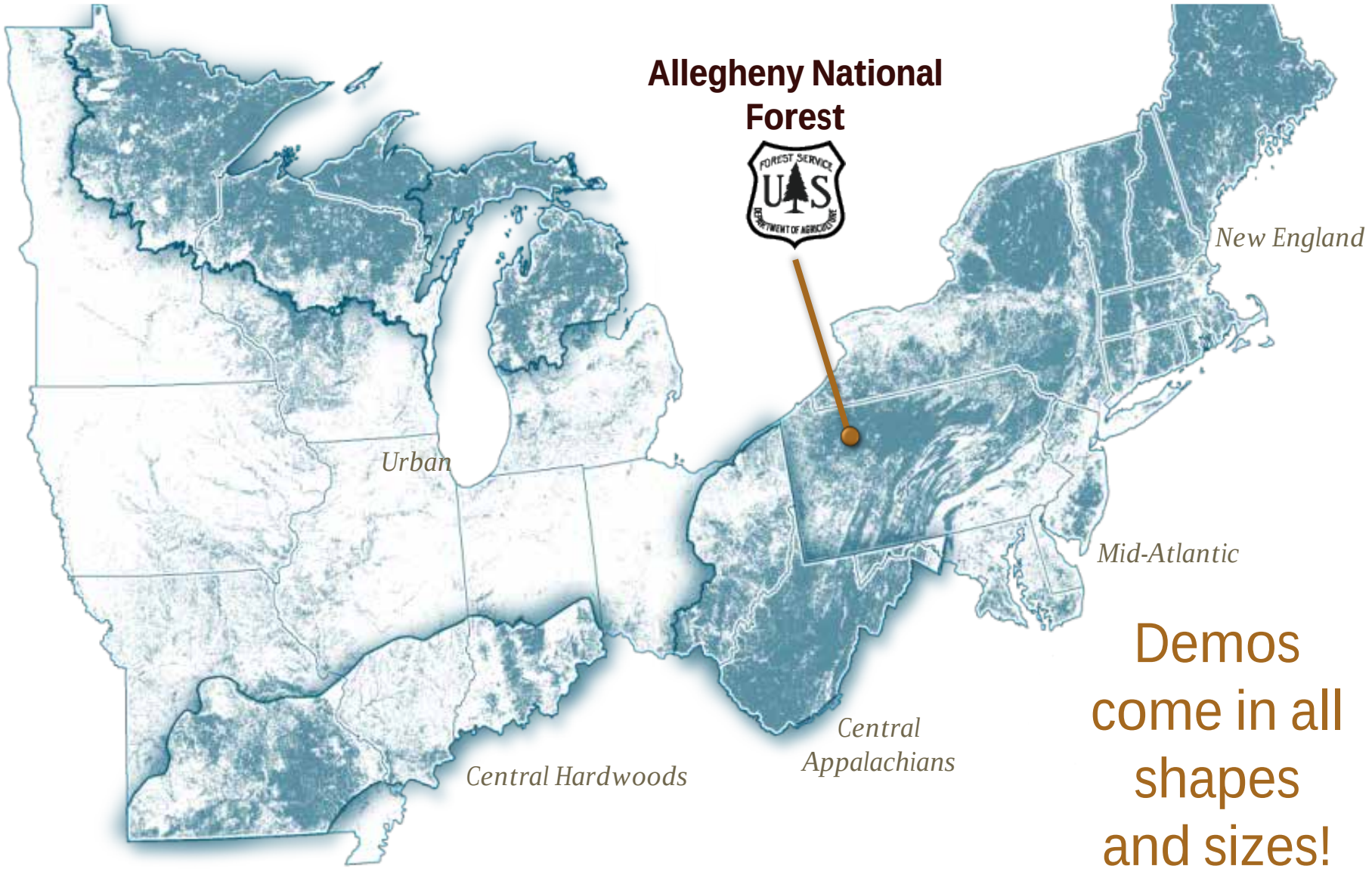
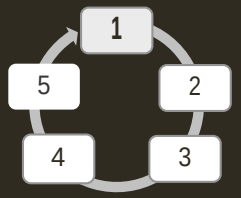
Adaptation Resources



