Climate Change Planning in Alaska's National Parks.

SOUTHEAST ALASKA NATIONAL PARKS

"NESTING THE SOCIO-POLITICAL FRAMEWORK."

DON CALLAWAY
FEB. 22, 2012

ASIS Case study: Focal Question – "What will be the social and political landscape around Climate change over the next 25 years?"

Explaining Scenarios: Creating a High-Level Scenario Framework

➢In our project, we asked the core team to consider the question:

What will be the social and political landscape around climate change over the next 25 years?

The core team identified the following critical forces that would be likely to affect this issue.

Forces marked in red were deemed to be the most important, and most uncertain, in shaping the future social and political landscape

1. rate and magnitude of GHG emissions
2. mood / position of administration
3. intensity of impacts on average American citizen
4. political stability of oil-producing and quickly-developing nations
5. population growth and development and energy demand
6. regional population shifts and consequent development
7. public perception of federal lands and their purpose
8. leadership
9. budgets (for funding science and management)
10. degrees of cooperation between agencies, sectors, etc.
11. energy availability and cost
12. levels of global conflict
13. public reaction to rate of temperature and sea level change
14. media portrayal
15. sense of public ability to make a difference
16. degree to which CC is a partisan issue
17. economic prosperity
18. knowledge of CC
19. threshold changes and wildcards
20. federal agriculture policies
21. urban planning policies
22. sequestration and technology developments
23. power of carbon tax / cap and trade / Kyoto
24. concern of / in society about natural systems
25. social and environmental movements / renaissance
26. resource availability / scarcity (water, lithium, etc.)
27. global health concerns / epidemics / disease

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"Using Scenarios to Explore Climate Change" GBN, June 2009

ASIS Case study: Focal Question – "What will be the social and political landscape around Climate change over the next 25 years?"

- 2. mood/position of administration
- 3. intensity of impacts on average American citizen
- 8. leadership
- 10. degrees of cooperation between agencies, sectors, etc.
- 13. public reaction to rate of temperature and sea level change.
- 15. sense of public ability to make a difference
- 24. concern of/in society about natural systems.

Explaining Scenarios: Critical Uncertainty (2)

- We combined other important and uncertain critical forces to form an axis around the "Degree of Societal Concern"

Broad Understanding

Heightened Urgency

High impacts on everyday lives of American citizens

Significant effects through energy demand , resource constraints and population movements

Powerful public reaction to weather phenomena and global images

People mostly feel able to make a difference

Marginal impact on everyday lives of American citizens

Effects on energy, resources etc. only impact a small proportion of population

Public generally not interested in, or feel capable of, making a difference

Public concerns focus on other pressing issues (conflict, economy, health etc.)

Widespread indifference

Competing concerns

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"Using Scenarios to Explore Climate Change" GBN, June 2009

“Institutional Response” Axis for Nesting.

Institutional Response is not Integrated and characterized by turf battles, little interdisciplinary coordination, and stove pipe funding.

Mechanisms are developed that integrate agency and stakeholder actions at all scales. Coordinated multilateral efforts are initiated, using value based decision making, to overcome parochial "agency cultural values"

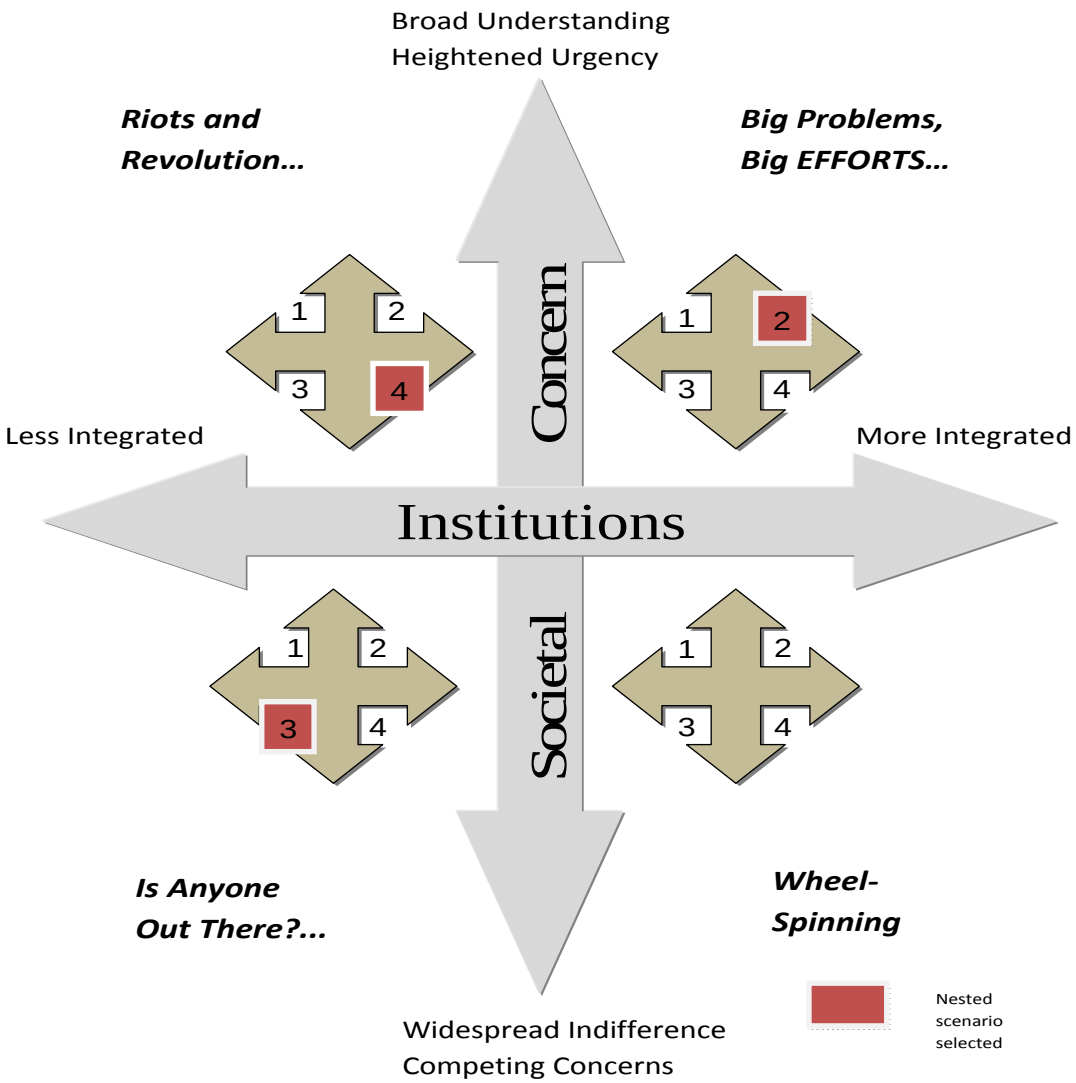
Fragmented Response to Climate Change Impacts

Institutionally Coordinated Response to Climate Change.

Agency "mandates" act as bulwarks and lack of cooperation between agencies is characteristic of stakeholders at all scales.

Turf battles, narrow funding and individual mandates are diminished. Interdisciplinary efforts are rewarded. Management's ability to achieve consensus is reinforced.

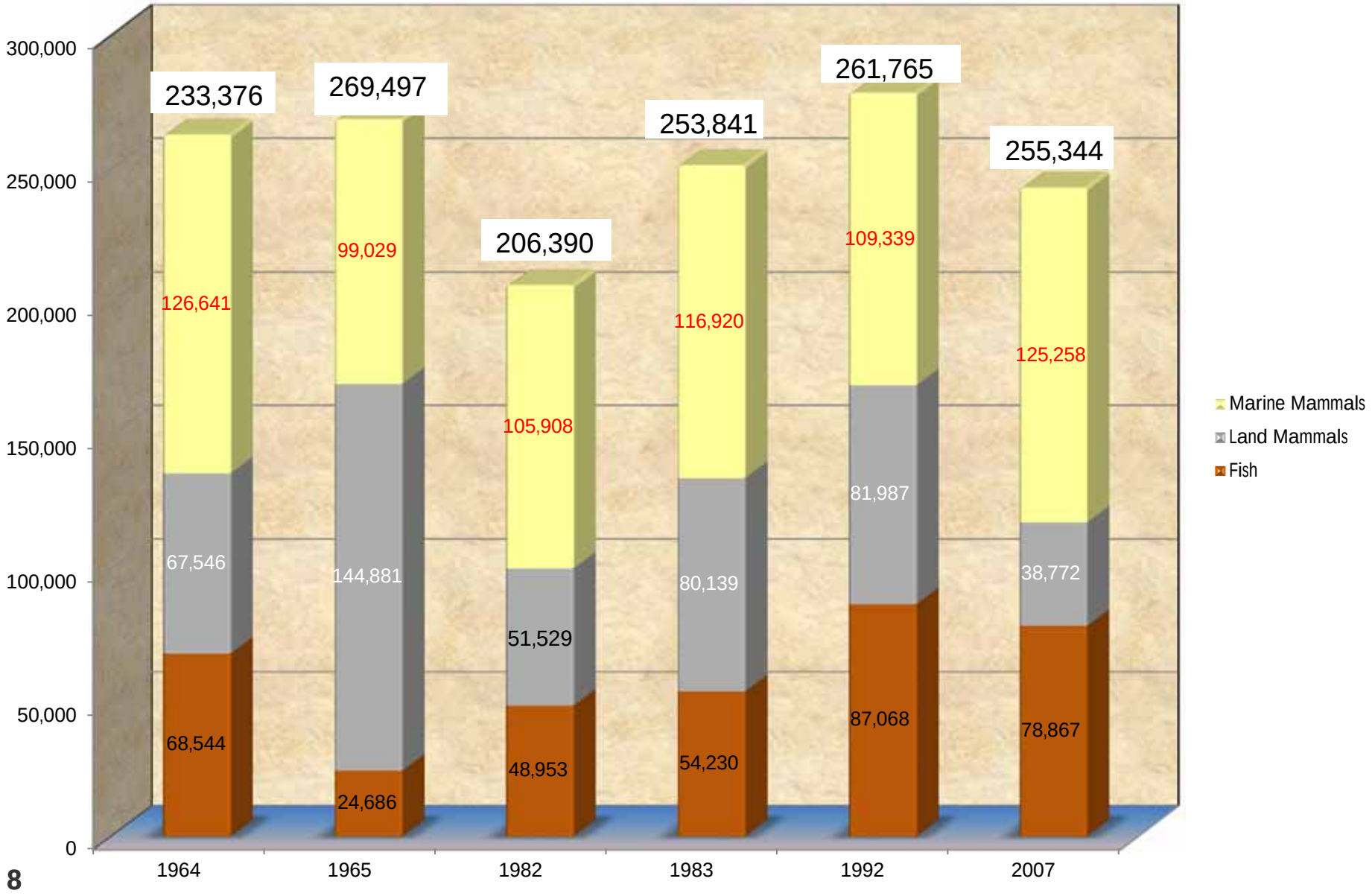
Nested Scenarios (SWAN coastal)



Matrix showing Coastal climate scenarios nested in a social/institutional framework. Each quadrant yields four linked scenarios; three are selected in red.

