



Photo by Randy Richard/Natural Lands



Photo by Natural Lands



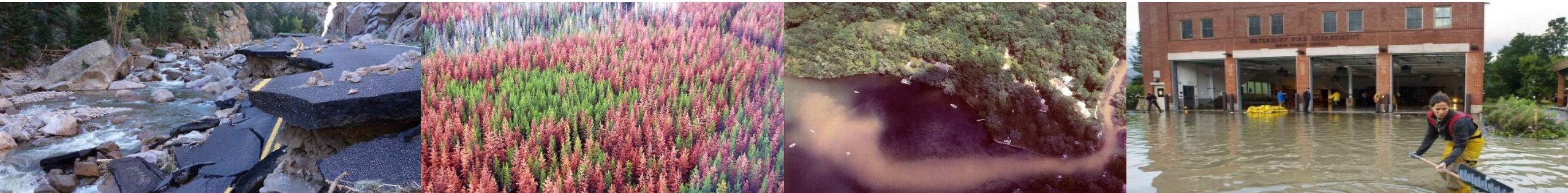
Identifying Climate-Informed Management Options

Introduction to Adaptation and Examples from the Field

Defining Adaptation



Climate change adaptation refers to adjustments in natural or human systems in response to changing climate conditions



Adaptation strategies are efforts to reduce the negative effects or take advantage of the opportunities provided by climate change

- How we prepare for and respond to changes that we are already experiencing or are likely to experience
- Can build on sustainable management, conservation, and restoration

Climate Change Adaptation



Photo by Natural Lands

~~What are all the changes
that will happen and how
can I respond?~~

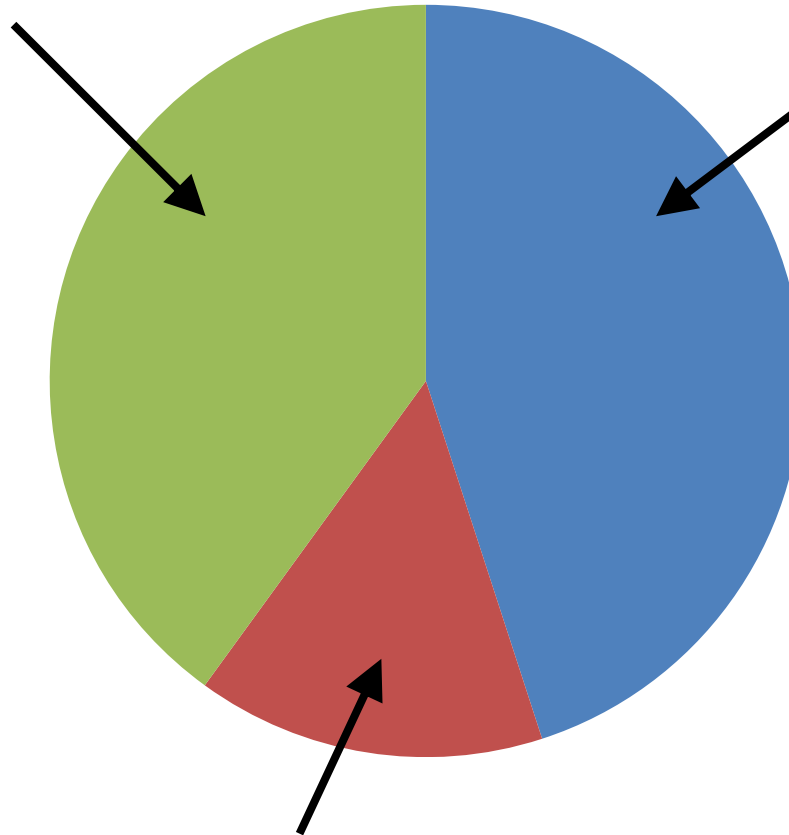
What do I do, and how
should I adjust that for the
reality of climate change?



Climate Change Adaptation

Current/same actions

Remove invasive plants
from intact remnant
habitats



Modifications to current actions

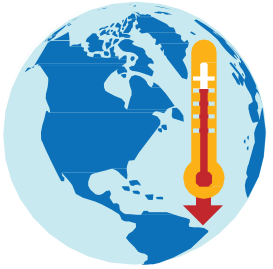
Plant and seed with native species
adapted to future conditions (e.g.,
drought-tolerant)

New/different actions

Actively transition habitat to new
ecological type (e.g., forest to shrubland)

Adaptation reflects the
intentional
consideration of climate
change...**but activities**
are not always different.

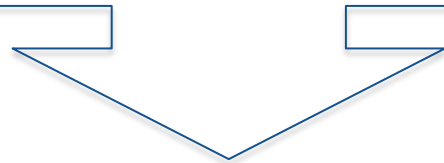
Applying Vulnerability Assessment Results