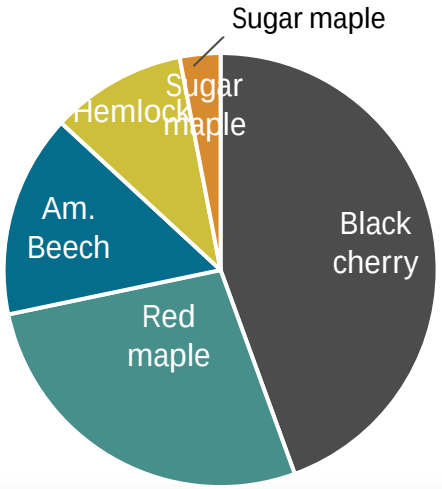
Demos come in all shapes and sizes!

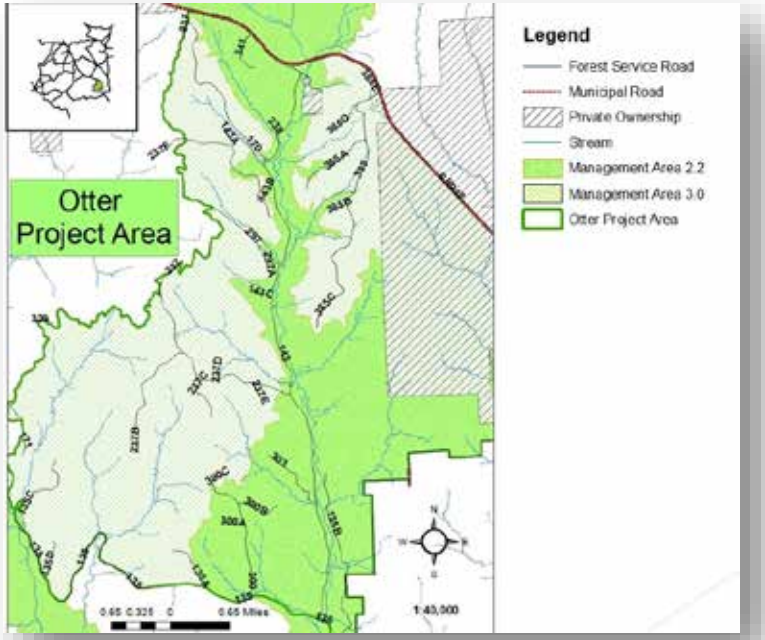


Step 1: DEFINE area of interest, management goals and objectives, and time frames.

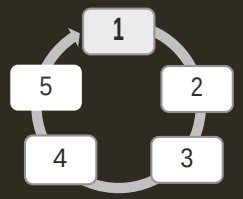
Allegheny National Forest: Otter Project

- Marienville Ranger District
- Treatment area = 1,633 acres
- Northern hardwoods 70+ years old
- Lacking early successional habitat





www.forestadaptation.org/otter



Step 1: DEFINE area of interest, management goals and objectives, and time frames.

Management Goals (Even-aged):

- provide a sustained yield of high-value species and high-quality timber products
- create a balanced forest age class distribution

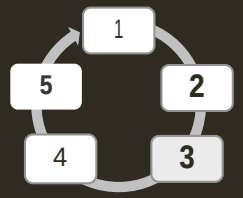
Management Goals (Uneven-aged):

- restore late structural forest conditions and emphasize sustaining forest structure and continuity
- respond to emerging issues and regenerate stands with a diversity of healthy tree seedlings

Step 2: ASSESS climate change impacts and vulnerabilities for the area of interest.

