES, NSB RISK MANAGEMENT, CRHNET, BENOIT & ASSOCIATES

**2015 CONFERENCES:** PRESENTATIONS AND ASSESSMENTS AT SARSCENE, ARCTICNET, CANADIAN RISK AND HAZARDS NETWORK, ARCTIC OBSERVING OPEN SCIENCE MEETING

# Historical Ecology for Risk Management: Youth Sustainability(HERMYS)

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Review of Stakeholder Engagements and Outreaches

# Historical Ecology for Risk Management

## What are the Coastal Risks of the Arctic for Tribal Governments?

These images have been recorded by a web cam overlooking the landfast ice (or coastal ocean during the ice-free period in summer) from atop the bank building in downtown Barrow, Alaska. The camera is looking approximately North.

[http://scaice.alaska.edu/gi/observatories/barrow\\_webcam](http://scaice.alaska.edu/gi/observatories/barrow_webcam)



1911\_webcam-uaf-barrow-seaice-images\_2013-11-10\_1-day-animation.mp4

Surge 11.10.2013

Surge 9.3.2014



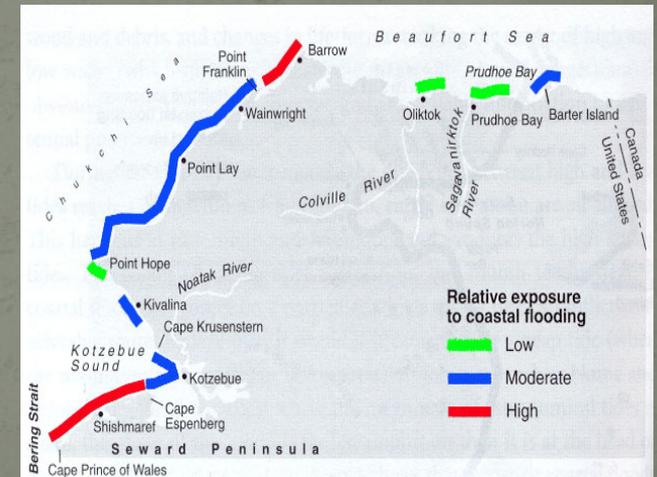
Surge 8.26-28. 2015



# Historical Ecology for Risk Management: Youth Sustainability **Natural Sciences** Long-Term Coastal Erosion Studies Barrow, Ak.

## Monthly monitoring of coastal erosion

- **Review North Slope Coastal Erosion Studies**
- Erosion critical to *community infrastructure*
  - Wainwright and Point Hope Sea Walls Collapse and Repairs
  - Gravel Sand Berm/Flood Dikes
- **Coastal bluff and berm erosion**
  - sea level rise
  - storm surge
  - bluff collapse
  - permafrost melting
  - loss of near shore sea ice coverage with increase in fall fetch
  - **shoreline armoring and other engineering**



Barrow Hazard Mitigation Plan 2004

# Long-Term Coastal Erosion Studies

## Barrow, Ak.

### Coastal Measurements

- berm/bluff heights (berm width)
- berm/bluff vertical (LIDAR)
- beach width (berm/bluff base to waterline)
- seaward face contours
- composition and fabric
- depth to permafrost
- temperature vs depth profiles
- time lapse photography
- differential GPS
- tundra infrastructure diversity and cohesion- e.g., soil pH and infrared webcam for photosynthesis



Examples of Coastal Erosion- Natural and Man Made

# Long Term Berms and Bluffs Surveys

## Green Engineering and Plant Ecology



# Long-Term Coastal Erosion Studies Barrow, Ak.

## Community Benefits

- Sections of coast considered most critical to protection of community critical infrastructure  
(See Examples in Photos)
- Educational opportunities and materials for local schools, library, community groups
- Community involvement throughout research program (e.g., Community Based Monitoring)
- Experiential learning for youth interested in risk management professions  
(e.g., PolarTREC teachers assist Risk Ed Camps and Teen CERT)
- Results contribute to risk mitigation planning



