



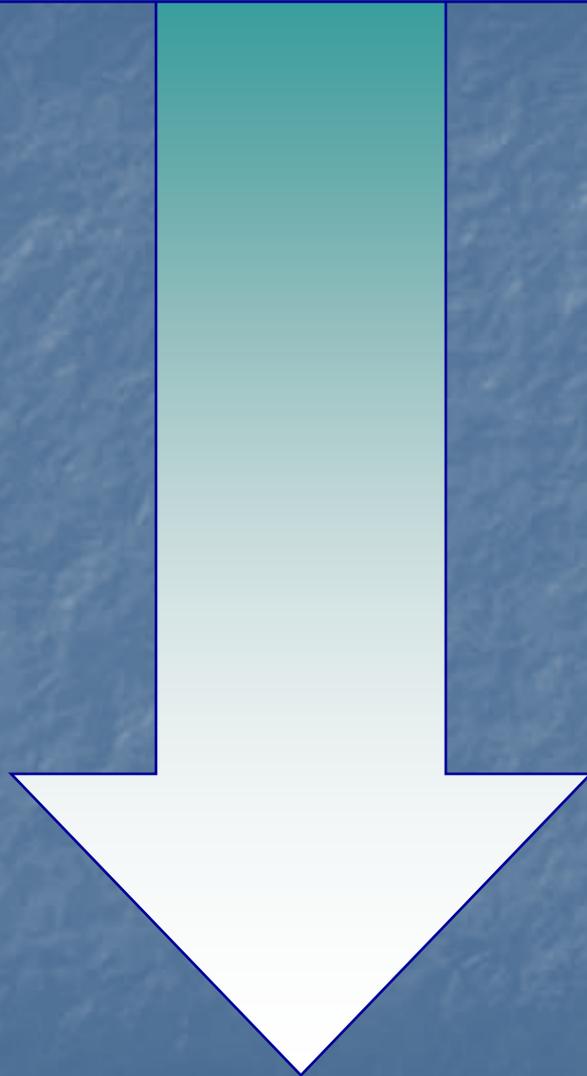
Conceptual Ecological Models to Support Monitoring of Alaska National Wildlife Refuges



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Science Center

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USGS Alaska Science Center

Effects of Climate Change on Refuges





Effects of Climate Change on Refuges

Potential Management Responses

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graph TD; A[Effects of Climate Change on Refuges] --> B[Potential Management Responses]; B --> C[What information is needed to decide when, where and how to respond?]; C --> D[Large downward arrow];
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Effects of Climate Change on Refuges

Potential Management Responses

What information is needed to decide when, where and how to respond?

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Effects of Climate Change on Refuges

Potential Management Responses

What information is needed to decide when, where and how to respond?

Objectives of monitoring program are to meet these information needs

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Effects of Climate Change on Refuges

Potential Management Responses

What information is needed to decide when, where and how to respond?

Objectives of monitoring program are to meet these information needs

Develop Monitoring Strategy

Meeting
October 2008

Effects of Climate Change on Refuges

Potential Management Responses

What information is needed to decide
when, where and how to respond?

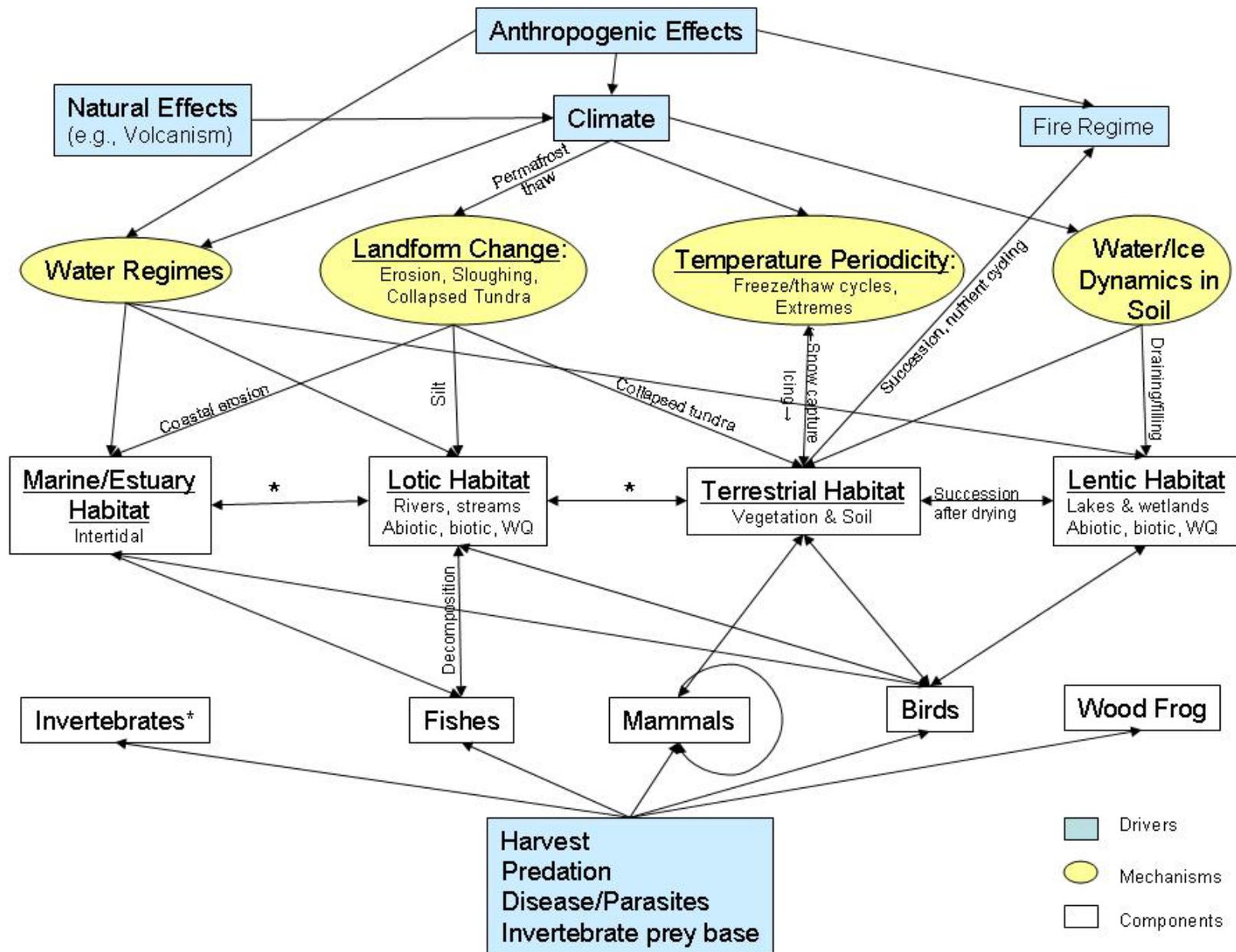
Objectives of monitoring program are
to meet these information needs