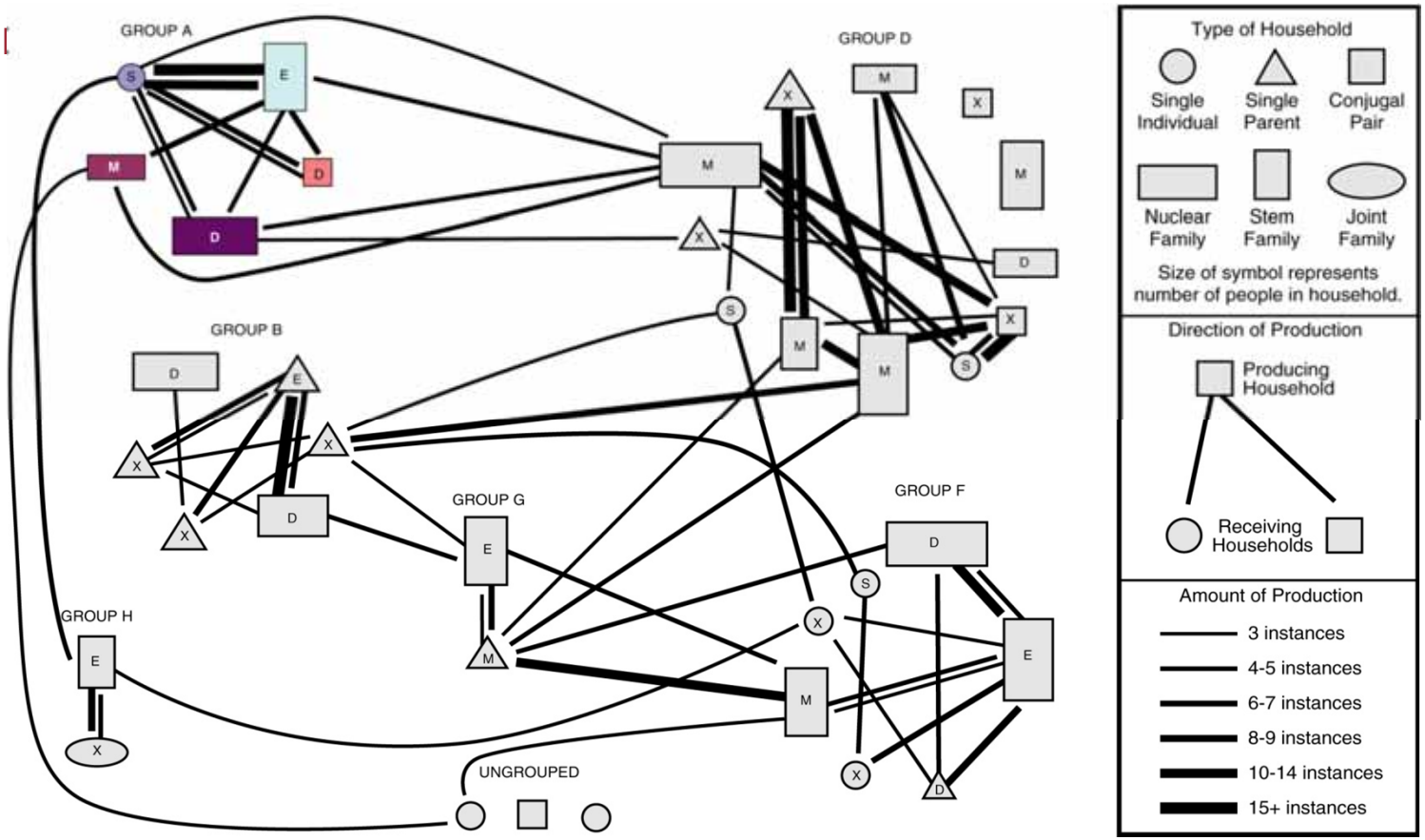
Kivalina

Kivalina Total Harvest 1964-2007 [lbs.]

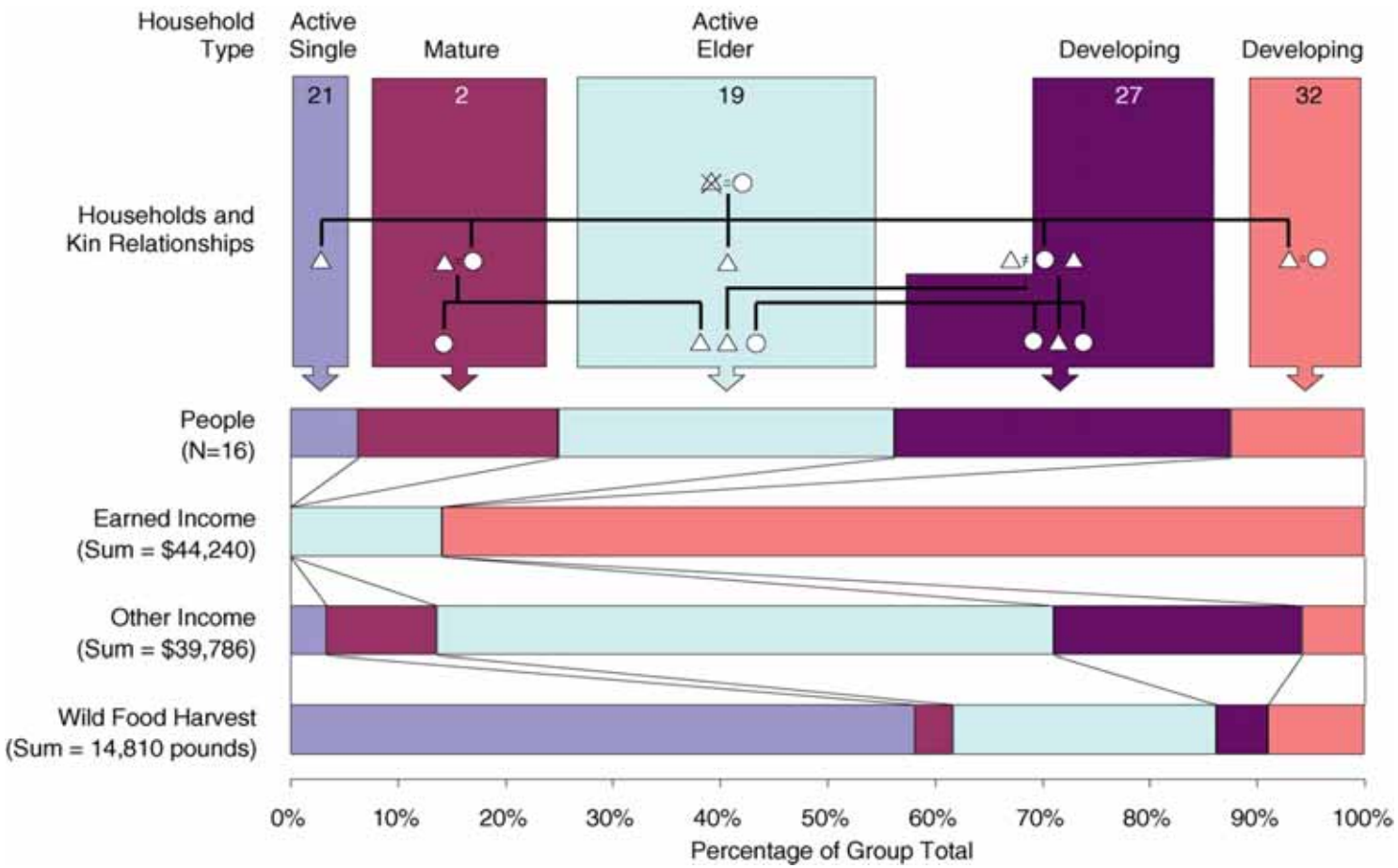


Community of Deering Alaska

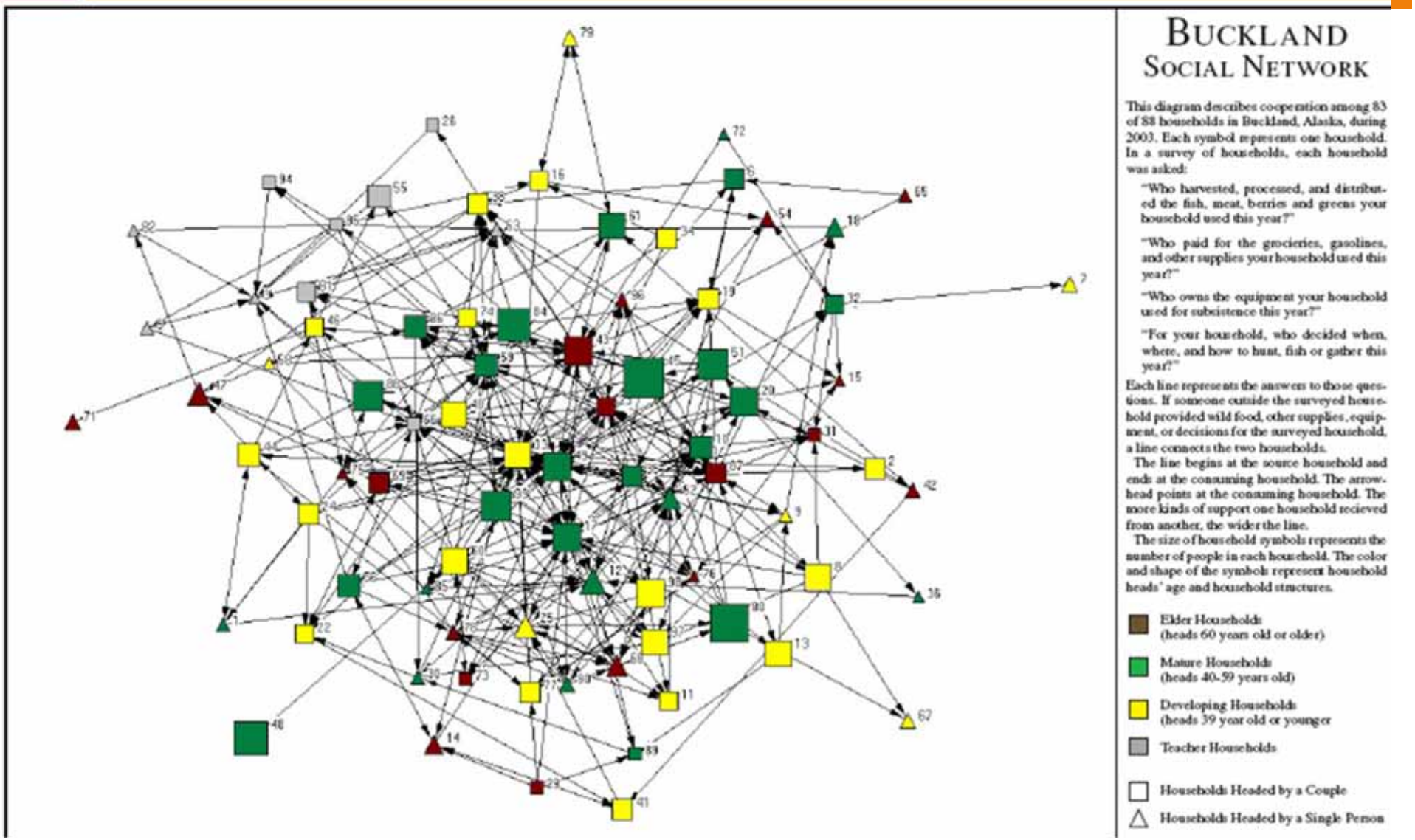
Wild Food Distribution Networks, Deering



One Network's Kin Relationships
Genealogy, People, Income, and Harvests, *Deering A*



Buckland Social Networks Based on Distribution of Subsistence Resources



Newtok

Bering Sea Coastal Community

Newtok – The First Casualty

Aerial view of the village of Newtok, August 2006. The Ninglick River is in the foreground and the Kealavik (Newtok) River meanders to the east (right of village in photo).
Photo: Jon Menough, ADEC, Village Safe Water Program

Newtok Shoreline Erosion Map
Bank Erosion of the Ninglick River (1954-2006)
With Erosion Projections (2007-2027)
Newtok, Alaska
N
W
E
S
Newtok River
School
Water Source
Barge Landing
Ninglick River
1996 Dump Site

Newtok Flood – September 22, 2005. *Source: Newtok Traditional Council and USACE*

Major Problems:

Flooding has eroded dock - bulk shipments of fuel can't be delivered.

Photo: Jennifer Payne, ADCCED

Photo: Jon Menough, ADEC Village Safe Water Program

Remains of barge landing.

Photo: Rich Sewell, ADOT/PF

Major Problems:

Solid waste disposal can only be accomplished by boat.

The old landfill eroded away in 1996. The new landfill is accessible by boat at high tide only.

Major Problems:

Complete community infrastructure – diesel storage, homes, school, clinic are eroding

Major Problems:

Flooding is causing problems with sewage disposal and may have serious health consequences.

