

# Menu of Adaptation Strategies and Approaches

## Developed for California Forest Ecosystems

### Strategy 1: Sustain fundamental ecological functions.

- 1.1. Reduce impacts to soils and nutrient cycling.
- 1.2. Maintain or restore hydrology.
- 1.3. Maintain or restore functional riparian systems.
- 1.4. Reduce vegetation competition for moisture, nutrients, and light.

### Strategy 2: Reduce the establishment, spread, and impact of biological stressors.

- 2.1. Maintain or improve the ability of forests to resist pathogens and insect pests.
- 2.2. Minimize the risk of the introduction and establishment of invasive plants and remove existing invasive species.
- 2.3. Manage herbivory to promote regeneration of desired species.

### Strategy 3: Reduce the risk and long-term impacts of severe disturbances.

- 3.1. Alter forest structure and or composition to reduce risk or severity of wildfire.
- 3.2. Establish and maintain fuelbreaks to minimize the risk of uncharacteristic, high-severity fire.
- 3.3. Alter forest structure to reduce severity or extent of extreme weather events.
- 3.4. Promptly revegetate after disturbance.

### Strategy 4: Maintain or create refugia.

- 4.1. Prioritize and maintain unique sites.
- 4.2. Prioritize and maintain sensitive or at-risk species or communities.
- 4.3. Establish artificial reserves for at-risk and displaced species.

### Strategy 5: Maintain and enhance species diversity and forest structural heterogeneity.

- 5.1. Promote forest age- and size-class diversity and spatial heterogeneity.
- 5.2. Maintain and restore diversity of native species.
- 5.3. Retain biological legacies.
- 5.4. Establish and protect reserves to maintain ecosystem diversity.

### Strategy 6: Maintain or increase ecosystem redundancy across the landscape.

- 6.1. Manage habitats over a range of sites and conditions.
- 6.2. Expand the boundaries of reserves to increase diversity.

### Strategy 7: Promote landscape connectivity.

- 7.1. Reduce landscape fragmentation.
- 7.2. Maintain and create landscape linkages through reforestation or restoration.

### Strategy 8: Maintain and enhance genetic diversity.

- 8.1. Use seeds, germplasm, and other genetic material from across a greater geographic range.
- 8.2. Favor existing genotypes that are better adapted to future conditions.

### Strategy 9: Facilitate ecological community adjustments through species transitions.

- 9.1. Favor or restore native species that are expected to be adapted to future conditions.
- 9.2. Establish or encourage new mixes of native species.
- 9.3. Guide changes in species composition at early stages of forest development.
- 9.4. Protect future-adapted seedlings and saplings.
- 9.5. Disfavor species that are distinctly maladapted.
- 9.6. Manage for species and genotypes with wide moisture and temperature tolerances.
- 9.7. Introduce species that are expected to be adapted to future conditions.
- 9.8. Move at-risk species to locations that are expected to provide sustainable habitat.

### Strategy 10: Realign ecosystems after disturbance.

- 10.1. Promptly revegetate sites after disturbance.
- 10.2. Allow for areas of natural regeneration to test for future-adapted species.
- 10.3. Realign significantly disrupted ecosystems to meet expected future conditions.

**MORE INFORMATION:** *This menu of adaptation strategies and approaches can be used within the Adaptation Workbook decision-support framework found in Swanson, C.W.; Janowiak, M.K.; Brandt, L. A.; Butler, P.R.; Handler, S. D.; Shannon, P.D.; Derby Lewis, A.; Hall, K.; Fahey, R.T.; Scott, L.; Kerber, A.; Miesbauer, J.W.; Darling, L.; Parker, L.; St. Pierre, M. 2016. **Forest adaptation resources: climate change tools and approaches for land managers, 2nd ed.** Gen. Tech. Rep. NRS-GTR-87-2. Newtown Square, PA: U.S. Department of Agriculture, Forest Service, Northern Research Station. 161 p. [doi.org/10.2737/NRS-GTR-87-2](https://doi.org/10.2737/NRS-GTR-87-2).*

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