Develop Monitoring Strategy

Predicting the Effects of Climate Change

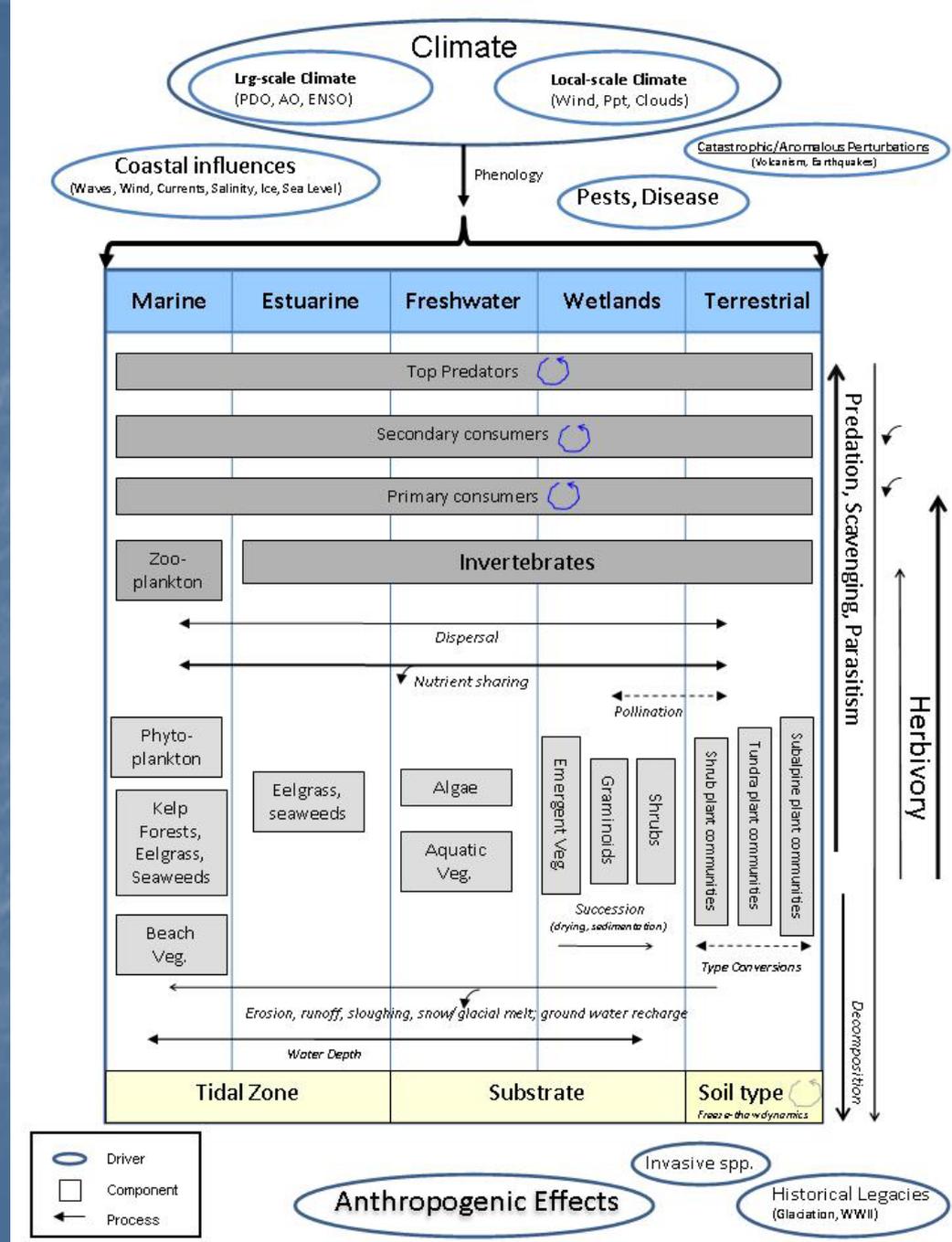
- Develop conceptual models of refuge ecosystems
- Predict impacts based on climate change predictions and understanding of ecosystem function
- Scope of changes requires consideration of context beyond refuge boundaries