Newtok – Agency Mandates Create Major Problems

- Stanley Tom of Newtok says one of the biggest obstacles is the lack of a single agency or group to be in charge of planning.
  - DOT can't build an airstrip unless we have a post office.
  - School has to have 25 students.
  - Land swap with USFWS requires lengthy and expensive EIS
  - FEMA regulations for emergency funding only allow for rebuilding on site, not for relocation.

Participants in Newtok Planning Group

Native Village of Newtok

- Newtok Traditional Council (NTC)
- Newtok Native Corporation (NNC)

State

- Alaska Department of Commerce, Community, and Economic Development (DCCED), Division of Community & Regional Affairs
- Alaska Department of Environmental Conservation/Village Safe Water Program (VSW)
- Alaska Department of Transportation and Public Facilities (DOT/PF)
- Alaska Department of Military and Veterans Affairs/Division of Homeland Security and Emergency Management (DHS&EM)
- Alaska Department of Education and Early Development (DEED)
- Alaska Department of Health and Social Services (DHSS)
- Alaska Industrial Development and Export Authority (AIDEA)/Alaska Energy Authority (AEA)
- Alaska Governor's Office

Federal

- U.S. Army Corps of Engineers (USACE), Alaska District
- U.S. Department of Commerce, Economic Development Administration (EDA)
- U.S. Department of Agriculture, Rural Development
- U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS)
- U.S Department of Housing and Urban Development (HUD)
- U.S. Department of the Interior, Bureau of Indian Affairs (BIA)
- U.S Department of Transportation, Federal Aviation Administration (FAA).
- U.S. Environmental Protection Agency (EPA)
- Denali Commission
- Senator Lisa Murkowski's Office

Regional Organizations

- Association of Village Council Presidents (AVCP), Housing Improvement Program (HIP)
- Coastal Villages Region Fund (CVRF)
- Lower Kuskokwim School District (LKSD)
- Rural Alaska Community Action Program (RurAL CAP)
- Yukon-Kuskokwim Health Corporation

Newtok
Implications of
Relocation Alternatives.

- Newtok:
  - 65 houses $50-100 million to relocate.
  - Lost 4,000 ft. to erosion & loses 90 ft shoreline per year.
  - Land under village will erode in next 5 years.
- Relocate to Bethel/Hooper Bay?:
  - Lose ready access to subsistence
  - Lose history & sense of intact community
  - May lose extended kin support integral to survival

Challenges [Bureaucratic Impediments] to Village Relocation

Sally Russell Cox, Newtok Planning Group

- No Mandate for Relocation Assistance
- No Designated Lead Agency at State and/or Federal Level.
- No Strategy for Relocation Process.
- No Dedicated Funding Source for Relocation.
- Uncertainty in Fulfilling NEPA.
- Barriers to Making Infrastructure Investments in Threatened and Unpopulated New Communities.
- Strained Local Capacity and Resources.

Possible Management Actions to Improve Institutional Response.

1. Create Climate Change Ombudsman Office.
2. Develop process for prioritizing impacted communities.
3. Create mandate for relocation assistance within State and Federal entities.
4. Designate lead agencies when agency responsibilities overlap.
5. Create dedicated funding source for relocation efforts.
6. Create Immediate Assistance Fund.
7. Streamline the NEPA Process.
8. Insure cross-cultural communication
9. Streamline regulatory response to subsistence seasons and bag limits.

What are the real possibilities of paying for relocation and/or erosion control projects?

- State legislature apportions more & more $'s to sustain urban infrastructure, e.g., roads in Fairbanks.
- Less $'s, even before this issue to maintain rural infrastructure (e.g., school maintenance)
- Fewer $'s and programs from State & Federal entities for local construction, services and transfer payments.
- Why "money is going to be tighter than ever before".

Summary: Threats to Sustainability

- Loss of subsistence species beyond community's ability to adapt.
- Relocation to urban areas impacts traditional sharing networks.
- Cost of living rising beyond ability to sustain infrastructure, heat houses or purchase gas/technology for subsistence.
- Long term cultural, social and psychological cost of "settlements without prospects".

Coastal Nested Scenario 1:

PB&J/Riots and Revolution: "Jellyfish Jamboree, Fishing Fiasco"

Implications

Natural Resources
- Pest and disease: increased parasite loads → marine mammals, ungulates
- Plant diseases: vegetation dieback
- PSP (paralytic shellfish poisoning) increase
- Glacial retreat or disappearance
- Vegetation shifts with impacts to ungulates: increased black spruce, woody upright veg (alder/willow)
- Major fisheries and ocean trophic restructuring
  - Failing: salmon, halibut
  - Gaining: unknown
- Invasive
  - Marine: range extensions from BC/WA of tunicates and green crab
  - Terrestrial: new invasive, rapid proliferation in distribution and diversity.
  - Range extensions.
- Species of concern: migratory birds and marine mammals

Cultural Resources
- Archaeological site loss
- Cultural disconnect of sacred or significant sites

Socioeconomic:
- Alcoholism and disease in people with dietary and social changes
- Decline and conflicts in commercial and sport fisheries/struggles with permitting and regulations for historic and or/emerging fisheries
- Village population declines w/ loss of subsistence and traditional economic base
- Reduced interest in marine wildlife viewing
- Oil and gas development: potential for mining, operational season changes
- Impacts on transportation options (overland, river boat, float plane access) due to loss of snow and ice

Facilities
- Fire safe communities become a priority
- Changing priorities for facility funding as use patterns change and resource attractions shift location/

Communication
- Communications budgets cut; face-to-face interaction lessens
- Public demands info; managers unable to meet demands (lack of funding, decentralized info)
- Visitor (external audience)
  - Lack of changing venues to engage visitors
  - Fewer tour boat visitors
  - Poor access to glaciers
  - Bear viewing moved or diminished

Subsistence
- Loss/decline of traditional hunting species; some replacement species
- Increase in occurrence of paralytic shellfish poisoning: health impacts to local population
- Collapse of salmon in both maritime and riverine lifeways
- Plant/berry harvest: change in timing (phenology) and species
- Loss of language and traditions as local demographic changes (e.g. marine mammal customs and crafts)

Coastal Nested Scenario 1 (cont'd):

PB&J/Riots and Revolution: "Jellyfish Jamboree, Fishing Fiasco"

Important Management Actions

- Energy development—renewable village development.
- Economic development (local and community ventures and employment).
- Partnerships with NGOs and community groups (LCCs, RACs, development groups, local government, native orgs).
- Streamline public engagement by issues rather than by jurisdiction
- Implement facility standards for green energy use and efficiency
- Provide forums for sharing scientific efforts and expertise
- Convert to local resource use

Research and Information Needs

- Develop relevant communication strategies to feed into existing networks; assign accountability
- Resource monitoring: shared responsibility and protocols between communities and agencies
  - Water quality
  - Fish and wildlife populations
  - Invasive species
- Trophic interaction linkages research
- Ocean acidification research
- Facilitation of academic research with clearly communicated needs
- Economic/energy development: emphasize mitigation options and build planning (NEPA) capacity

ASIS Case Study: Workshop and Project Findings.

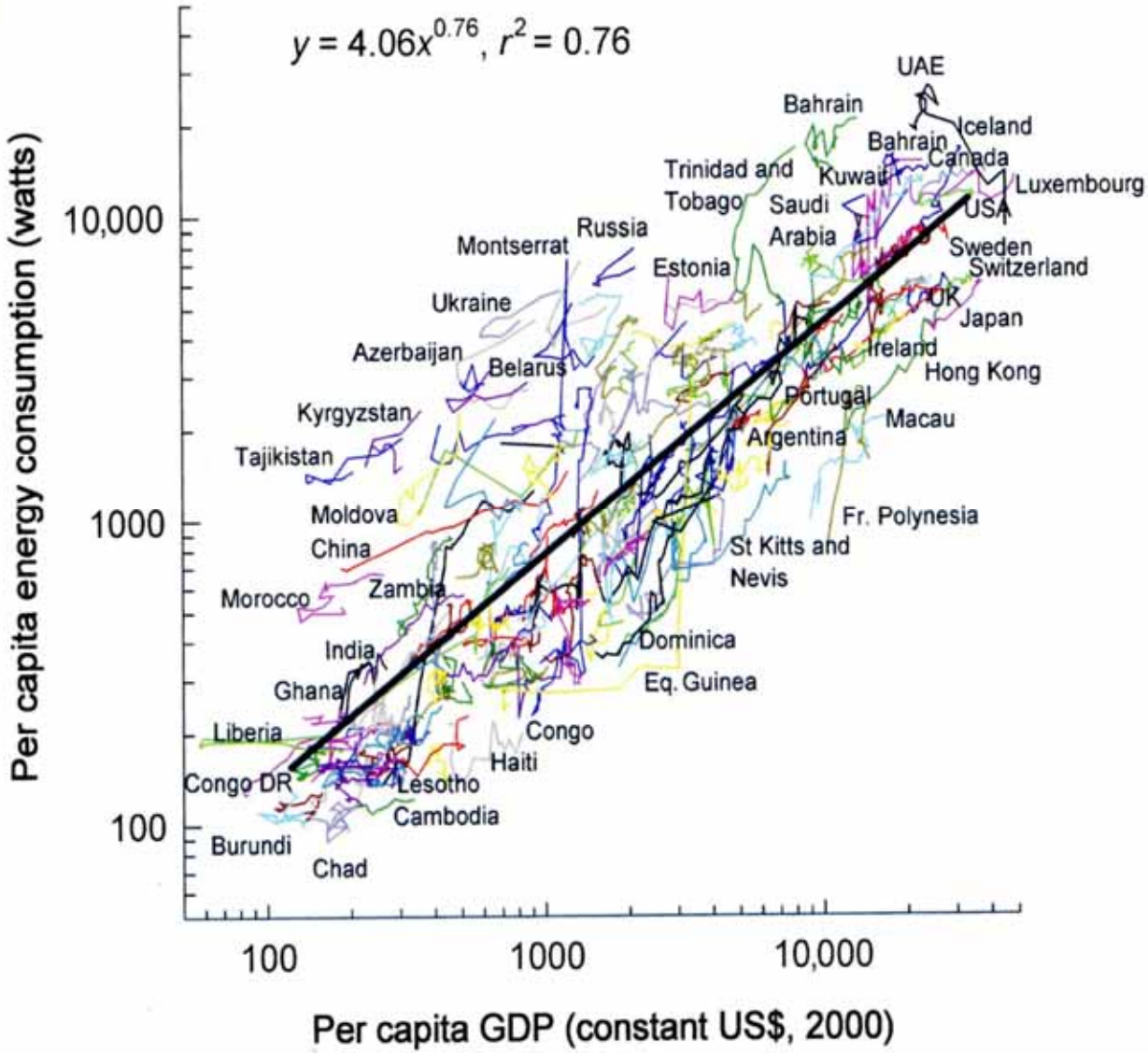
("Using Scenarios to Explore Climate Change." GBN June 2009)

- "Participants saw the scenario conversations offered an opportunity to challenge some 'structural impediments' to change and progress across agencies …and to ask some fundamental questions about the true end goals of the organization."
- "Many felt the scenario approach …was also a real opportunity to use with various Interdisciplinary teams (IDTs) across agencies."
- "Other participants saw this approach…to challenge…a set of assumptions that the future is 'unchanging' . Do our assumptions - about our role – continue to be valid and appropriate in a time of such change?"

Energetic Limits to Economic Growth. (James H. Brown et al., Bioscience, Vol. 61 No.1 Jan. 2011.)

- Article did a regression analysis between per capita energy use and per capita gross domestic product from 220 nations during 1980-2003..
- GDP data are from World Resources Institute.
- Total energy consumption are Σ of energy consumption from eating and all other sources such as utilities, manufacturing and transportation. These data are from International Energy Agency. (Brown et al, 2011:20)

Figure I. The relationship between per capita energy use and per capita gross domestic product (GDP; in US dollars) of countries, plotted on logarithmic axes, from 1980 to 2003



Current and Projected Global Energy Consumption.