Climate Change & the Otter Project Area

- Invasive species expected to benefit: glossy buckthorn, stiltgrass, etc.
- Decline of hemlock (hwa and climate change) and northern hardwood spp.
- Insect pests (hwa, beech scale, black cherry scallop shell moth) may cause mortality in stressed trees
- Larger rain events = more flooding in riparian areas



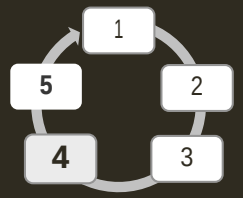
Step 3: EVALUATE management objectives given projected impacts and vulnerabilities.

Challenges

- Many species may lose some habitat suitability
- Hemlock woolly adelgid and leaf spot disease
- Stream shading declines with hemlock
- Wet soils may decrease time for harvest and operations

Opportunities

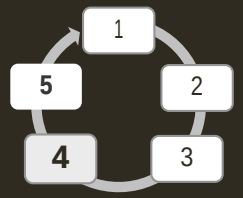
- Guiding regeneration now will increase forest health and vigor over time
- Loss of hemlock will create openings to promote a diversity of species
  - Thermal cover
  - Future adapted timber species



Step 4: IDENTIFY and adaptation approaches and tactics for implementation.

"MENU" OF ADAPTATION STRATEGIES

1. Sustain fundamental ecological functions.
2. Reduce existing biological stressors.
3. Reduce impacts of severe disturbances.
4. Maintain or create refugia.
5. Enhance species and structural diversity.
6. Promote ecosystem redundancy.
7. Increase landscape connectivity.
8. Enhance genetic diversity.
9. Facilitate species transitions.
10. Realign after disturbance.



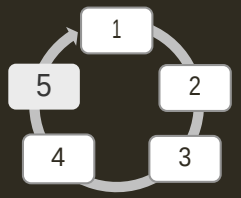
Step 4: IDENTIFY and adaptation approaches and tactics for implementation.

Adaptation Approaches

- Reduce impacts to soil and nutrient cycling à
- Maintain or restore hydrology à
- Maintain or restore riparian areas à
- Introduce species expected to be future-adapted à

Adaptation Tactics

- Apply lime in riparian zones
- Identify roads for decommission; storm-proof washout roads
- Plant white pine and identify add'l species to replace hemlock
- Plant scarlet oak, black oak, hickories, southern pines) to fill regen. gaps