Conceptual Models of Individual Refuges – Yukon Flats NWR



Conceptual Models of Individual Refuges

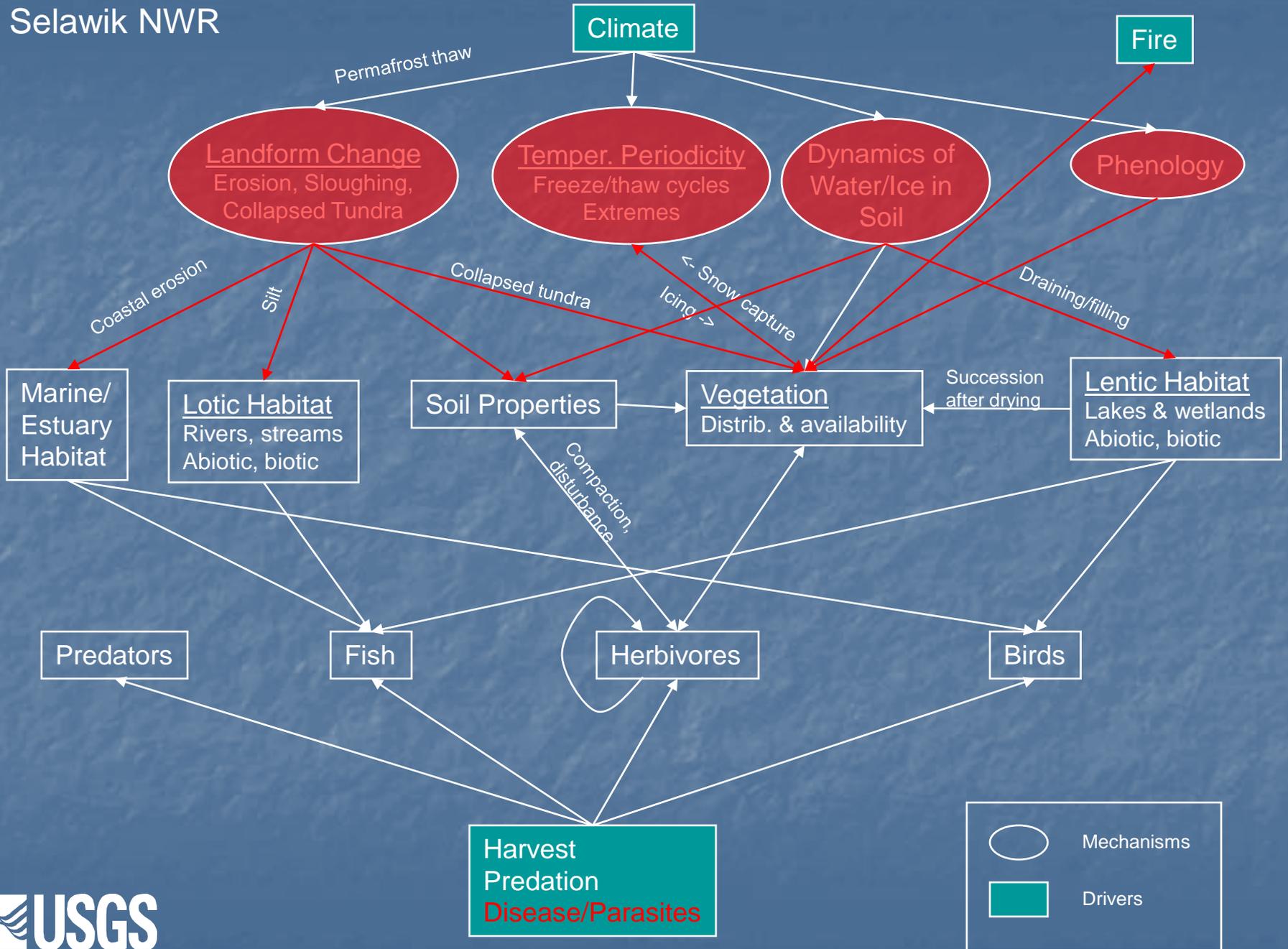
Izembek NWR



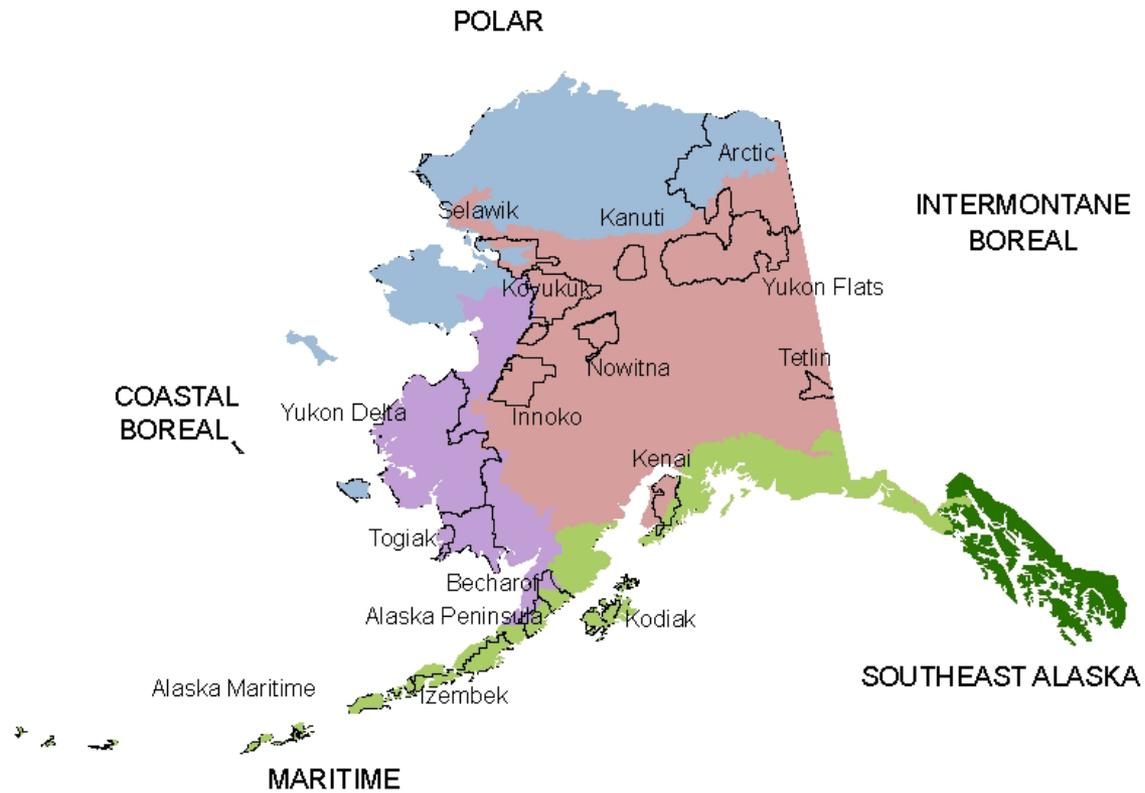
Predicting the Effects of Climate Change

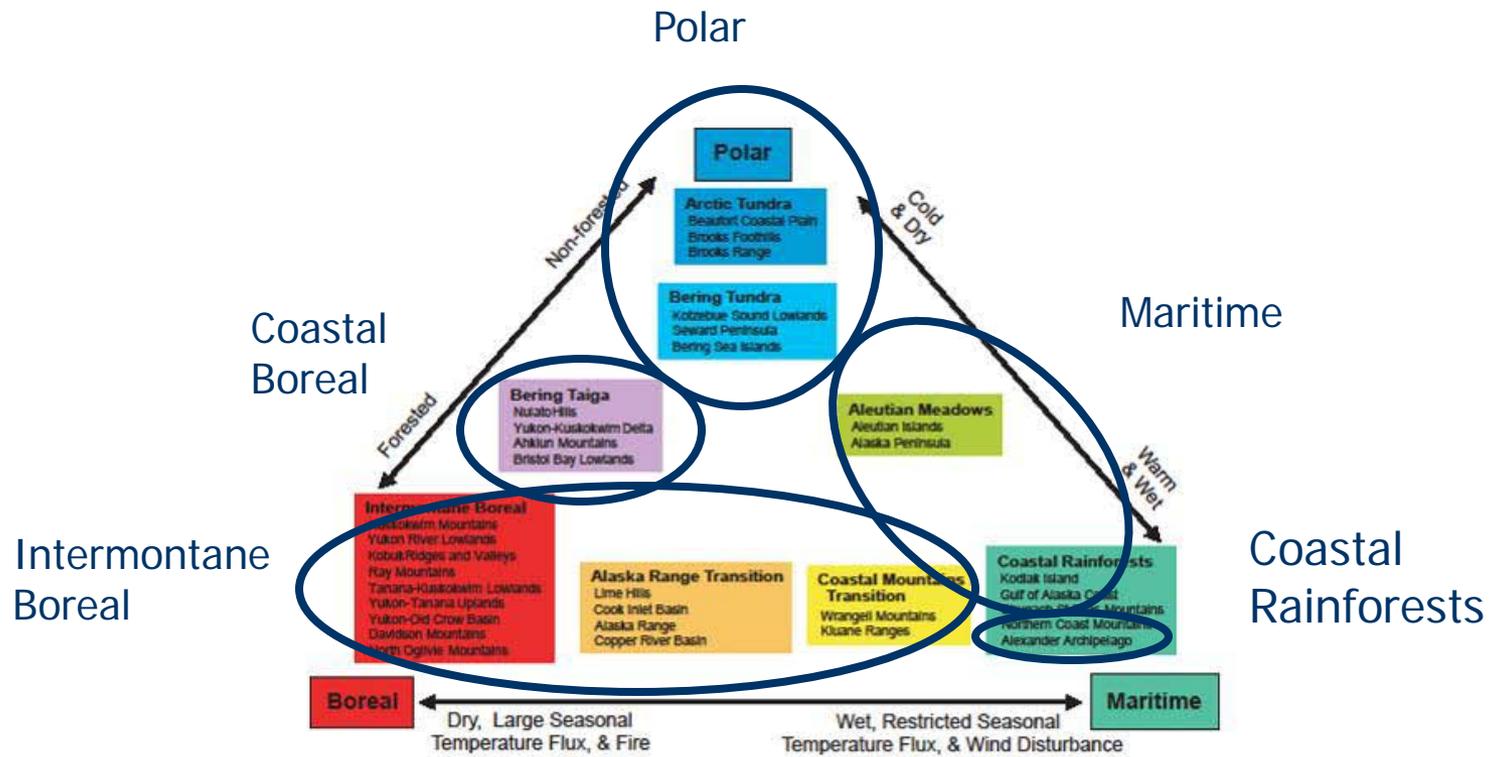
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Selawik NWR