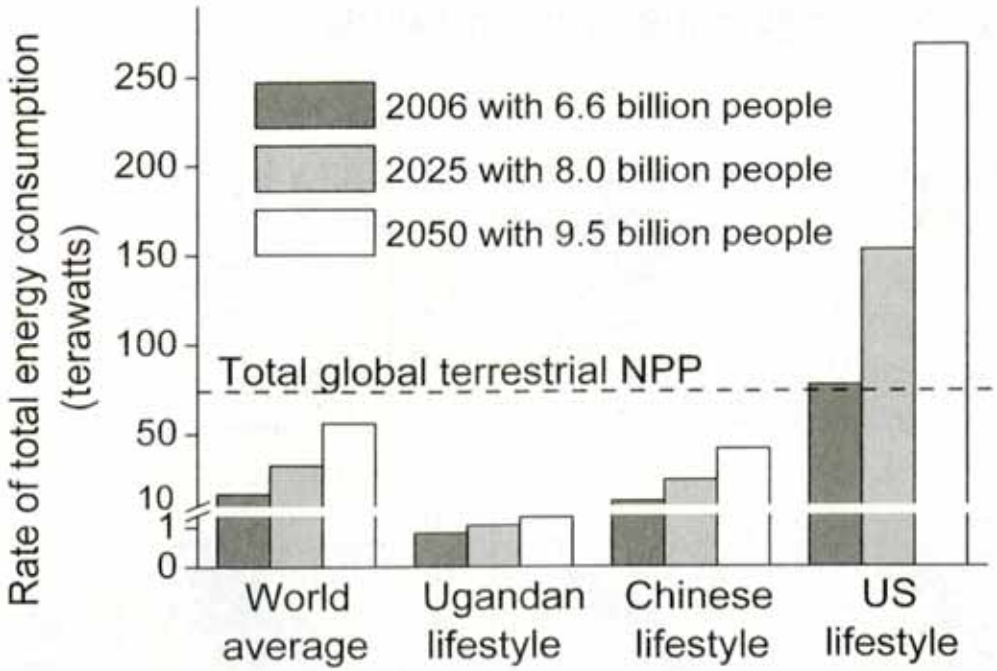


Figure 4. Current and projected global energy consumption based on alternative scenarios of population growth (2006, 2025, and 2050) and standard of living (equivalent to contemporary Uganda, China, and United States). Dashed line is total global terrestrial net primary productivity (NPP), 75 terawatts (Haberl et al. 2007). Data sources and calculation methods can be found in supplemental online materials **(www.jstor.org/stable/10.1525/bio.2011.61.1.7).**

Sources of Energy Currently Consumed by the Global Human Economy.

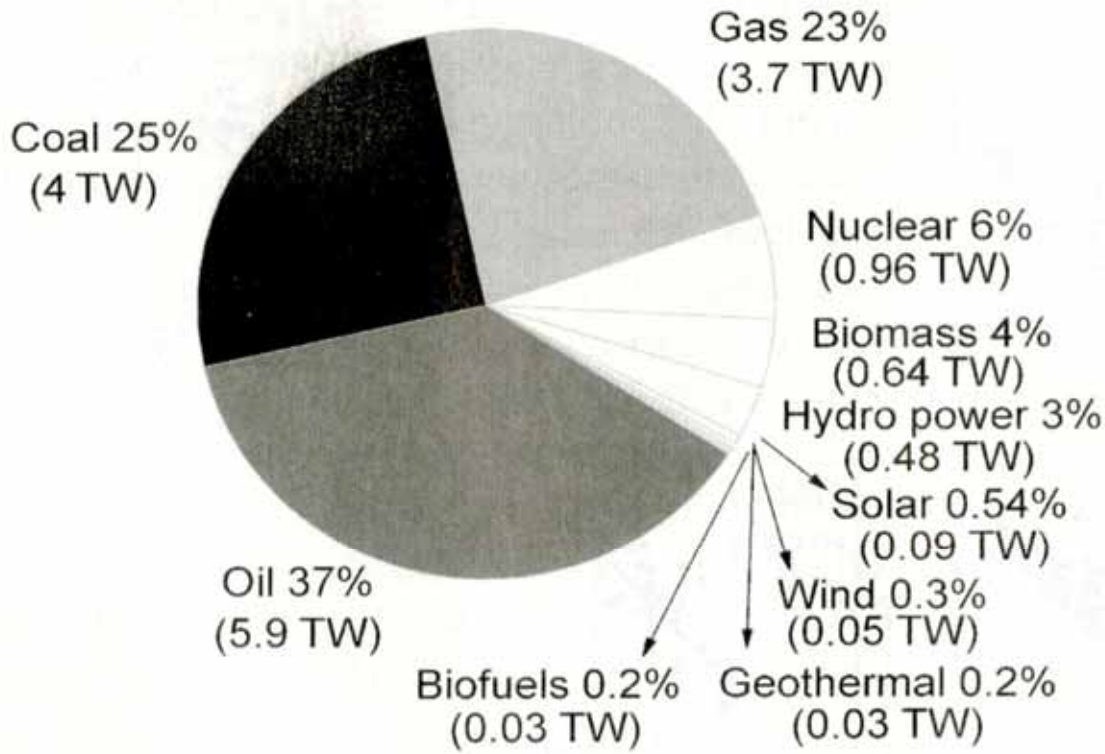


Figure 5. Sources of energy currently consumed by the global human economy. Total annual consumption is approximately 15.9 terawatts (TW; 1 terawatt = 10^{12} watts), of which about 85% comes from fossil fuels, 6% from nuclear energy, and the remaining 9% from solar, hydro, wind, and other renewable sources (BP 2009, REN21 2009).

"Energetic Limits to Economic Growth" (continued).

- With an $r^2 = 0.76$ the authors' ask & conclude:
  - Can economic growth and associated increases in human population, resource use, technological development and standard of living continue their present trajectories?
  - It is not possible to increase socially desirable goods and services substantially without concomitantly increasing the consumption of energy and other natural resources and without increasing environmental impacts that now include climate change, pollution, altered biogeochemical cycles, and reduced biodiversity. (Brown et al,2011:211)

"Energetic Limits to Economic Growth" (continued).

- Projections:
  - To raise current global population to current U.S. standard of living would require 77 terawatts.
  - In 2050 to support 9.5 billion people with current U.S. standard of living would require 268 terawatts (10^{12}) - 16 times the current global energy use (~17 terawatts).
  - To maintain 9.5 billion people by using the more modest current Chinese standard of living would require 2.5 times the current use (42.5 terawatts)

"Energetic Limits to Economic Growth" (continued).

- Projections:
  - To achieve these or even more modest standards will require:
    - Increased energy supply:
      Currently fossil fuels 85%, nuclear 6%, solar, hydro, wind and tidal as well as Biofuels face economic problems of diminishing returns on energy and economic investment.
    - Decreased per capita energy use:
      "people in richest nations are reluctant to sacrifice economic growth – much less give up their automobiles and electronics so poorer countries can have bicycles, personal computers and flu shots."
    - Decreased human population:
      Family size and per capita energy consumption suggest 5x current energy use to stabilize world population (85 terawatts).

"Energetic Limits to Economic Growth" (continued).

- Is this scenario planning?
  - "we caution that these are not intended to be predictions of the future… rather they are extrapolations of the power-law relations ($y=4.06x^{0.76}$).
  - "good reasons.. such simple scenarios.. maybe imprecise. Do not take into account.. greater efficiencies triggered by shortages, technological innovations, socio-economic-behavioral changes.."
  - "Indeed the global human socioeconomic system is complex, poised far from thermodynamic equilibrium by high rates of energy input and transformation. Such systems have unpredictable nonlinear dynamics, making it nearly impossible to predict very far into the future.:

Workshop and Project Findings (1)

At the end of the training workshop, we asked participants to reflect on the scenarios and their use within the process. In what situations might this type of thinking prove useful to ongoing work?

The scenario approach offers some promise in **complementing existing technical and scientific information**. Many felt that scenario approach could help explain outcomes to management. There was also a real opportunity to use this approach with various Interdisciplinary teams (IDTs) across agencies. However, more work would need to be done in validating the findings to ensure that the approach had credibility.

Participants saw that scenario conversations offered an opportunity to challenge and possibly expose some 'structural impediments' to change and progress across agencies. The nature of these conversations encourages groups, ultimately, to **ask some fundamental questions about the true end-goals** of the organization.

There appear to be promising links between scenarios and approaches to General Park Planning. Participants committed to explore how the scenario creation approach could be **specifically tailored as an input to the GMP** and other planning processes. For example, the Drivers and Impacts tables are valuable documents that could be created for all Parks. Further, the scenario process would be enhanced by further technical work to validate the scenarios created.

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Workshop and Project Findings (2)

Because scenarios is a conversational process, participants saw real opportunities in using the technique to **explore the Park Service's future relevance to the public**, both in the context of climate change, and more broadly, as other factors (e.g. energy policy) will likely affect Parks in future.

Other participants saw this approach as a good opportunity to fundamentally **challenge the assumptions of many different groups who work in and around the Park Service**. Do our assumptions – about our role – continue to be valid and appropriate in a time of such change? To some, the Park Service seems to operate under a set of assumptions that the future is "unchanging". But we know this is implausible. Can scenarios help people to ask – and consider – these difficult questions?

What should the Park Service do if – as is likely – it is faced with a future of "black swans" (highly impactful but low probability events)? How should it prepare for, and react to, such possible changes? Is there a way of constructing a conservative/low-risk approach (analogous to an investment strategy)? To help generate an appetite for this kind of conversation, one participant suggested **creating a list of some "Black Swans" that the Park Service has been impacted by over recent decades**.

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"Climate Bad Boys Link Up"

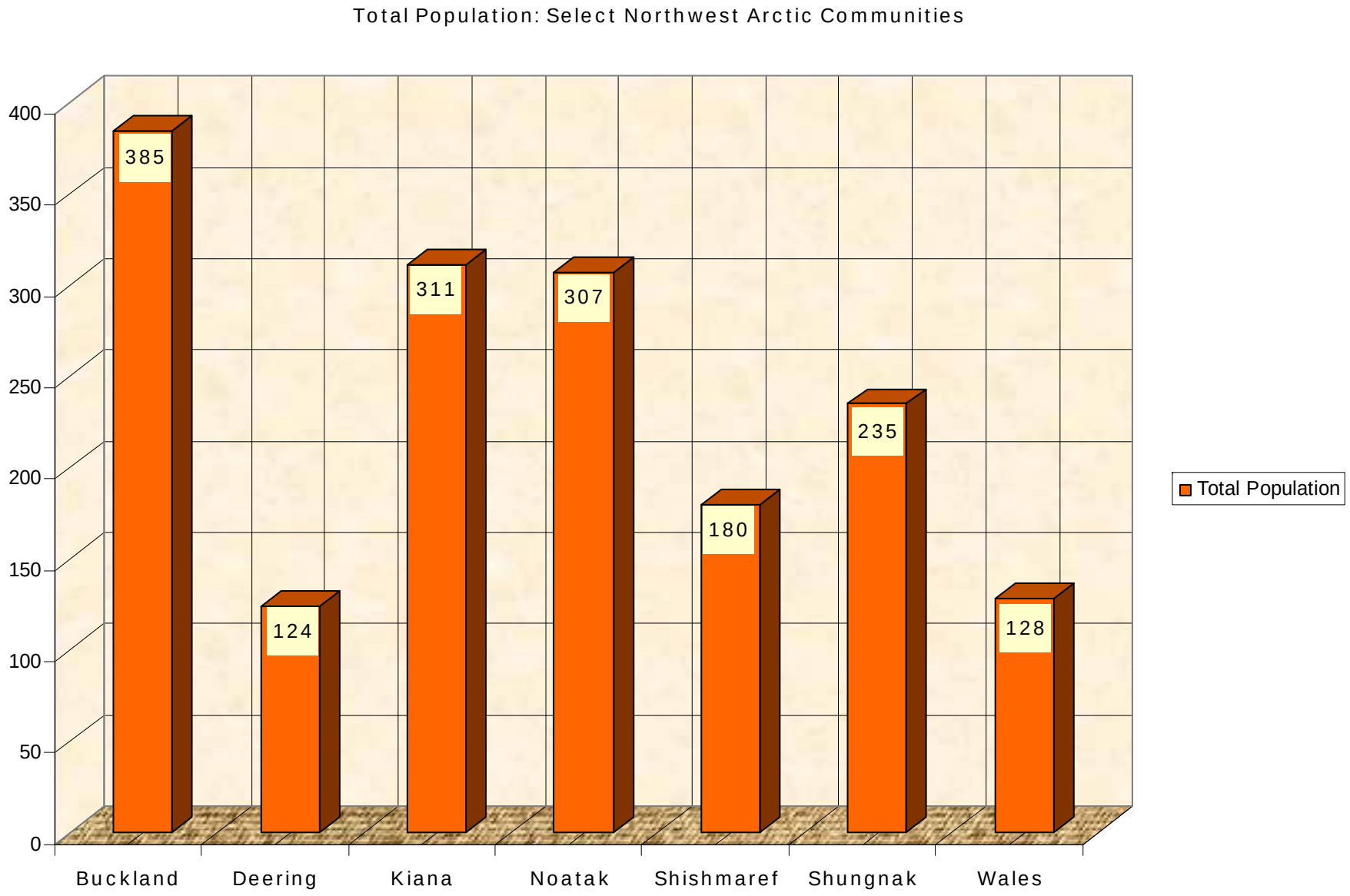
(New Scientist Vol. 209 No 2797, Jan. 29, 2011, p.4)