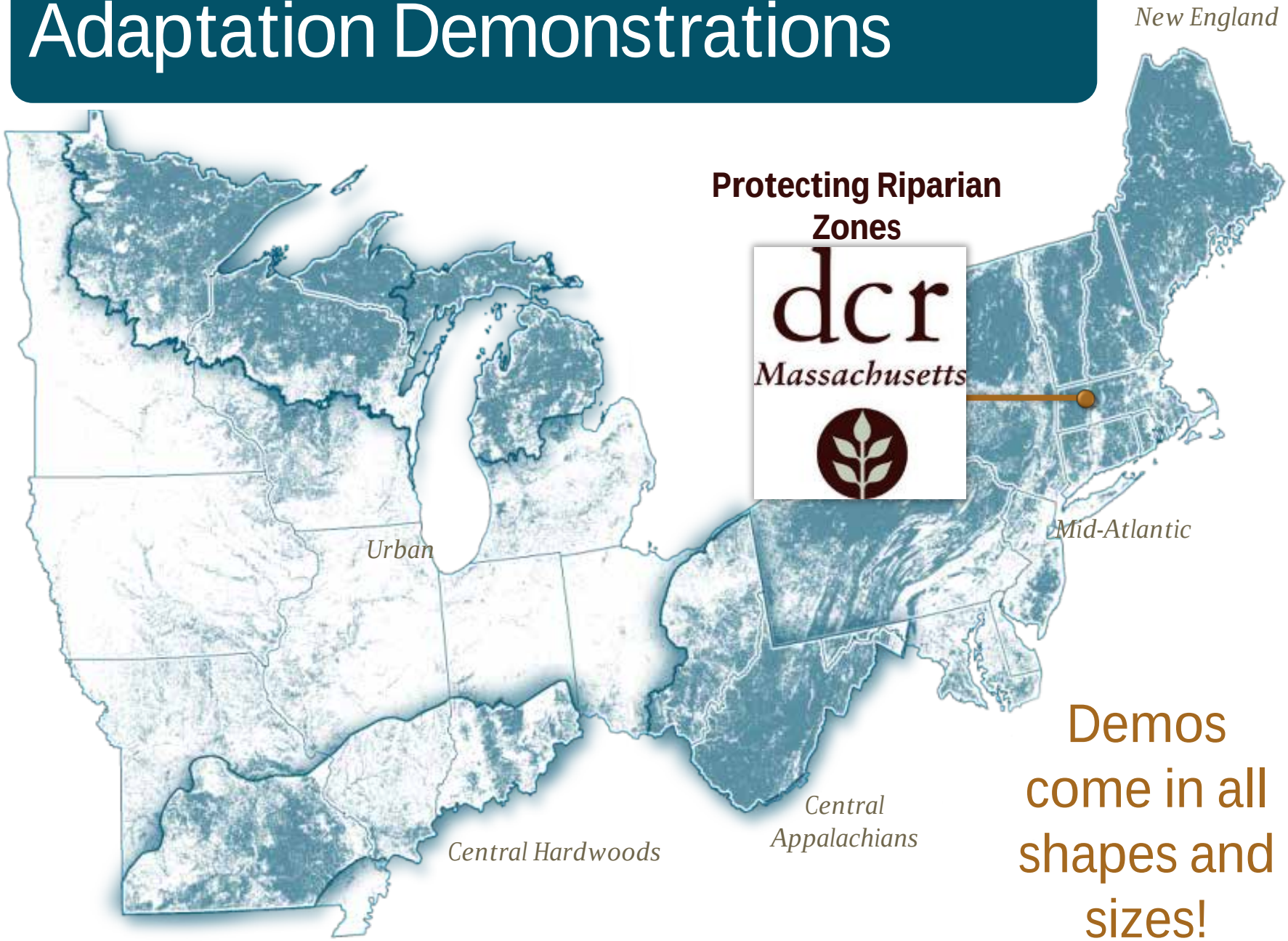


Step 5: MONITOR and evaluate effectiveness of implemented actions.

Monitor with intent to adjust future management:

- Seedling diversity and success
- Forest health threats such as hemlock mortality from hemlock wooly adelgid
- Density of large downed wood
- Stream temperature and water quality

Adaptation Demonstrations



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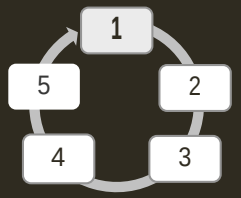
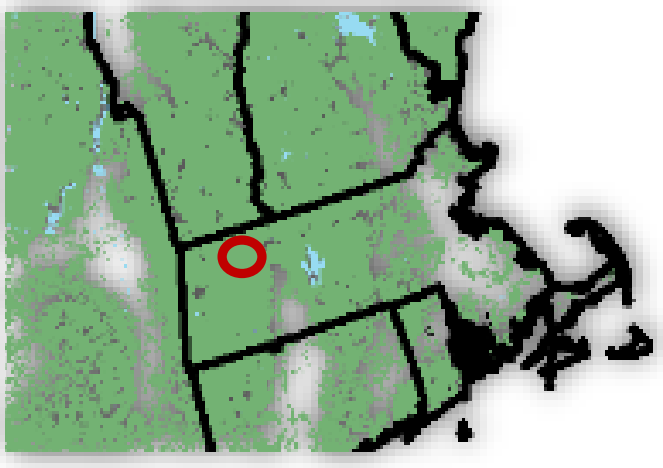
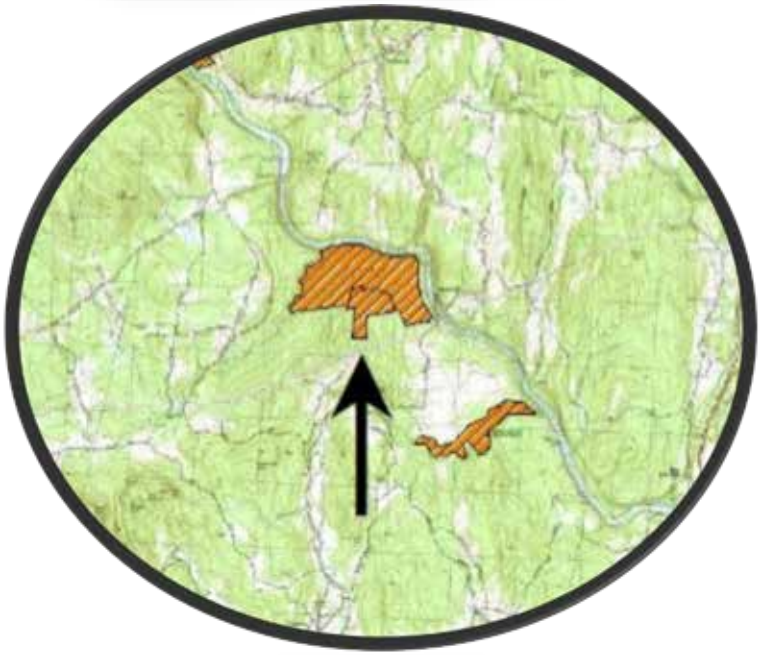