# Community Based Monitoring

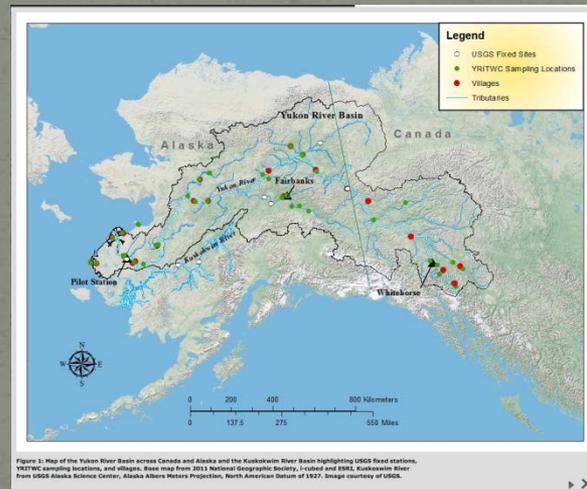
- Community-based monitoring and citizen science programs are expanding throughout Alaska.
- These programs allow local people to participate in the scientific process
- Observe environmental phenomenon on front lines of change
- Alaska Ocean Observing System and Alaska Sea Grant **Best CBM Practices**

<http://www.aous.org/community-based-monitoring/>

<http://seagrant.uaf.edu/conferences/2014/community-based-monitoring/index.php>

## Atlas of Community Based Monitoring in a Changing Arctic

Example: [Yukon River Inter-Tribal Watershed Council \(YRITWC\)](#)



[http://www.arcticcbm.org/index.html?modules=module\\_arcticcbmAlaska](http://www.arcticcbm.org/index.html?modules=module_arcticcbmAlaska)

# Citizen Science Training

## Geo Challenge

- 7 Critical Areas of City's Beach
  - 2 Pump Stations, Old Landfill, Sewage Ponds, Gas Station, Revetments, Utqiagvik
- Assigned 1 Locale to Monitor
- Monitor 1x per month (fall, spring, summer)
- Monitor 1x after major change from berm maintenance or surge erosion
- Equipment Kits Checked Out (Tuzzy Library)

## Go Green Challenge

- Berm/Bluff Plant Colonies of City Beach
  - Decide on # of Locales
    - Random Intervals
    - Non Random Bio diverse Colonies
- Assigned 1 Locale to Monitor
- Monitor 1x per month (fall, spring, summer)
- Monitor 1x after major change from berm maintenance or surge erosion
- Equipment Kits Checked Out (Tuzzy Library)

# Citizen Science Training

## Beach Erosion Study

### Geo Challenge

- Line of Sight, Smartphone, Portable GPS
- Photos from specific GPS Coordinates
- Digital Download or Manual Forms (AkCCO)
- Measure Waterline to Berm Base
- Measure Berm Height and Base Width
- Upload Forms and Photos to Cloud (dropbox)
- Soil Types (Geo-Technical Gauge)
- Plants and ID
- Participate in Devoted Facebook with CBM Colleagues @COBCBM

## Berm Plant Ecology Study

### Go Green Challenge

- Smartphone or Portable GPS
- Photos from specific GPS Coordinates
  - Scale
  - N Arrow
- Measure width of plant colonies for growth
- Soil Types (Geo-Technical Gauge)
- Plants and ID



# Historical Ecology for Risk Management: Youth Sustainability(HERMYS) **Historical Sciences**

- Disaster Legends
- Disaster Oral History
- Local Traditional Knowledge of Risks, Mitigation, and Preparedness
- Historical Maps of Coastal Regions of North Slope
- Traditional Settlement Patterns
- Community and Salvage Archaeology from Coastal Erosion -Anne Jensen UIC Senior Scientist Blog <http://iccandtime.wordpress.com/>
  - Nuvuk (Point Barrow)
  - Walakpa (Wiley Post Memorial)



# Community and Salvage Archaeology from Coastal Erosion **Historical Sciences**

## Sea Level Rise, Permafrost Calving, and Storm Surges

### North Slope Borough

### Nuvuk, Walakpa, Utqiagvik



Chicago: George F. Cram, ca. 1880.  
Color cerograph.



# Historical Ecology for Risk Management: Youth Sustainability(HERMYS) **Community**

## Are You Ready To...

- Learn about the hazards in your area? **Historical Sciences of hazards**
- Help others in the event of a disaster?
- Be a leader in your school?