- U.S. and China ("rogues of climate change") announce collaboration on carbon capture and storage(CCS) and nuclear power.
- China with U.S. technical assistance built in 17 months ("breakneck speed") "GreenGen" a 250 MW coal fired power plant with CCS.
- China offered U.S. "a less rigid test bed" for a new type of nuclear reactor known as a "travelling wave" reactor because "The regulatory environment in the US would take decades just to certify the design"[1]
- "Problem isn't lax Chinese rules but overly rigid US ones" "US process does not allow for innovative designs"

[1]John Huntsman – US ambassador to China

Northwest Alaska

Population Size Select Northwest Alaska Communities.

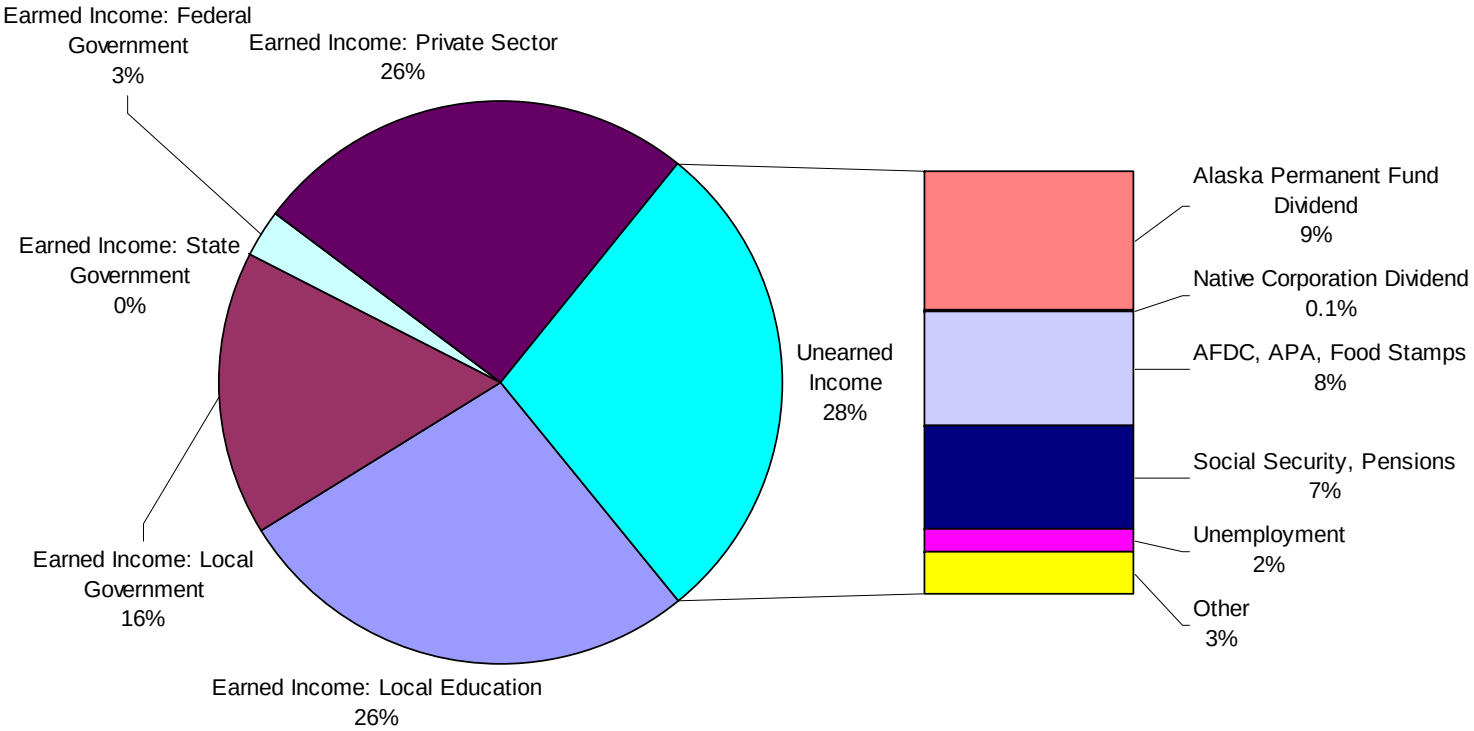


Select Northwest Alaska Communities: Income & Harvest Levels

Community	*Per Capita Personal Income **(2006 - Constant $'s)**	Percent Wage	Per Capita Harvest (lbs)
Kiana (2006)	15,203	67%	345
Wales (1993)	13,689	73%	744
Deering (1994)	13,423	70%	672
Buckland (2003)	11,513	74%	554
Shishmaref (1995)	11,137	47%	792
Shungnak (2002)	10,926	47%	611
Noatak (1994)	7,644	59%	461
	*Anchorage = $40,187 (2006)		

The Community of Wales Alaska 1994

Wales: Source of Community Income

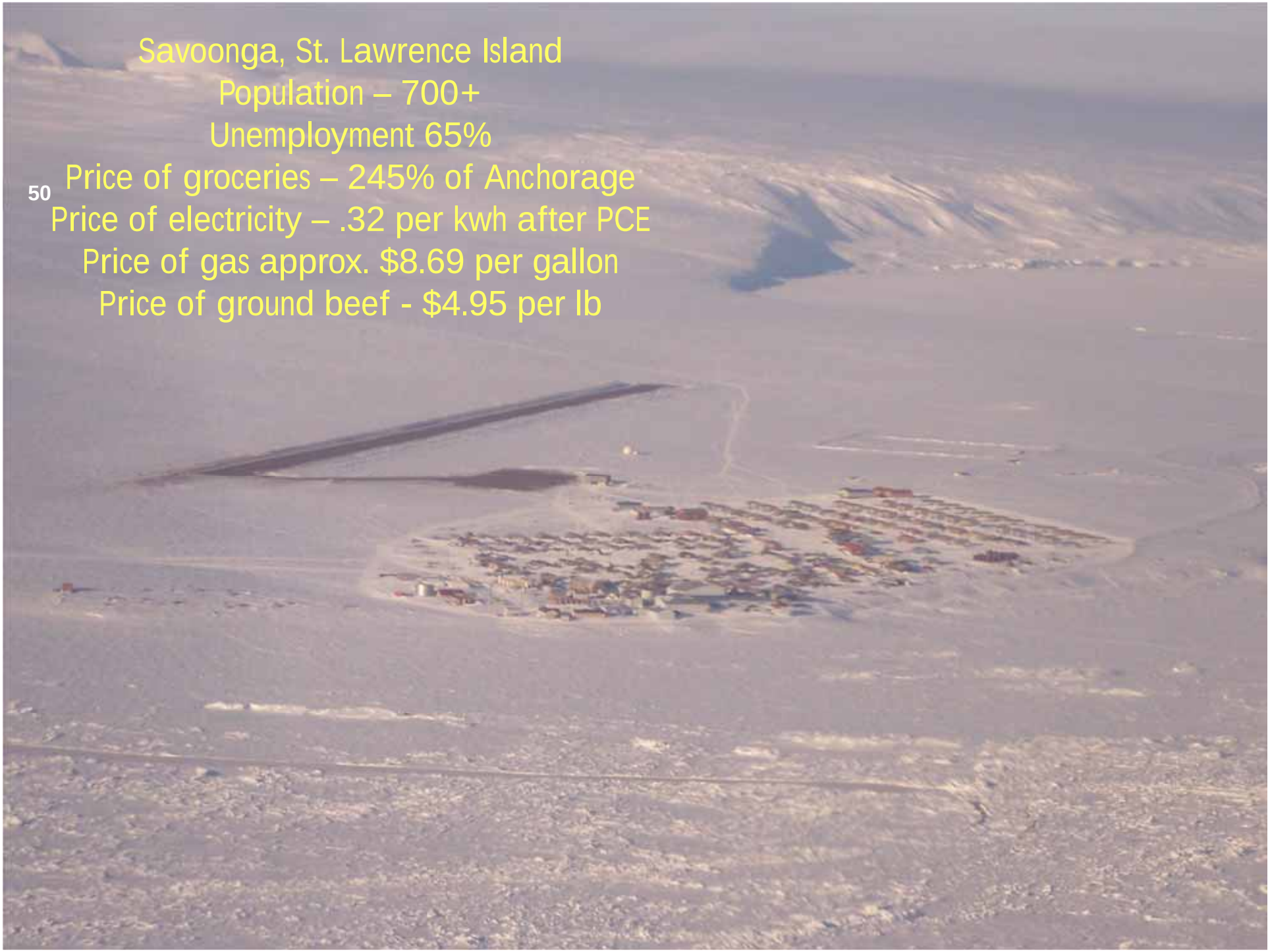


POVERTY STATISTICS FOR REMOTE RURAL ALASKA: PERCENT OF POPULATION BELOW THE POVERTY THRESHOLD: 2000

	TOTAL	ALASKA NATIVE*	NON-NATIVE
Remote Rural	19.4%	22.5%	5.4%
Regional Centers	10.1%	13.6%	3.7%
Smaller Places	23.6%	25.4%	8.1%
Anchorage	7.3%	15.7%	6.4%

