Wildlife Adaptation Menu

Please do not distribute. Contact Stephen Handler (stephen.handler@usda.gov) for more information. Authors of this menu include: Olivia LeDee (USGS Northeast Climate Adaptation Science Center), Ben Zuckerberg (University of Wisconsin), Chris Hoving (Michigan Dept. of Natural Resources), Stephen Handler (USDA Forest Service and Northern Institute of Applied Climate Science), and Chris Swanston (USDA Forest Service and Northern Institute of Applied Climate Science). Visit www.forestadaptation.org/focus/wildlife to learn more about the project.

Adaptation Strategies for Population Management

1. **Maintain and enhance genetic diversity**
   Approaches
   - 1.1. Increase genetic exchange between populations
   - 1.2. Protect genetic admixture (interbreeding) zones in order to facilitate adaptive genetic exchange
   - 1.3. Limit genetic exchange to protect isolated populations
   - 1.4. Protect trailing edge or leading edge populations
   - 1.5. Protect populations in disturbed environments because they may contain adaptive traits
   - 1.6. Protect areas of high phylogenetic or phenotypic diversity or endemism
   - 1.7. Import individuals with climate-adaptive genetic traits (translocation)
   - 1.8. Preserve genetic material (gene banks)
   - 1.9. Restore genetic diversity in isolated or inbred populations (genetic rescue)

2. **Establish and maintain connectivity between populations**
   Approaches
   - *2.1.* Translocate individuals or populations to habitat within the existing range that was formerly occupied and remains suitable (reintroduction)
   - 2.2. Identify and protect source sub-populations
   - 2.3. Establish and maintain connectivity between sub-populations through corridors or stepping stones

3. **Facilitate shifts in the geographic range of the species in anticipation of future conditions**
   Approaches
   - 3.1. Establish corridors and minimize barriers to movement to new suitable habitats
   - 3.2. Prepare suitable habitat in anticipation of future introduction, reintroduction, or natural range shift of a species
   - 3.3. Move and release individuals into a population where conditions are now suitable and are expected to improve
   - 3.4. Reintroduce species where climate is expected to remain suitable
   - 3.5. Conserve leading-edge populations (high altitude, northern, etc.)
   - 3.6. Introduce species to new areas with suitable current and future climate

4. **Manage interspecific and biotic interactions**
   Approaches
   - 4.1. Increase or protect existing biodiversity, for example species richness, functional diversity, and phylogenetic diversity
   - 4.2. Detect and remove non-native invasive species
   - 4.3. Manage predator populations

4.4. Restore historic trophic linkages
4.5. Protect functional groups or keystone species that help sustain ecosystem functions
4.6. Reintroduce extirpated species or functional groups
4.7. Manage extant and emerging diseases

5. Maintain a sustainable population size by managing reproduction, survival, and migration

Approaches

5.1. Move and attract individuals to augment an existing population
5.2. Increase reproduction and survival rates
5.3. Use captive breeding programs to increase populations of declining or rare species
5.4. Manage natural predation to increase populations of declining or rare species
5.5. Control take, harvest, and illegal harvest

6. Manage harvest regulations to manipulate populations of harvestable species

Approaches

6.1. Manage hunting to increase population size for declining species or species anticipated to be impacted by climate change
6.2. Manage hunting to decrease population size
6.3. Manage hunting to facilitate shifting phenology or species ranges

7. Plan for and reduce human disturbance and human-wildlife conflict

Approaches

7.1. Anticipate and manage conflict from increasing populations and range expansions
7.2. Manage conflict associated with societal adaptations to climate change (coastline hardening, land-use changes, etc.)
7.3. Reduce or limit access to sensitive habitats or environments
7.4. Reduce or remove human disturbance stress during sensitive time periods
7.5. Implement nonlethal behavioral control methods (barriers and deterrents)

Adaptation Strategies for Habitat Management

8. Restore, and maintain sources of food, water, and cover as components of habitat.

Approaches

8.1. Manage for plant species diversity and complexity
8.2. Promote plant genetic diversity
8.3. Prioritize native vegetation and suitable site conditions for habitat management and restoration
8.4. Manage and create suitable microhabitats and microclimates
8.5. Enhance primary food sources for specialist climate-sensitive species
8.6. Provide supplemental food sources
8.7. Create or maintain replicated sources of food, water, and cover in a variety of locations across the landscape
8.8. Maintain or mimic natural disturbance regimes to enhance habitat quality

9. Adjust management of food, water, and cover to align with expected future conditions.

Approaches

9.1. Use non-local, future-adapted genotypes in habitat management
9.2. Create new sources of food, water, and cover in anticipation of future conditions
9.3. Accommodate altered hydrology, accounting for periods of high water and low water availability
9.4. Manage for sources of food, water, and cover across the annual cycle and different life stages in response to changing phenology
9.5. Establish or redesign infrastructure to protect habitat from anticipated climate impacts

10. Establish and enhance protected areas or habitat reserves

Approaches

10.1. Create large, intact, or aggregated protected areas
10.2. Increase the number of small protected areas
10.3. Increase representation and replication of protected species and habitats
10.4. Select reserves that maximize biodiversity protection for a suite of species
10.5. Orient suites of protected areas in ways that span gradients in climate
10.6. Create protected areas that maximize topographic and geologic variety
10.7. Protect areas at high risk of change due to climate or land use change
10.8. Protect climate refugia across the landscape
10.9. Protect sites that are expected to provide future suitable habitat
10.10. Protect stepping stones, adjacent reserves, and corridors
10.11. Create temporary or dynamic reserves
10.12. Protect habitat across the annual cycle and life stages
10.13. Protect current safe havens for climate vulnerable populations to ensure those populations are available for future conservation efforts
10.14. Protect sufficient habitat for viable populations to be self-sustaining and of sufficient quality to create surplus dispersers

11. Promote wildlife habitat conservation on lands outside of protected areas

Approaches

11.1. Identify and restore degraded landscapes with high potential habitat quality
11.2. Reduce or limit barriers to wildlife movement across private land
11.3. Manage private lands near and between protected lands (buffer zones)
11.4. Enhance green infrastructure in urban or developed landscapes

11.5. Manage public or private agricultural land to provide compatible wildlife use
11.6. Manage forest structure to provide compatible wildlife use

Additional Adaptation Strategies

12. Intentionally choose to take no action

Approaches

12.1. Take no action in some situations as part of an overall triage strategy
12.2. Designate "no action" areas as a control to compare with management interventions
12.3. Allow for autonomous adaptation, or unassisted adaptation to climate change

13. Engage human communities in wildlife conservation

Approaches

13.1. Develop outreach and technical assistance programs for the public
13.2. Provide access for wildlife-dependent recreation
13.3. Increase local community involvement in wildlife management
13.4. Promote community-managed conservation lands
13.5. Respect and incorporate landscape values of indigenous communities in management decisions
13.6. Pay for ecosystem services or provide subsidies for income losses
13.7. Coordinate across landowners and scales to make sure programs are complementary
13.8. Promote sustainable urbanization