Step 1: DEFINE area of interest, management goals and objectives, and time frames.

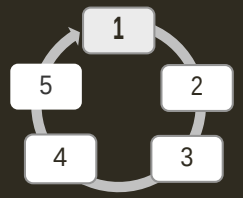
Massachusetts Dept. of Conservation & Recreation

- South River State Forest
- Sale area = 100 acres
- Former utility land managed for timber, fuelwood, and Christmas trees
- Plantations of white pine, red pine, and Norway spruce
- Hemlock and sugar maple-northern hardwood stands





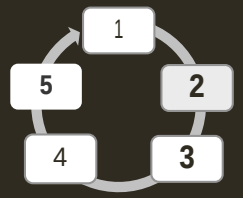
More information: https://forestadaptation.org/node/716



Step 1: DEFINE area of interest, management goals and objectives, and time frames.

General Management Goals:

- Update failing culverts; replace with bridges
- Restore stream habitat for aquatic species
- Improve riparian habitat and ecosystem

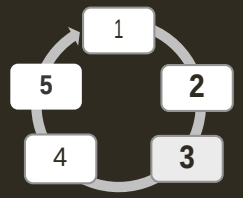


Step 2: ASSESS climate change impacts and vulnerabilities for the area of interest.

Climate Change & the South River SF

- Warmer temperatures, increased moisture deficit
- Potential increased runoff
- Variable precipitation events increase extremes of drought and bank full

Images: http://southriver.franklinsites.com/photosbardwell.php



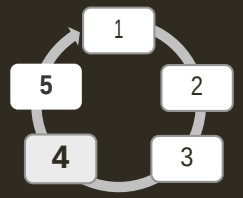
Step 3: EVALUATE management objectives given projected impacts and vulnerabilities.

Challenges

- Operating in wet conditions
- Hemlock woolly adelgid
- Canopy disturbance and understory management

Opportunities

- Guiding regeneration now will increase forest health and vigor over time
- Increase diversity of species



Step 4: IDENTIFY and adaptation approaches and tactics for implementation.

Adaptation Approaches

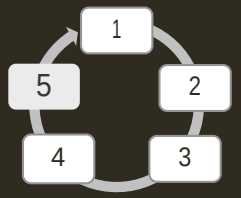
- Reduce competition for moisture, nutrients, and light
- Promote diverse age classes
- Restore a diversity of native species

à Adaptation Tactics

à
- Control invasive species with herbicides pre- and post-harvest

à
- Selectively remove hemlock and ash to make room for newbies

à
- Plant desired species, (oak, hickory, chestnut) expected to persist during future warming



Step 5: MONITOR and evaluate effectiveness of implemented actions.