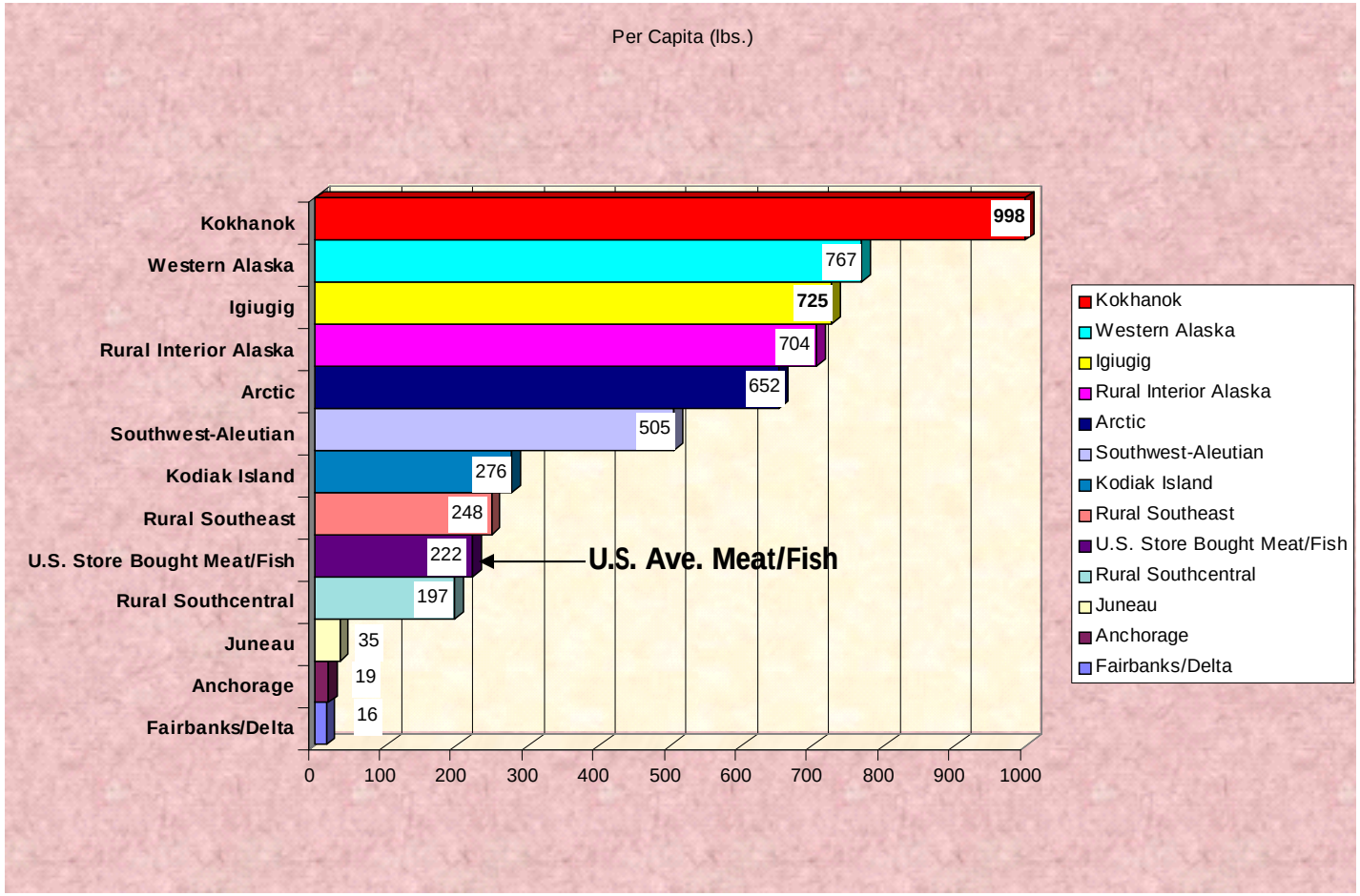
Source: U.S. Census of Population

*Alaska Native alone or in combination with another ethnicity.

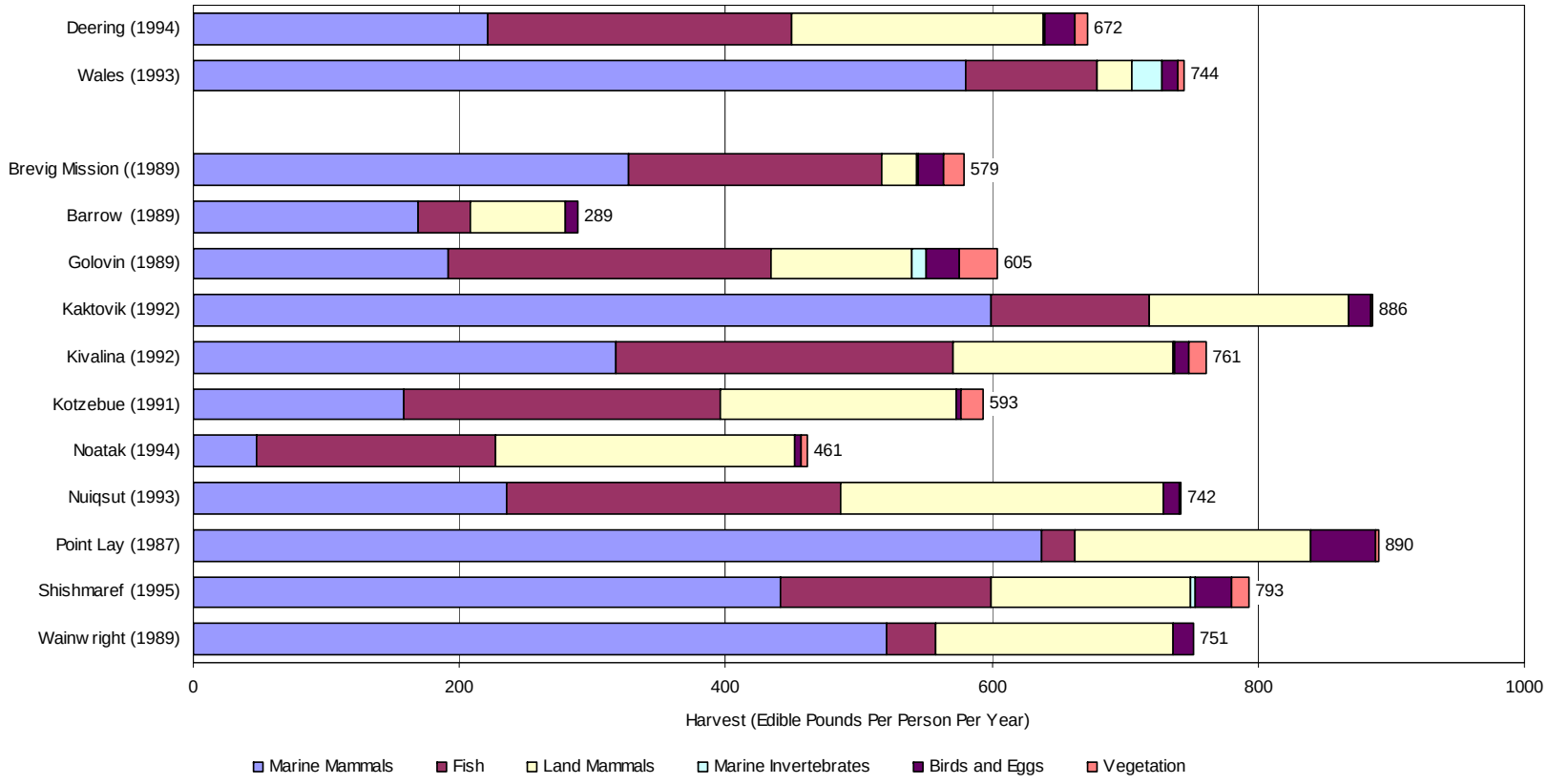

Savoonga, St. Lawrence Island
Population – 700+
Unemployment 65%
Price of groceries – 245% of Anchorage
Price of electricity – .32 per kwh after PCE
Price of gas approx. $8.69 per gallon
Price of ground beef - $4.95 per lb

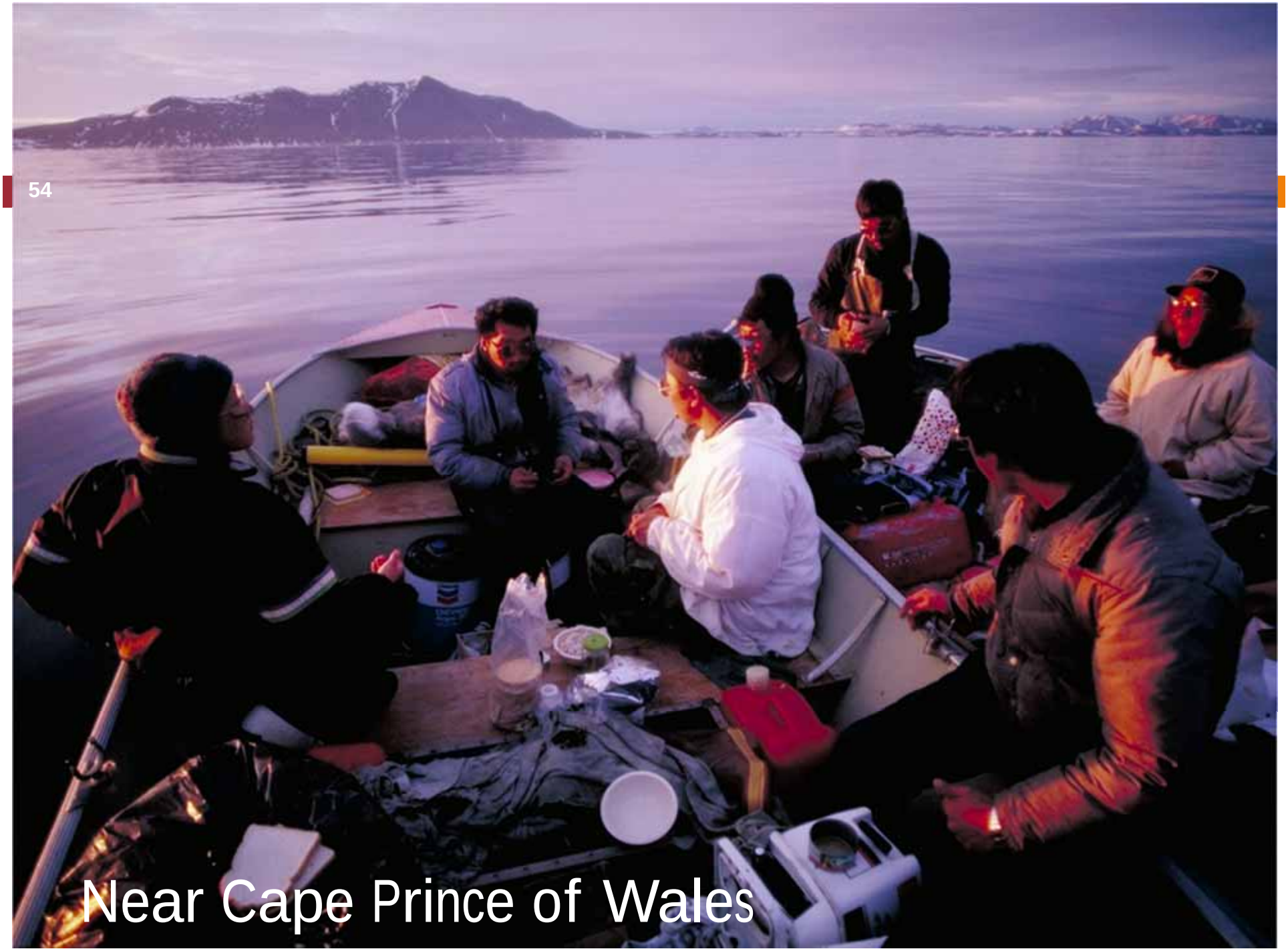
Shungnak

Per Capita Consumption of Wildlife Resources in lbs.



Estimated Harvests of 13 northwest Alaska communities by Resource Category





Near Cape Prince of Wales

Tipping Points …. (continued)

- "Environmental science must move beyond identifying issues and toward providing sound bases for the development of innovative solutions, effective adaptation, and mitigation strategies. To accomplish this goal we urgently need to expand our capacity to study the environment as an integrated system that includes the human dimension."

- "To understand this coupling of natural and human social systems, we must advance general concepts such as ecosystem services and describe the processes that link natural systems from local to global scales with human systems from individuals to collectives."

Tipping Points …. (continued)

- "Incorporating the human component will require long-term regional-scale research that addresses how individual behavior, demography, and social systems respond to changes in the functioning of environmental systems. While scientists from every discipline can make significant contributions, studying the components of environmental systems in isolation from each other is neither adequate nor meaningful."

Impacts from Melting Permafrost

- Impacts of infrastructure such as:
  - Buildings
  - Roads
- Loss of closed-basin lakes.
  - Migratory bird habitat
- Makes coastal soils more susceptible to erosion from storm surges.