## Join Teen CERT (Community Emergency Response Team)

<http://www.fema.gov/video-materials#teen>

- [Arnold, Missouri](#)
- [Danville, Virginia](#)
- [Flower Meound, Texas](#)
- [Jamestown, North Dakota](#)
- [Julian, California](#)
- [Miami, Florida](#)
- [Montgomery County, Maryland](#)
- [North Dakota National Guard](#)
- [Riverside, California](#)
- [Sacramento, California](#)
- [Testimonial](#)

• **North Slope TEEN CERT**

Facebook @LendingHandsTeenCERT



### Teen CERT

Teen CERT (Community Emergency Response Team) is a voluntary group of teens that want to prepare and help the community when and if a hazard were to occur at any time.



**What the program does:**

- Discuss the different kinds of hazards in the environment or community
- Practice preparation methods
- Learn the elements to respond towards a Hazard
- How to recover from a hazard

**How does the program provide help ?**

- It provides guidance by a special and determine disaster risk instructor
- Support others who do not understand the fundamentals and subordinate causes of disaster that occurs or has happened before
- Sacrificing the time to motivate others to be well aware of the causes and things that are happening around them and to be mentally ready



# Historical Ecology for Risk Management: Youth Sustainability (HERMYS) **Community**

## PERCIAS Applied Theater

(Perception of Risk, Communication, Interpretation and Action in Social Ecological Systems)

1. Public Engagement and Feedback 2013-2014
2. RIA Proposal and Ethics Review (**seeking academic partner**)
3. Collaborators: KnowInnovation and Together Act Now

Includes: Implemented\*

Shadow Theaters\*

Table Top Scenarios and Training \*(Kaktovik Blizzard 2005, First Disaster Legend *NSF AON LTO Funds, 2014*)

Interactive Participatory Performances

Radio Programs

Hazard Charades \*

Role Plays of Disaster Scenarios \*, Legends, Dance, Music

STEAM Art Media Challenges\*



Playing with Disaster.pdf

## Youth Habitat Corps (USFWS/City of Barrow/Iliasvik College Coop Extension Funds)

*Nautchialiqirit*=Arctic Gardening (Tundra, Home and Community Gardens)

YHC Logo



1. Tundra Garden for Senior Center and Elders (Botanical Memories)
2. Lagoon Tundra Boardwalk Repairs
3. Food Security and Health

Senior Center



# Historical Ecology for Risk Management: Youth Sustainability (HERMYS) Individual PolarTREC

PolarTREC (Teachers and Researchers Exploring and Collaborating) is a program in which K-12 teachers spend 3-6 weeks participating in hands-on field research experiences in the polar regions. The goal of PolarTREC is to invigorate polar science education and understanding by bringing K-12 educators and polar researchers together. By fostering the integration of research and education, PolarTREC will continue the momentum established during the International Polar Year (IPY)

<http://www.polar-trec.com/expeditions/historical-ecology-for-risk-management>



PolarTrec Teacher & NSB Risk Manager, HERMYS Event, Summer, 2013, Barrow Arctic Science Consortium Public Event at Tuzzy Library



PolarTrec Teacher Summer 8.2014 storm surge survey



# Historical Ecology for Risk Management: Youth Sustainability (HERMYS) Individual

## Risky Business Camps

### Participants and Consultants

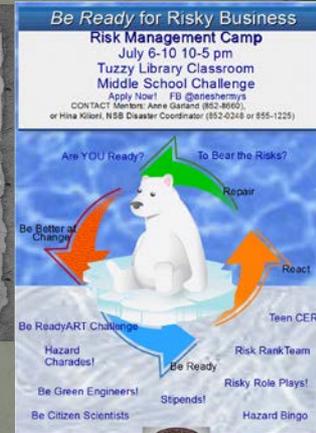
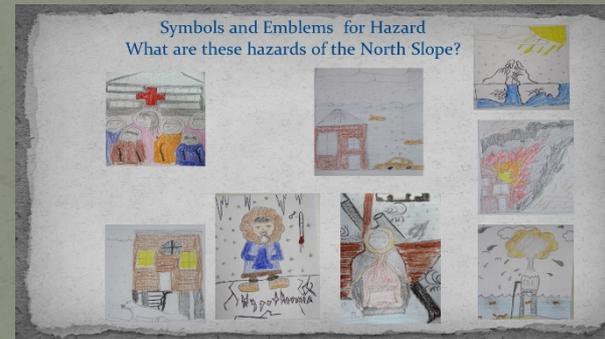
- PolarTREC teacher
- NSB Risk Management Office
- ARIES researchers
- ARIES student interns
- Teen CERT students
- NSB School District
- Ilisagvik College
- Tuzzy Library