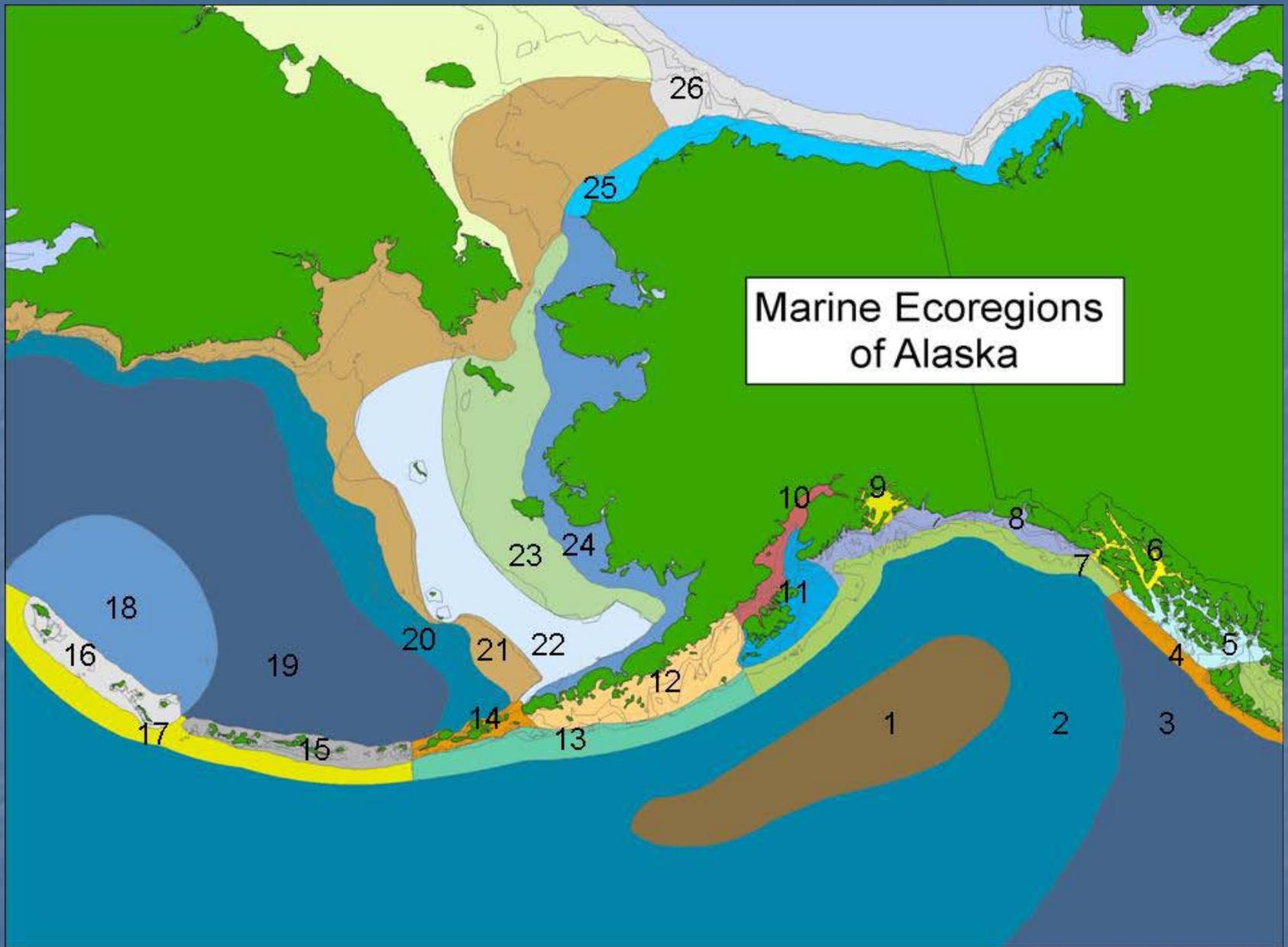
Ecoregions





This figure shows the climatic and environmental relationships between the 32 Ecoregions and the eight Level 1 groups.