Shishmaref: reduced sea ice allows higher storm surges to reach shore and thawing permafrost makes the shoreline more vulnerable to erosion

Storm Surges & Climate Change Impacts on Community Infrastructure

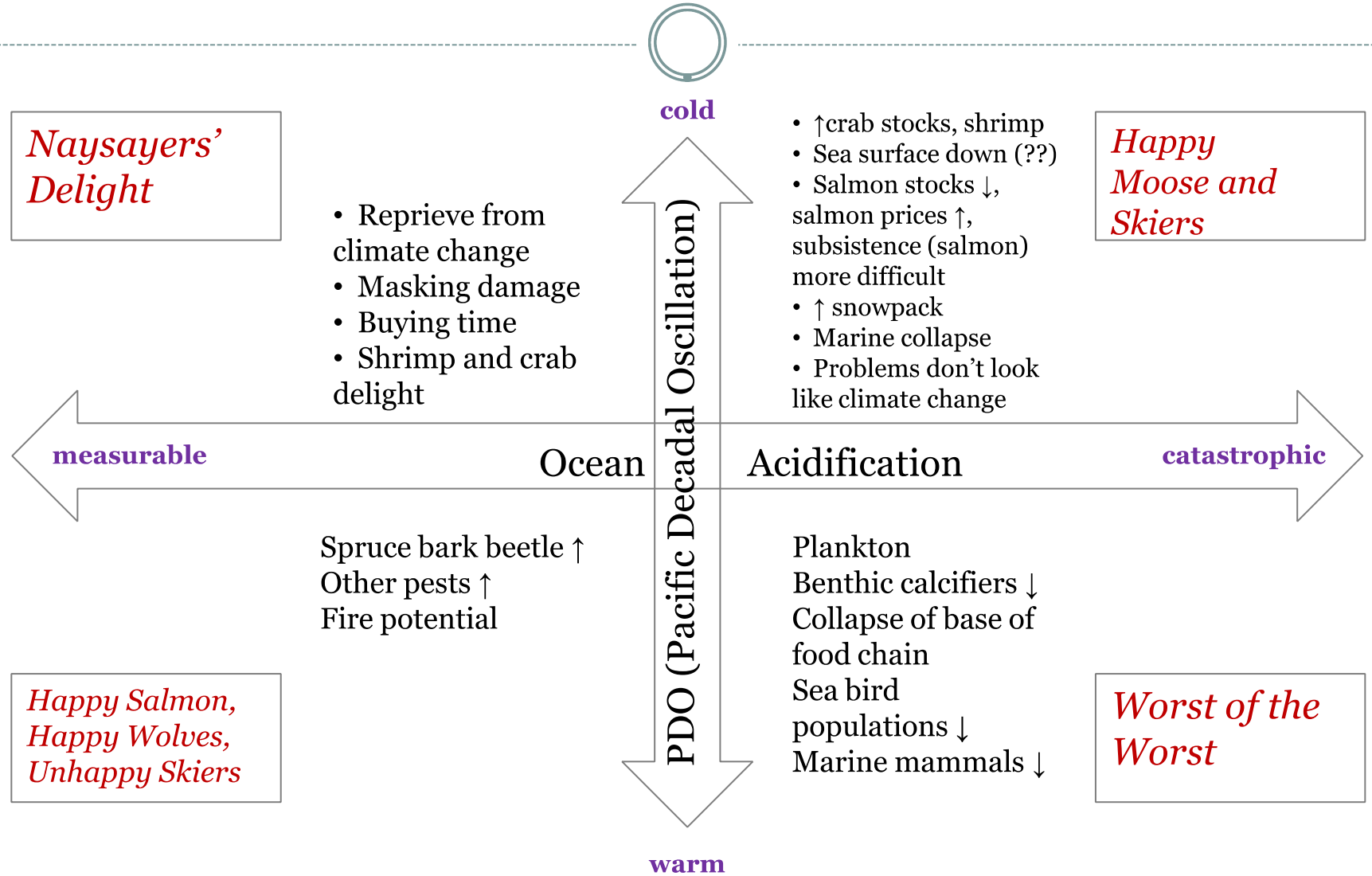
- Recent GAO report found 90% of states 213 predominantly Native villages, historically situated along rivers and coasts, are affected regularly by floods or erosion.
- Global Warming has exacerbated the problems according to the report:
  - Melting permafrost more prone to erosion
  - Barrier sea ice coming later in the year leaving villages, such as Shishmaref, vulnerable to fall storms (and storms are more violent).
  - Flooding from rising sea levels.

Shishmaref Relocation Costs.

- Four Alternatives ($650k- $1million/hh):
  - Move to mainland - $179 million
    - $20 million move 150 homes
    - $26 million to move or build school, clinic, city hall
    - $25 million for new airport
    - $23 million for roads
    - $25 million for water treatment & sewage
  - Move everyone to Nome - $93 million
  - Move everyone to Kotzebue - $141 million
  - Stay put on Sarichef “Island” & fight erosion $109 million.

CLIMATE SCENARIOS

BIOREGION: SWAN



Summary by SNAP of Climate Change Scenario Planning Workshop by GBN, Aug. 2010

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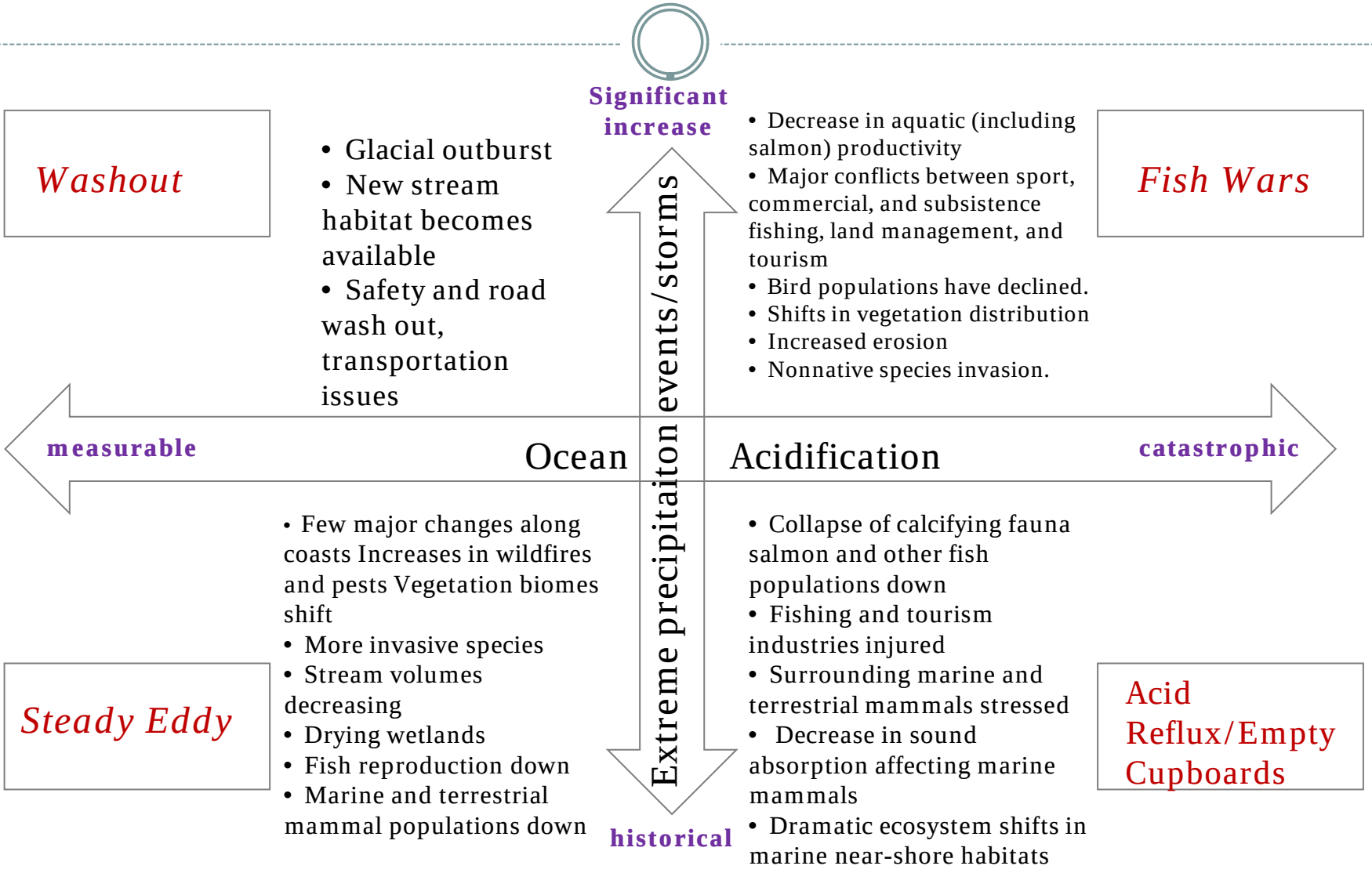

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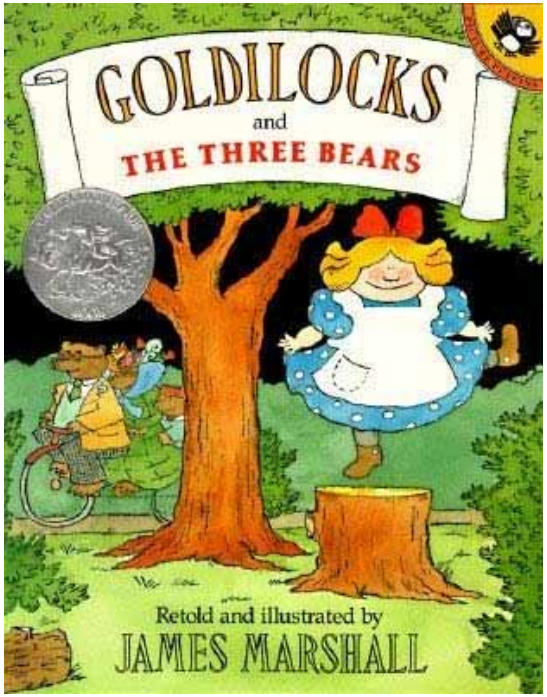
Step Three: Synthesize

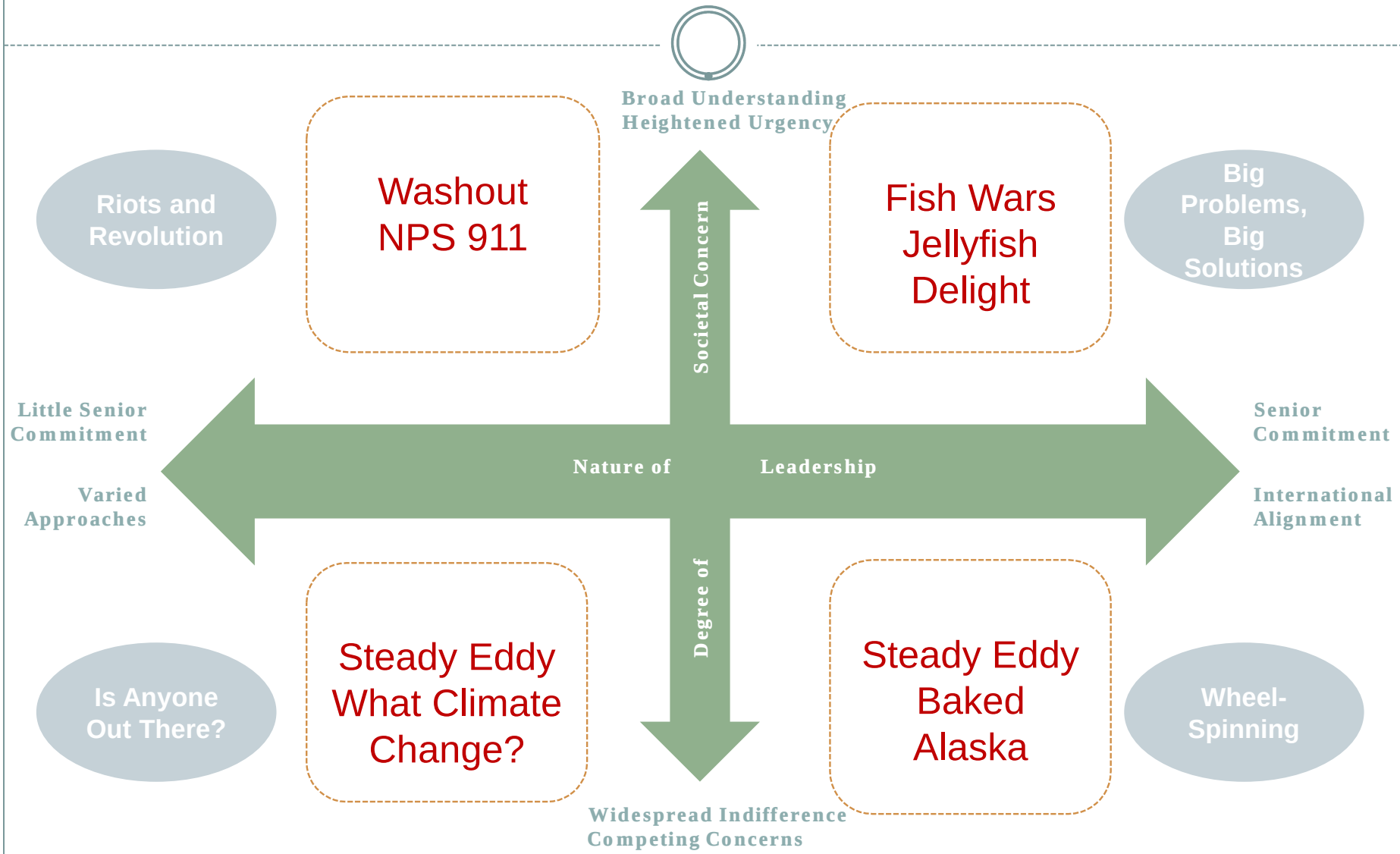
How do we combine and synthesize these forces to create a small number of alternative stories?