Disaster Legend Shadow Theater 2014



North Slope Borough Risk Management Officers



Hazard	Risk Rank
Subsistence Hunting	1
Epidemic	2
Fire	3
Blizzard	4
Oil Industry	5
Flooding	6
Storm Surge	7
Sea Level Rise	8
Ice Shove	9
Tundra Fire	10

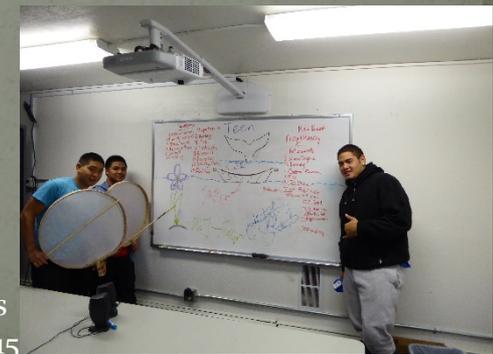


Risk Rank game- Tuzzy Library Permission

Risk Rank game- Results Middle School players 2013 (PolarTREC Outreach)



CBM Training beach metrics



Risk Rank game Results High School players 2015

# Working Together Helping Hands

(Lyrics for Serenity, Music Susan Cumbie, Lyrics A. Garland)

- We are hands that work together
- We are hands of helping all
- We are there for you in the midst of your grief
- To remember, to give you hope about life
- 
- Let's prepare for all, be ready for all despair
- That comes our way.
- We all are blessed. We are blessed by all others.
- Let's learn how to keep the harms away
- 
- We are hands that work together
- We are hands of helping all
- We are there for you in the midst of your grief
- To remember, to give you hope about life
- 
- So no matter what is happening, we will be together still
- We are working hands, we are helping all.
- We all are blessed. We are blessed by you.



12 Track 12.mp3



Serenity final Mix 5-16-13.mp3



# Helping Hands Art Exhibit Fundraiser Art Competition



Fundraiser Competition Rules and Awards  
See [www.ariesnonprofit.com](http://www.ariesnonprofit.com)



# Historical Ecology for Risk Management: Youth Sustainability

## HERMYS

Natalya Sousa (Long Island University), Simone Balog (Kings College), Michael Brady (Rutgers University), Hollis Yenna (PolarTREC High School Teacher), Anne Garland (DHS CREATE, ARIES, University of Maryland, Angelo State University), Kathleen Fischer ARIES



### Methods

- 1) bibliographic database of relevant historical resources,
- 2) examination of the shoreline to provide a time-series baseline
- 3) simulations of socio-natural cycles of change,
- 4) interactive mapping and database as a web resource to assist academia, industry, regional government and communities about socio-natural risk management (e.g., Barrow Area Information Database, <http://www.baaid.utep.edu/>)
- 5) integrated team of researchers, corporations, and NSB Risk Management to provide mitigation tools for community decisions, and
- 6) provide eco-heritage opportunities : research, educational products, age level appropriate outreaches for community service learning such as Teen CERT and PolarTREC

Since 2008, Applied Research in Environmental Sciences Nonprofit, Inc., ARIES, the Barrow Arctic Science Consortium, BASC, the North Slope Borough (NSB) of Risk Management, and Cooperative Extension of Ilisgavik College are collaborating to develop and implement a historical ecology model for the North Slope Coastal Region of Alaska. Historical ecology is an applied research program that focuses on interactions of people and their environments in both time and space to gain a full picture of all of its accumulated effects. The research program can be applied to understanding changes among community landscapes that can assist strategies for the future. For this proposal the emphases align with the ARIES mission of research, education and community outreach, the Inupiaq Learning Framework, and the eco-heritage indicator of the CRIOS model (Cumulative Regional Integrated Operability Scores).