Nowacki et al. 2001

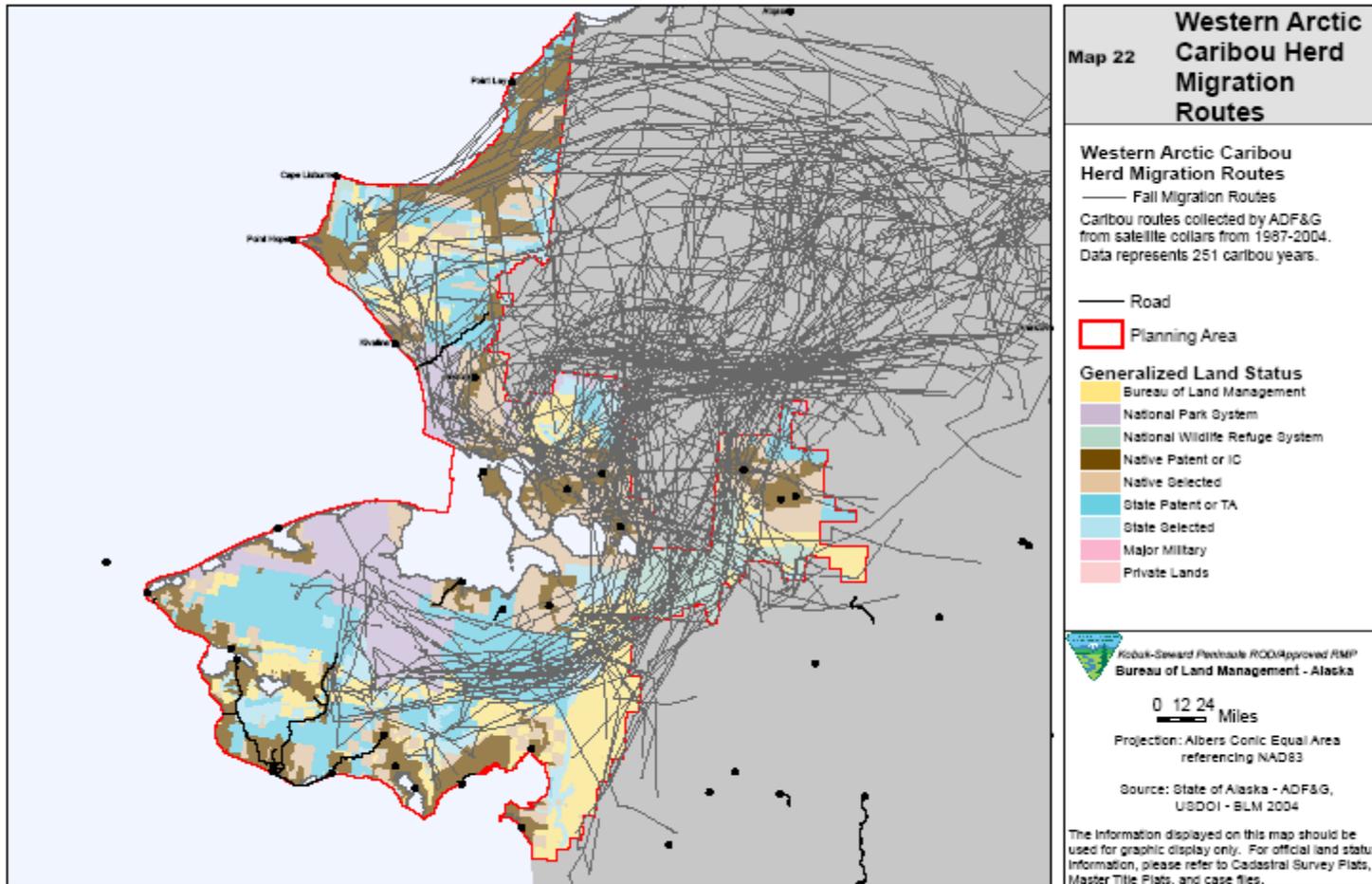


Marine Ecoregions
of Alaska

Predicting the Effects of Climate Change

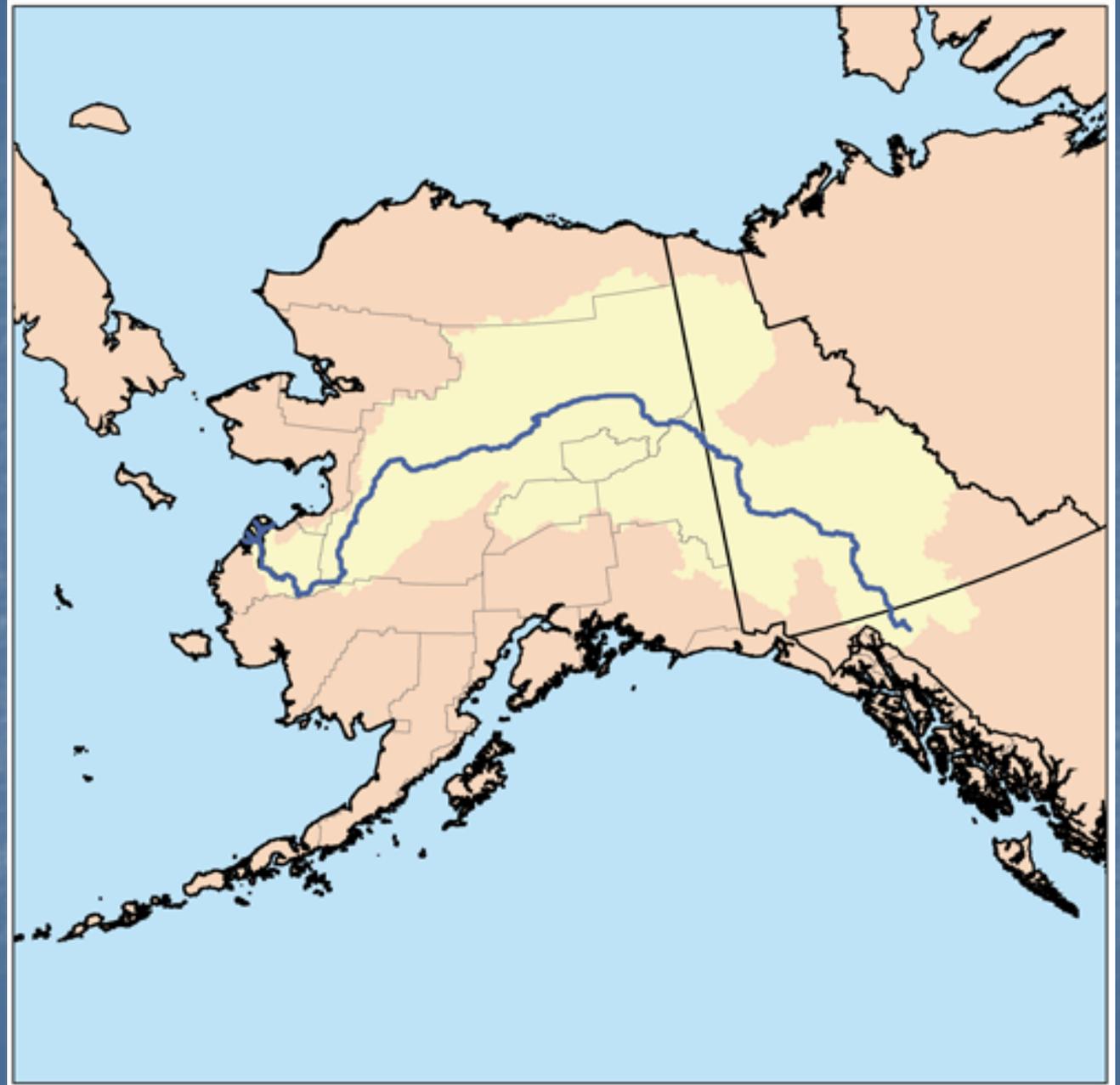
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Wildlife: Western Arctic Caribou Herd



Geographic
Feature/
Hydrology:

Yukon River

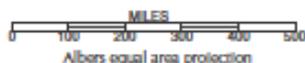




FEDERAL LANDS AND INDIAN RESERVATIONS

- Bureau of Indian Affairs
- Bureau of Land Management / Wilderness
- Department of Defense (Includes Army Corps of Engineers lakes)
- Fish and Wildlife Service / Wilderness
- Forest Service / Wilderness
- National Park Service / Wilderness

Some small sites are not shown, especially in urban areas.