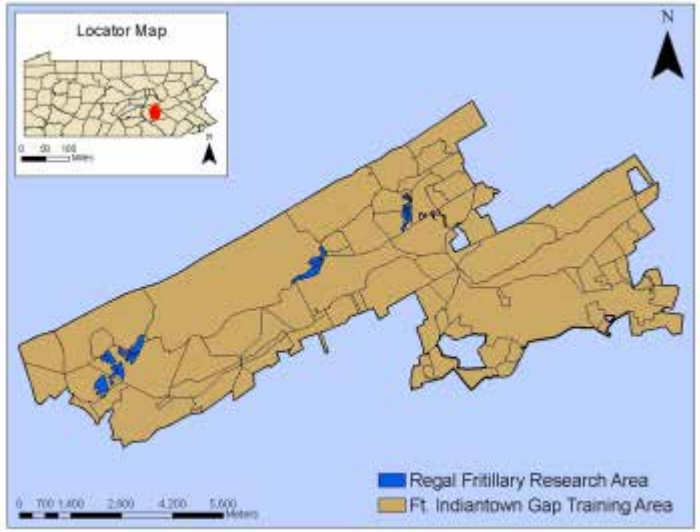
Monitor with intent to adjust future management:

- Stream bottom conditions
- Cost of replacing culverts with bridges
- Forest composition

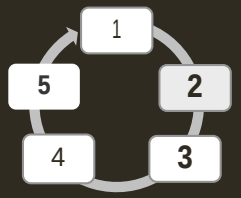
Step 1: DEFINE area of interest, management goals and objectives, and time frames.

Fort Indiantown Gap: National Guard Training Center

- 17,000 acres/200 for butterfly
- Warm season grasses
- Maintain a durable and safe training environment, while providing for the longevity of at-risk species
- Maintain the oak and native warm-season grass vegetation community that provides habitat for the regal fritillary butterfly
- Maintain or increase the density of plants that provide nectar or act as larval hosts
- Support migratory and breeding monarch butterflies by increasing the presence of milkweeds



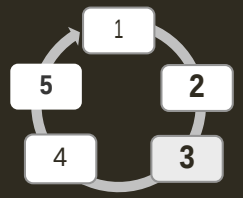
https://tinyurl.com/regalfrit



Step 2: ASSESS climate change impacts and vulnerabilities for the area of interest.

Climate Change & Fort Indiantown Gap

- Longer growing season
- Changes in phenology
- Increased potential for wildfire
- Increases in nonnative plant species



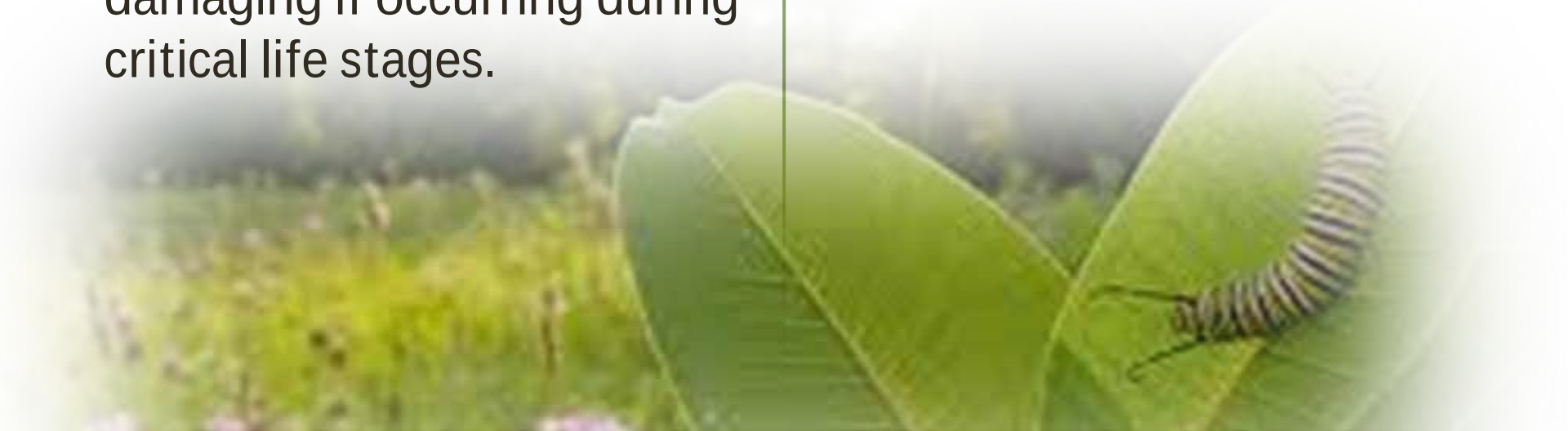
Step 3: EVALUATE management objectives given projected impacts and vulnerabilities.