Hazard	Risk Rank
Subsistence Hunting	1
Epidemic	2
Fire	3
Blizzard	4
Oil Industry	5
Flooding	6
Storm Surge	7
Sea Level Rise	8
Ice Shove	9
Tundra Fire	10

### Current Research Summer 2014-2016

Long-Term Monitoring of Coastal Bluffs on the North Slope, AK  
**Participants:** ARIES student interns, and PolarTREC teacher  
**Location:** coastal bluffs in the vicinity of Barrow, AK  
**Goal:** establish baseline of bluff topography for long-term monitoring of bluff erosion and recession  
**Methods:** DGPS, traditional surveying, photography, composition, fabric analysis of bluffs  
**Purpose:** document temporal changes in coastal landform protection of critical infrastructure; monitor changes in bluffs as related to SLR, surges, permafrost calving, sea ice coverage, shoreline armoring  
**Research Integration:** consult with researchers to build upon existing and future data (near shore physical oceanographic studies, LIDAR, BAID, NSB Risk Management Office data, remote sensing imagery, published geomorphological studies, historical records, photos, maps, archaeology, and oral history).  
**Educational Outreach and Community Involvement:** instructional materials to Teen CERT, schools, library, and community groups; partner with NSB Risk Management for usefulness of methods and results.



Inupiaq Learning Framework- North Slope Borough School District



Risk Rank game- Tuzzy Library Permission



**Data:** Long term Observing of social and natural datasets: archaeology, historical maps, legends, oral history, past, current, and future metrics of coastal hazards (Map: Chicago: George F. Cram, ca. 1880. Color cerograph)

### References

- <http://www.arcticapoll.com/APL/Contacts.php>
- <http://www.dcsandinc.com/index.cfm>
- <http://www.baaia.gov/video-materials/baaia>
- <http://www.polarrec.com/explore-the-north-historical-ecology-for-risk-management>
- <http://www.nsbcd.org/domain/44>
- <http://www.inupiaqheritage.org/our-culture>
- <http://www.philaprintshop.com/alaska.html>

Risk Rank game- Results of Middle School players (PolarTREC Outreach)

NSB Risk Management Mitigation Beach Nourishment (Army Corps Engineers Study)



Walakpa Eroding Bluffs, Archaeological House Site, Surge, Permafrost Calving



# Historical Ecology for Risk Management: Youth Sustainability



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## HERMYS Abstract

Applied Research in Environmental Sciences Nonprofit, Inc., ARIES, the Barrow Arctic Science Consortium, BASC, the North Slope Borough of Risk Management, and Cooperative Extension of Iisgavik Collage are collaborating to develop and implement a historical ecology model for the North Slope Coastal Region of Alaska. Historical ecology is an applied research program that focuses on interactions of people and their environments in both time and space to gain a full picture of all of its accumulated effects. The research program can be applied to understanding changes among community landscapes that can assist strategies for the future. For this proposal the emphases align with the ARIES mission that combines research, education and community outreach, the **Inupiaq Learning Framework**, and the eco-heritage indicator of the **CRIOS model** (Cumulative Regional Integrated Operability Scores).



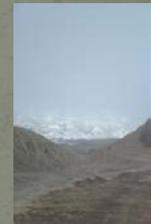
Methods

- 1) bibliographic database of relevant historical resources,
- 2) examination of the shoreline to provide a time-series baseline
- 3) simulations of socio-natural cycles of change,
- 4) interactive mapping and database as a web resource to assist academia, industry, regional government and communities about socio-natural risk management (e.g., Barrow Area Information Database, <http://www.baid.utep.edu/>)
- 5) integrated team of researchers, corporations, and NSB Risk Management to provide mitigation tools for community decisions, and
- 6) provide eco-heritage opportunities that include research, educational products, age level appropriate outreaches for community service learning such as Teen CERT, the "Next Generation".



<http://www.nsbci.org/domain/14>  
<http://www.inupiaqheritage.org/our-culture>

Geo-Hazard	Risk Rank
Subsistence Hunting	1
Epidemic	2
Fire	3
Blizzard	4
Oil Industry	5
Flooding	6
Storm Surge	7
Sea Level Rise	8
Ice Shove	9
Tundra Fire	10



NSB Risk Management Mitigation - Beach Nourishment



<http://www.fema.gov/video-materials/boom>



<http://www.ariesnonprofit.com/ARIESprojects.php>



<http://www.polartrc.com/expeditions/historical-ecology-for-risk-management>



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**QUESTIONS and SUGGESTIONS?**

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