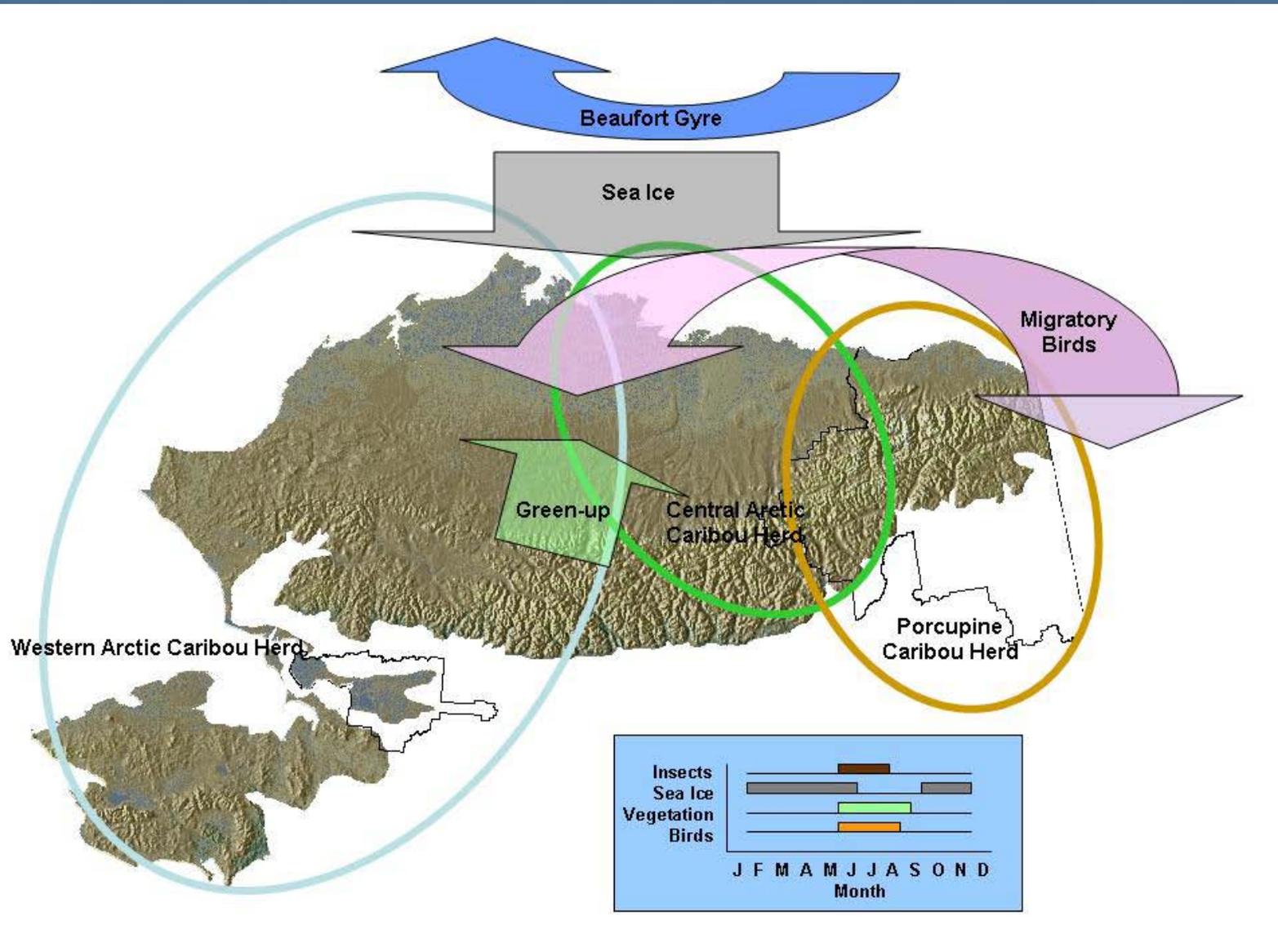


Abbreviations

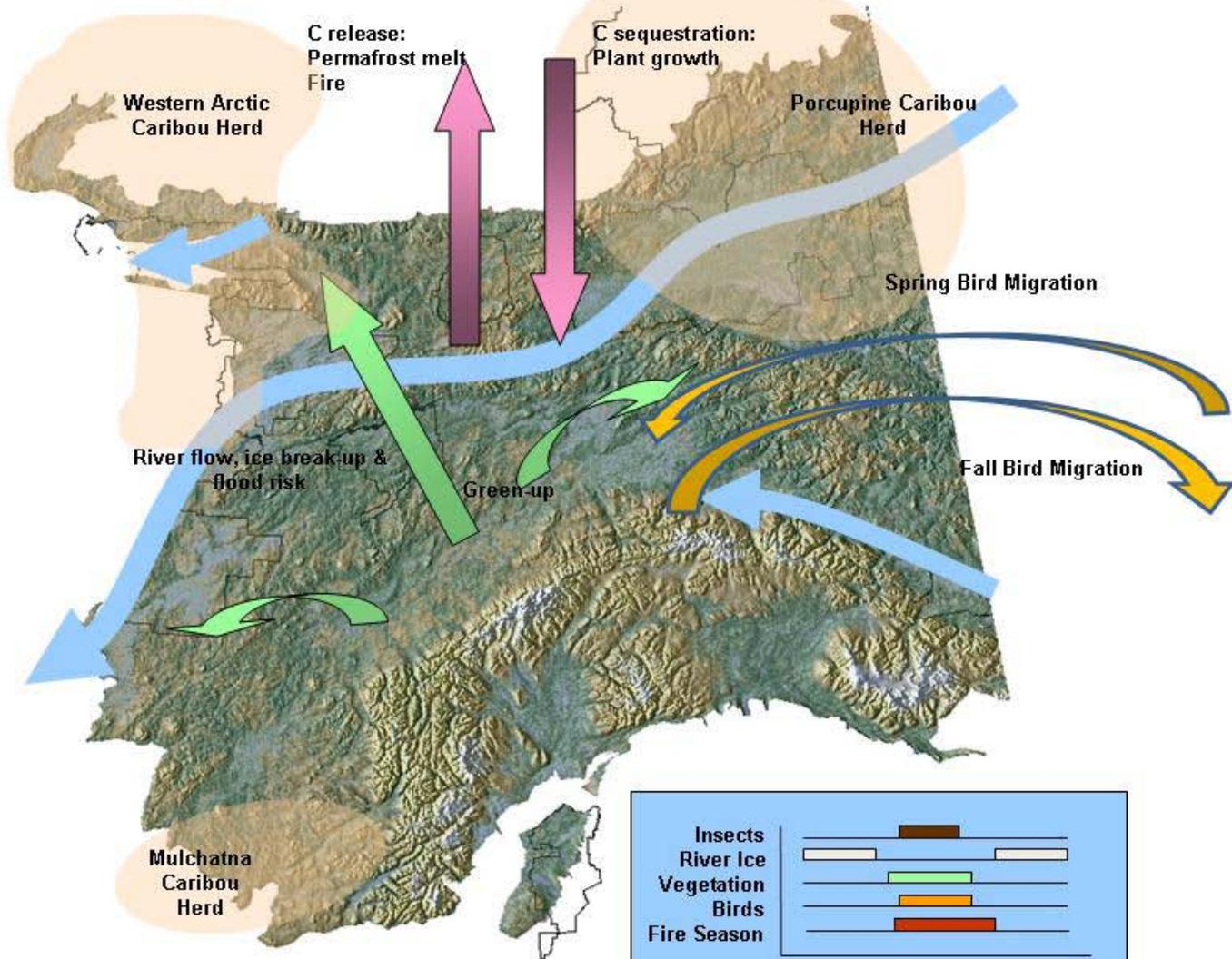
- NCA National Conservation Area
- NF National Forest
- NHP National Historic Park
- NM National Monument
- NP National Park
- NPres National Preserve
- NRA National Recreation Area
- NWR National Wildlife Refuge