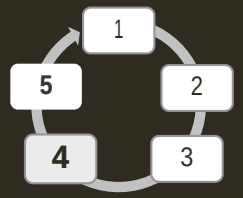
Challenges

- Mismatch in timing of regal fritillary and food (Viola sagittata).
- Increased risk of wildfire; fire can be a tool for sustaining butterfly habitat, but can be damaging if occurring during critical life stages.

Opportunities

- Disturbances (fire, etc.) are generally good for promoting butterfly habitat.
- Warm season grasses (butterfly habitat) may do well under future climates.





Step 4: IDENTIFY and adaptation approaches and tactics for implementation.

Adaptation Approaches

- Prioritize at-risk species à
- Manage habitats over a wide range of conditions à
- Maintain/create habitat corridors
- Promptly revegetate after fires à

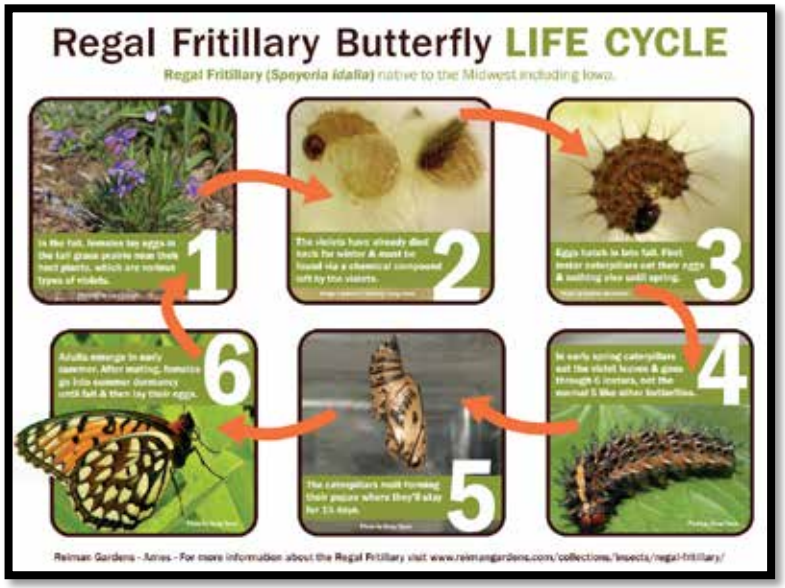
Adaptation Tactics

- Conduct prescribed burns to maintain current habitat
- Expand butterfly habitat by removing hardwood species and restoring warm season grasses
- Seed/plant corridors and post-burn areas with nectar plant species

Step 5: MONITOR and evaluate effectiveness of implemented actions.

Monitor with intent to adjust future management:

- Abundance and distribution of forb species in newly created habitat areas.
- Presence/absence of fritillary butterflies (larval and adult stages).
- Presence/absence of new violet species and whether or not caterpillars are using them.
- Military use of new habitat areas for training purposes.



MORE INFORMATION:
https://www.threeriversparks.org/natural_resources