

Unit 2: Presentation 6
Adaptive Capacity

- Session Goals
- Review the concept of adaptive capacity
 - Introduce roots of concept and its applications
 - Understand factors affecting adaptive capacity
 - Recognizing adaptive capacity and its limits

- Definitions
- "...the ability of a system to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences."
» IPCC 2007
 - "Coping range" or "coping capacity"
– Ability for a system to reconfigure without significant declines in crucial functions
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Social System Applications

- Rooted in biological/ecological concept of “adaptability”
- Embraced in assessing vulnerability and adaptation of social/human systems
- Key adaptive capacity attributes in social systems include:
 - Health
 - Literacy
 - Governance
 - Economic wealth



Resilience and Adaptive Capacity

- Resilience
 - often regarded as the capacity to return to a prior functional state after disturbance
 - “temporary” change
- Adaptive Capacity
 - retain functionality during a shift
 - “directional” change
 - adjust to a new “normal”



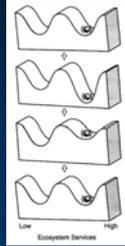


“the capacity for self-renewal”
-- Aldo Leopold



Ecological Thresholds

- Ecological regimes often described using “ball and cup” metaphor
- Peaks represent thresholds between alternate states
- Thresholds can be thought of as conditions that exceed a system’s adaptive capacity



From Carpenter & Gunderson 2001



Factors Affecting Adaptive Capacity

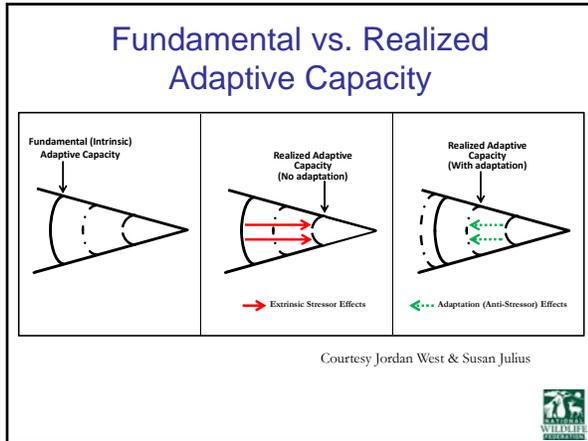
- Genetic diversity
- Phenotypic plasticity
- Behavioral plasticity
- Dispersal ability
- Landscape permeability
- Management potential

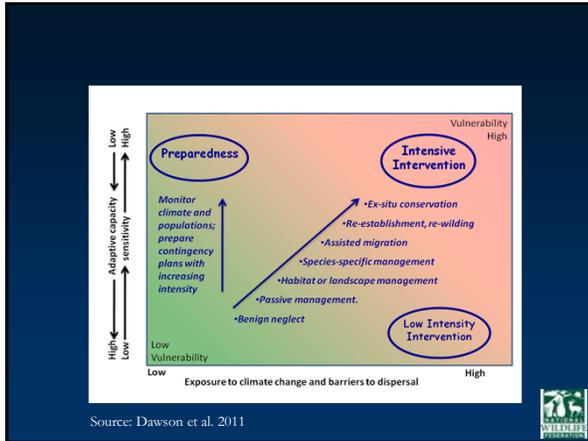


Institutional Aspects of Adaptive Capacity

- Important to think about the adaptive capacity of institutions, not just species and ecosystems
- What is the ability of our institutions to adjust to and respond to change?
 - How prepared are our institutions to reconsider conservation goals and management objectives, and to truly put adaptive management into practice?







Recognizing the Limits of Adaptive Capacity

From Zhu et al 2011 based on FIA Data

Overall Range expansion:
Offspring will have greater latitudinal extent than adults at both range limits

Northward range shift:
If a species is expanding north and retreating from southern limits: offspring will extend north of adults at northern limit and adults will extend south of offspring at southern range limit

Overall range contraction:
offspring have less latitudinal extent than adults

Southern range shift:
adults extend north of offspring at northern range limit offspring extend south of adults at southern range limit

Caution!

From Rushing and Primack 2008

Black birch/grey birch flowering

2.83 days earlier for each degree C for black birch and no relationship for grey birch

Rough stemmed goldenrod/ lance leaved goldenrod flowering

11.7 days earlier for rough stemmed goldenrod and no relationship for lance leaved or most other goldenrod species