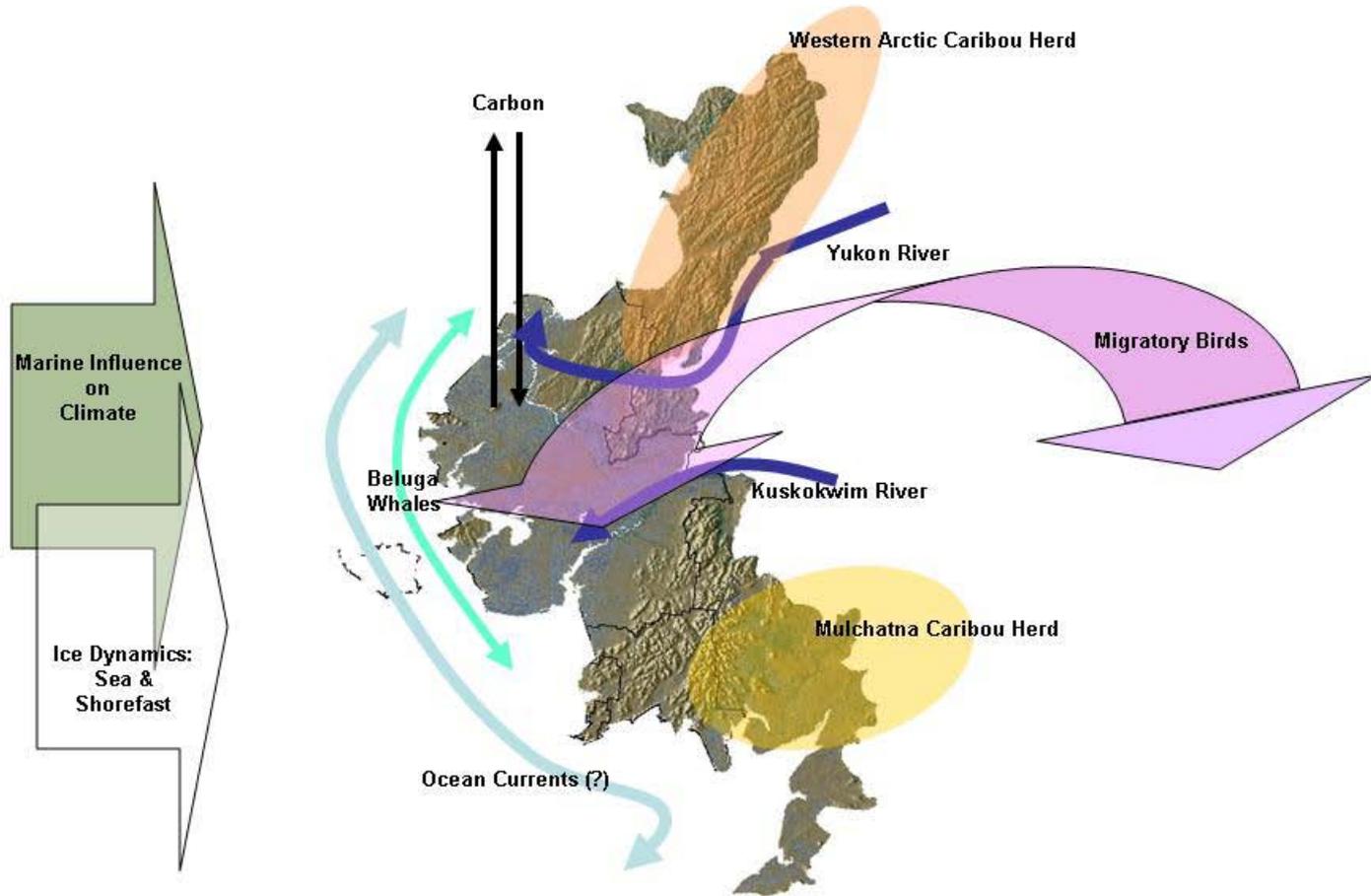
Polar Ecoregion



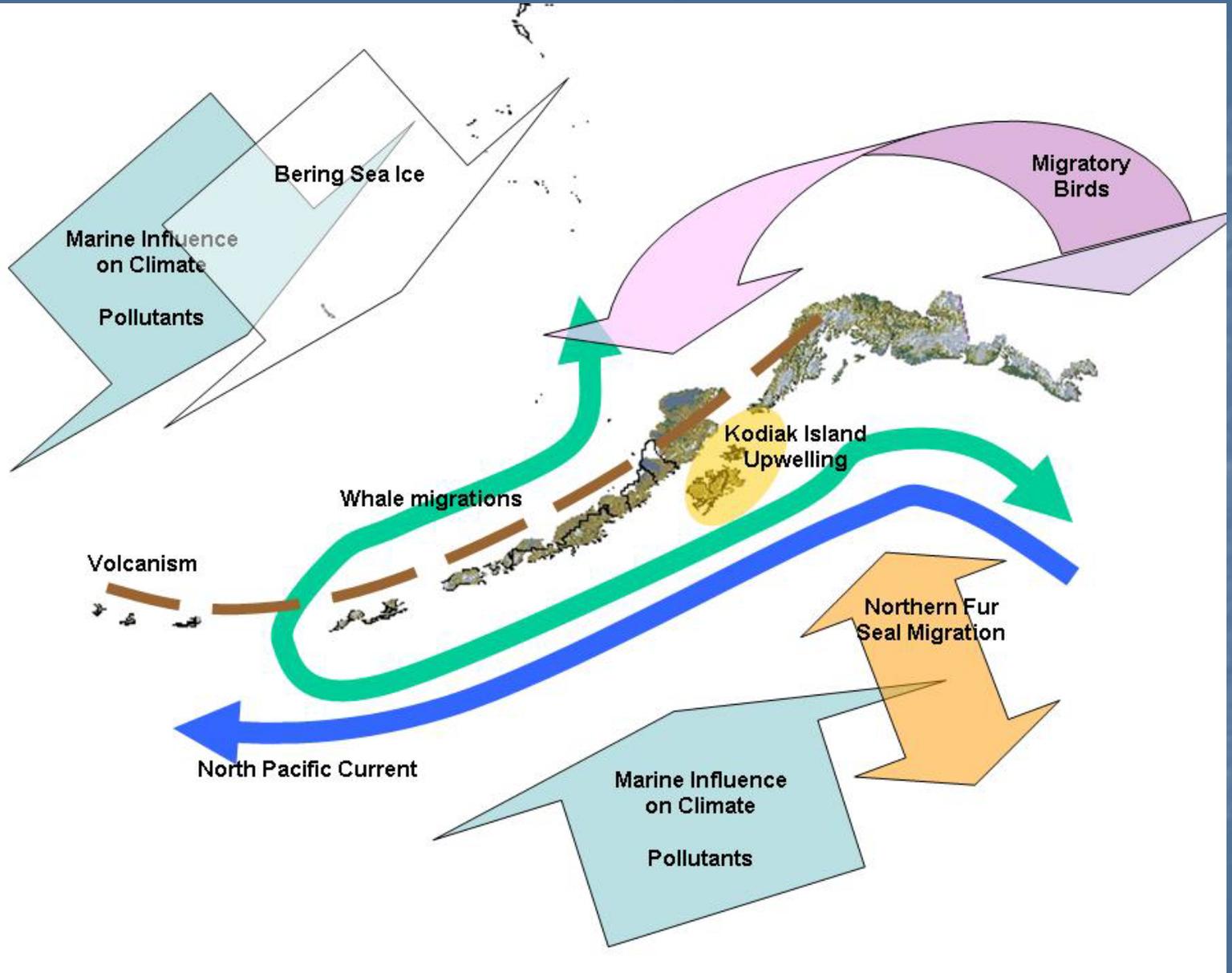
Intermontane Boreal Ecoregion



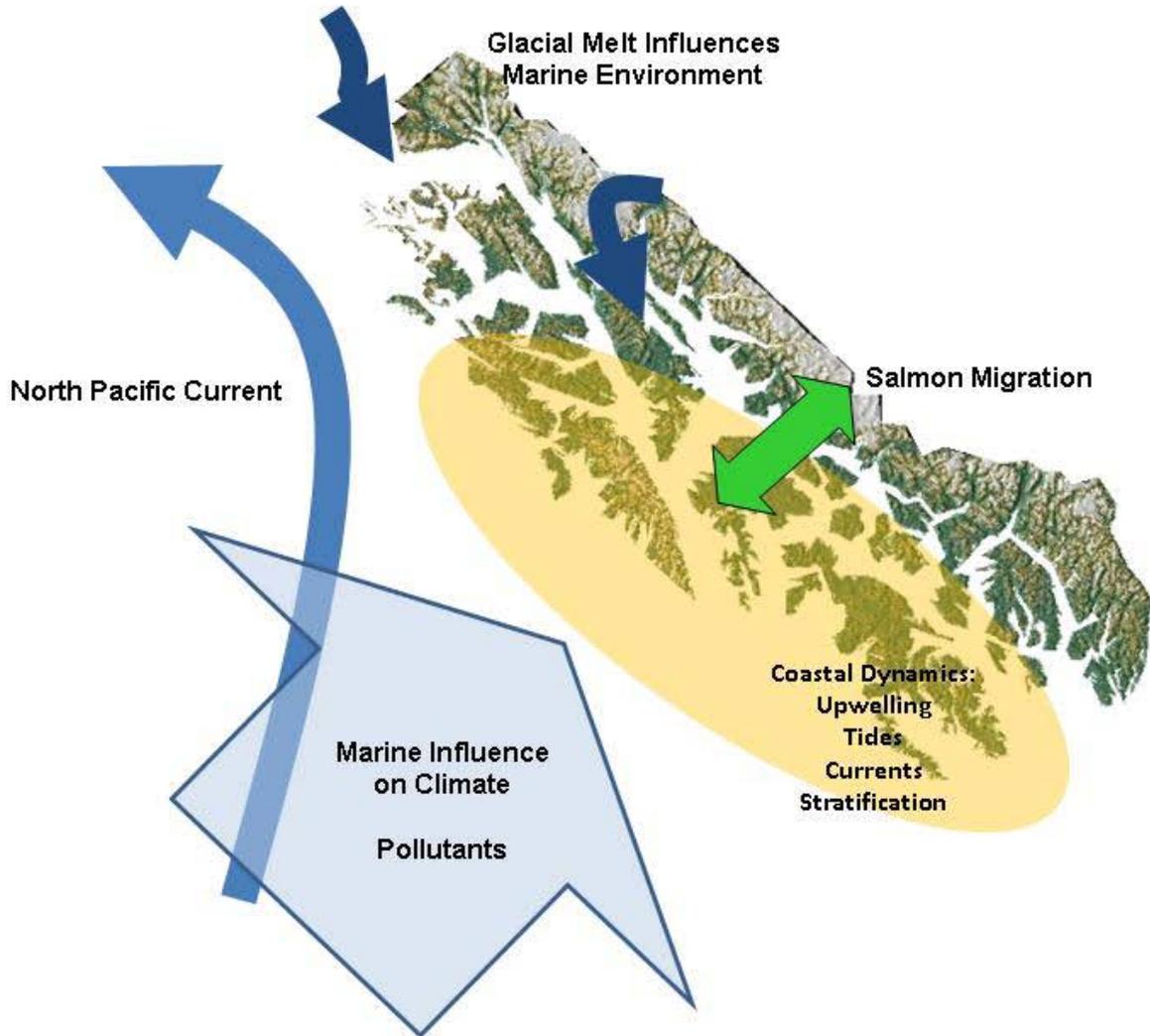
Coastal Boreal Ecoregion



Maritime Ecoregion



Coastal Rainforests Ecoregion



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Effects of Climate Change on Refuges

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What information is needed to decide when, where and how to respond?

Objectives of monitoring program are to meet these information needs

Develop Monitoring Strategy



Benefits of Ecoregional Monitoring

- Context
- Validation
- Statistical sufficiency
- Understand causation
- Cross spatial scales
- Leverage resources