- Sixteen (or more) choices available (4x4)
- Need to select only 3-4 to turn into narratives and planning tools
- Focus on scenarios that are:
  - Relevant
  - Divergent
  - Plausible
  - Challenging
- Create a narrative (story) about each scenario



NESTED SCENARIO MAP

BIOREGION: ___SWAN____



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Topics to Covered in This Presentation

- China and U.S. Reach a Small Detente.

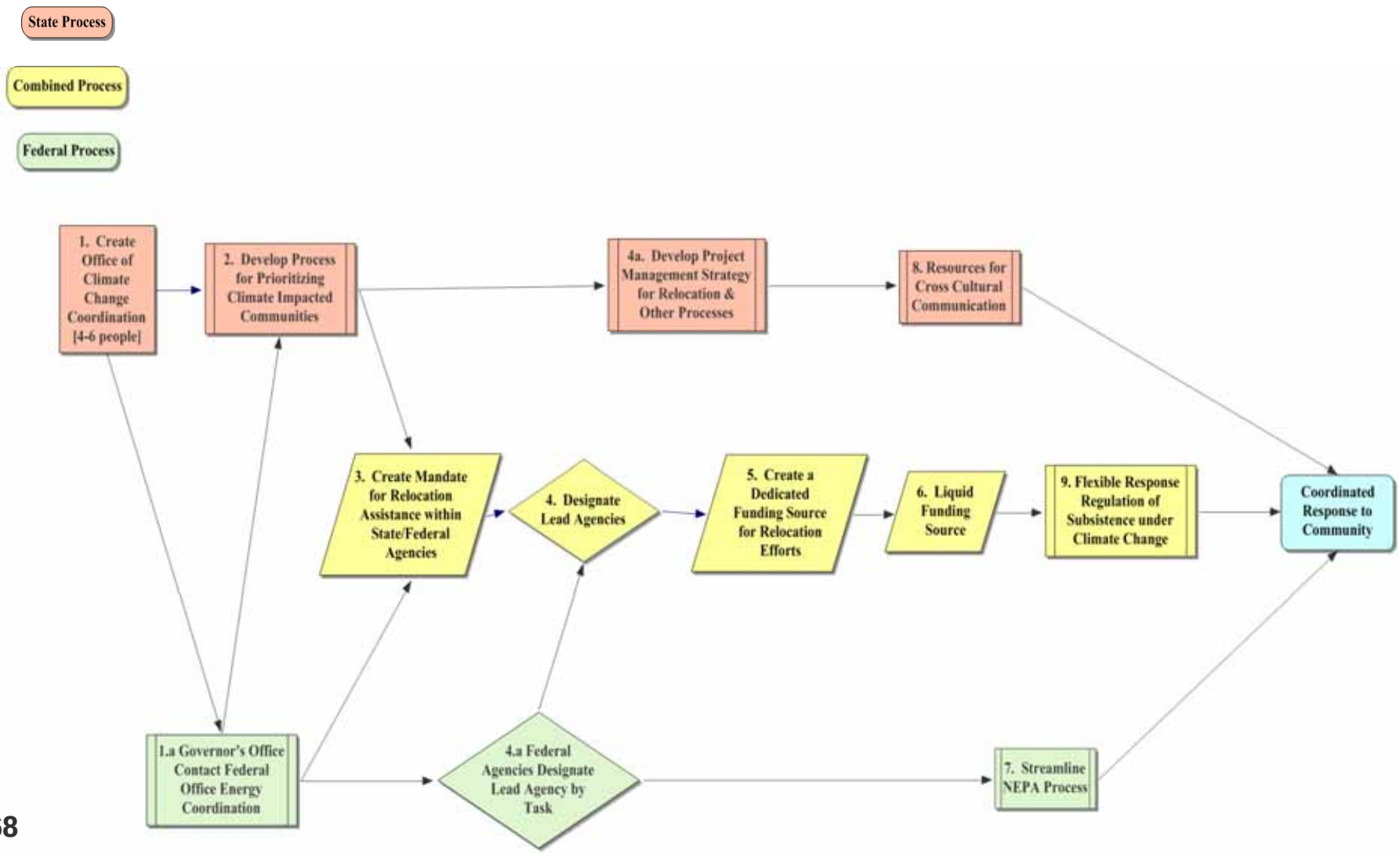
- "Energetic Limits to Economic Growth."

- Workshop Findings: "Using Scenarios to Explore Climate Change" GBN, June 2009. [Nesting the "Institutional Response Dimension"]
  - "Interdisciplinary Teams (IDT's)" {NSF "Tipping Points"}
  - "Structural "impediments" to change and progress across agencies.

    {Newtok a Case Study}
  - NPS seems to operate under assumptions that future is unchanging. {Beyond Naturalness: Rethinking Park and Wilderness Stewardship in an Era of Rapid Change}

- Nesting the dimensions of "Institutional Response" and "Degree of Societal Concern".

Option One: Office of Climate Change Coordination



Substituting the "Institutional Response" Axis for "Nature of Leadership Axis.

Explaining Scenarios: Critical Uncertainty (1)

➢We combined some of the most important and uncertain critical forces to form an axis around the "Nature of Leadership"

All countries see value in coordinated global approaches

Leaders willing to make tough decisions to address the long-term challenges

Government commitment shows in budgets, priorities and inter-agency cooperation

Media holds politicians, business leaders, to account

Lack of senior commitment

Varied approaches and alignment

Short-term concerns

Senior commitment

International alignment

Long-term perspectives

Climate change problems seen very differently across the world

Political statis and controversy leads to lack of firm progress and decision-making

Governments and businesses show only partial commitment, focusing attention on more immediate concerns

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"Using Scenarios to Explore Climate Change" GBN, June 2009

Transitions & Tipping Points in Complex Environmental Systems

(NSF Advisory Committee)

- With Respect to climate change NSF place a high priority on research that integrates behavior & live sciences, earth and atmospheric sciences, social sciences and mathematical, physical, engineering, and informational sciences.

- Interdisciplinary priorities for NSF and other agencies will not achieve all they could achieve if the institutional practices within the research and education communities are not adapted to facilitate interdisciplinary action. (p.5)

Institutional Practices that Impede Interdisciplinary Research.

- Current practices in academic and government institutions, with their traditional disciplinary funding and evaluation mechanisms, often inhibit the truly innovative and integrative science and education the nation needs.

- NSF needs to insure that programs funded for interdisciplinary activities have the longevity necessary to attract scientists to work collaboratively across the disciplines.

Tipping Points…. Continued.

- "Rapid development and growth of human populations are causing changes to natural ecosystems and biodiversity loss of a magnitude and scale not seen before in human existence."

- "As these socioeconomic systems have become more globally connected and interdependent so too have their interactions with environmental systems. These changes in environmental and social systems represent serious threats to our economy, security, and human health"

Beyond Naturalness: Rethinking Park and Wilderness Stewardship in an Era of Rapid Change.

(Cole & Yung 2010 Island Press.)

- Mgt. Policies, e.g., "Restoration of Naturally Functioning Ecosystems."
  - "Our world has entered an era in which keystone environmental drivers – those that define the possible range of characteristics of a protected area – simply have no analog in the past, no matter how distantly we look." (p. 50)
  - "Furthermore, at the spatial and temporal scales relevant to protected area management, the ability to predict future ecosystem conditions and outcomes of management actions is, at best, qualitative. (p. 50)

Beyond Naturalness … (continued).

- Mgt. Policy – Invasive species:
  - "Thus, maintaining historic species assemblages may not be the only valid management goal in protected areas. Novel species assemblages arising through species migration and invasion are increasingly inevitable as climate change and species movement increase; some of these novel assemblages might be desirable." (p. 44)
- Mgt. Policy – "Preserving natural and healthy ecosystems".
  - The traditional notion of restoring past conditions is often inappropriate because many of the changes in ecosystem state (e.g., climate change) that demand intervention are irreversible. (p. 38).
  - Restoration of past conditions may be a recipe for disaster if climatic conditions of the future are unfavorable for those ecosystems (p. 23)

Beyond Naturalness …. (continued).

- Mgt. Policy – “Preservation of wilderness”.
  - The authors, in citing William Cronon, argue “for a need to move beyond couching our conception of wilderness and the values it embodies so firmly in a dualistic vision of humans apart from nature.” “In particular, it is time to articulate goals and objectives for parks and wilderness that are founded in a perspective that views humans as part of, rather than apart from, nature.” (p. 26)

NESTED SCENARIO DETAILS

BIOREGION: __SWAN___

Socio-Political

Big Problems, Big Solutions **Fish Wars**

Jellyfish Delight

Bioregion Climate

The world of 2030 spoken from Will Douglas's grandson Buddy:
Will's family started Fisherman's Paradise Lodge in 1950. Today, Will's grandson Buddy is facing a drastically different world than his father Bill was raised in. In 1950 no limits existed for sport fishing, and fishermen drove the bears away. By 2000, the bear population had increased dramatically under NPS protection, and it was catch and release only for trout and only one salmon could be kept, which was bad enough for Bill and his clients. But today (summer 2030) you're lucky to catch anything, and regulations are such that Buddy and his clients are rarely allowed to try. Business has collapsed, not just for Buddy, but all the sports and commercial industries. Tourism, even on the coast, isn't much of an option either – the collapse of the marine food web and flooding of breeding grounds from severe storms have made it difficult to spot the seabirds, seals, sea lions, and brown bears that attracted the tourists there in the first place, and the easiest way to get the lodge from Anchorage is flying, which few can afford nowadays. Eight hours of Buddy's time every week is tied up traveling to endless community meetings in King Salmon or Anchorage for any number of projects proposed by the NPS and the public to manage fish resources. The local tribal communities are fiercely competing with sport fishing businesses like Buddy's, an exhausting process for Buddy who spends plenty of time on the advisory groups for federal and state bag limit processes, particularly because the docks at Fisherman's Paradise camps and King Salmon have been washed out by repeated flooding and abandoned by the NPS and others, forcing Buddy to fly or boat without good landing sites. The NPS isn't paying attention to Buddy's problems – they're distracted by the need to rebuild and retrofit park facilities and roads from flooding, including loss of archeological sites. Luckily, state and federal funding have gushed into the region to build new fisheries hatcheries and fish farms, while some brave residents have begun shifting commercial and sports activities to the few marine species still thriving in the ocean. Buddy is looking into re-opening historic canneries for fish hatcheries and processing jellyfish, a growing industry in the region where residents have been forced to shift diets. At the national level, policy decisions to reduce GHG emissions have been implemented across the board and research scientists are crawling over the landscape, but Buddy is certain that any benefits coming from these changes won't be felt in his lifetime.

Summary: Threats to Resilience

- Loss of subsistence species beyond community's ability to adapt.
- Relocation to urban areas destroys traditional local networks.
- Cost of living rising beyond ability to sustain infrastructure, heat houses or purchase gas/technology for hunting.
- Long term cultural, social and psychological cost of "settlements without prospects".