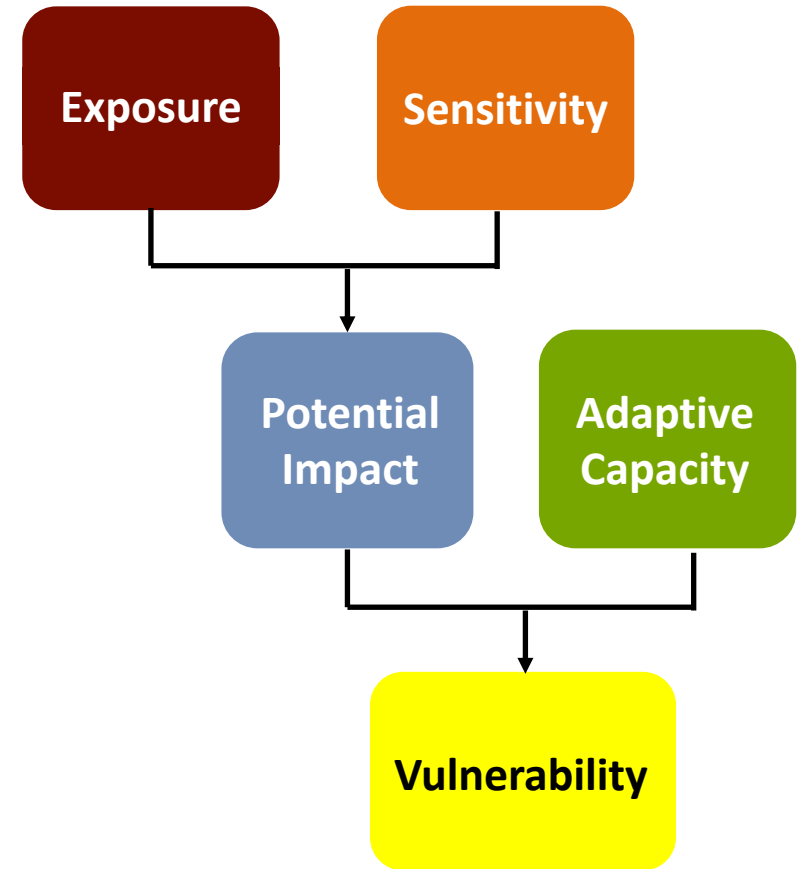
Reduce climate impacts
(sensitivity & exposure)



Increase climate resilience
(adaptive capacity)



Reduce climate change vulnerability



Applying Vulnerability Assessment Results



↓ Exposure

- Protect resources and infrastructure from flood damage
- Plant riparian vegetation to shade streams



↓ Sensitivity

- Plant drought-tolerant native species in an area projected to get drier
- Reduce pollutants that increase sensitivity to climate stressors



Applying Vulnerability Assessment Results



↑ Adaptive capacity

- Remove barriers to species movement/migration
- Adjust timing or route of access for recreation opportunities
- Develop genetic banks for species restoration



Adaptation Approaches



Resistance/Resilience

Focused on managing for persistence of existing ecosystems

Example: Prevent the spread of invasive species that may proliferate under future conditions



Acceptance

Focused on accommodating change in response to novel conditions

Example: Allow transition from one habitat type to another (e.g., grassland to forest) in response to changing climate conditions



Direct/Response

Focused on actively facilitating change/transformation in response to novel conditions

Example: Introduce species well-adapted to future conditions but not historically present on the site



Knowledge

Focused on gathering information about climate impacts and/or management effectiveness

Example: Expand research on silviculture techniques for drought- and heat-tolerant species



Collaboration

Focused on coordinating management efforts and/or capacity across organizations

Example: Develop and/or strengthen new and existing collaborative networks in order to leverage resources

Adaptation Strategies & Actions



Management Goal

How will climate change impact my ability to meet management goals?

ChesLen Preserve:

- Protect and enhance Unionville Barrens, Exceptional Value Streams, and passive recreation
- Protect and enhance forested habitat
- Protect and enhance wet meadow and wetland habitats
- Protect and enhance grassland habitat
- Manage for climate change

Bear Creek Preserve:

- Protect water quality by maintaining native habitats
- Manage meadow habitat to ensure temporary successional stage
- Improve forest health conditions
- Manage invasives
- Enhance and maintain wildlife habitat

Adaptation Strategies & Actions



Management Goal

How will climate change impact my ability to meet management goals?

Strategy

How can I reduce the impacts of climate change and/or increase resilience?

Adaptation Strategies & Actions



Management Goal

How will climate change impact my ability to meet management goals?

Strategy

How can I reduce the impacts of climate change and/or increase resilience?

Action

What action steps are required to carry out this strategy?

- Needs to be concrete and specific!
- Consider site conditions, spatial/temporal scale, resources required for successful implementation

Adaptation Strategies & Actions



Management Goal

*CURRENT GOAL:
Protect water
quality*

How will climate change impact my ability to meet management goals?

- Increased water temperature reduces dissolved oxygen, affecting aquatic vegetation and organisms
- More frequent and intense extreme precipitation events increase runoff into streams, carrying sediment, excess nutrients, and contaminants from surrounding upland areas
- Increased air temperatures and changes in precipitation patterns may affect the health and integrity of riparian vegetation, reducing its ability to intercept and filter precipitation and runoff

Adaptation Strategies & Actions



Management Goal

CURRENT GOAL: Protect water quality

Strategy

How can I reduce the impacts of climate change and/or increase resilience?

- Restore degraded riparian vegetation

Adaptation Strategies & Actions



Management Goal

CURRENT GOAL: Protect water quality

Strategy

STRATEGY: Restore degraded riparian vegetation

Action

- Plant native riparian trees and shrubs that are well-adapted to future conditions (e.g., silver maple, sycamore)
- Water plantings as necessary to ensure establishment and survival



Key Considerations for Adaptation

Balance

- Aim for a balanced portfolio of approaches with short-, medium-, and long-term time frames

Collaboration

- Work with traditional and non-traditional partners to develop and implement solutions

Spatial Context

- Pay attention to potential benefits and/or unintended consequences on other sectors

Flexibility

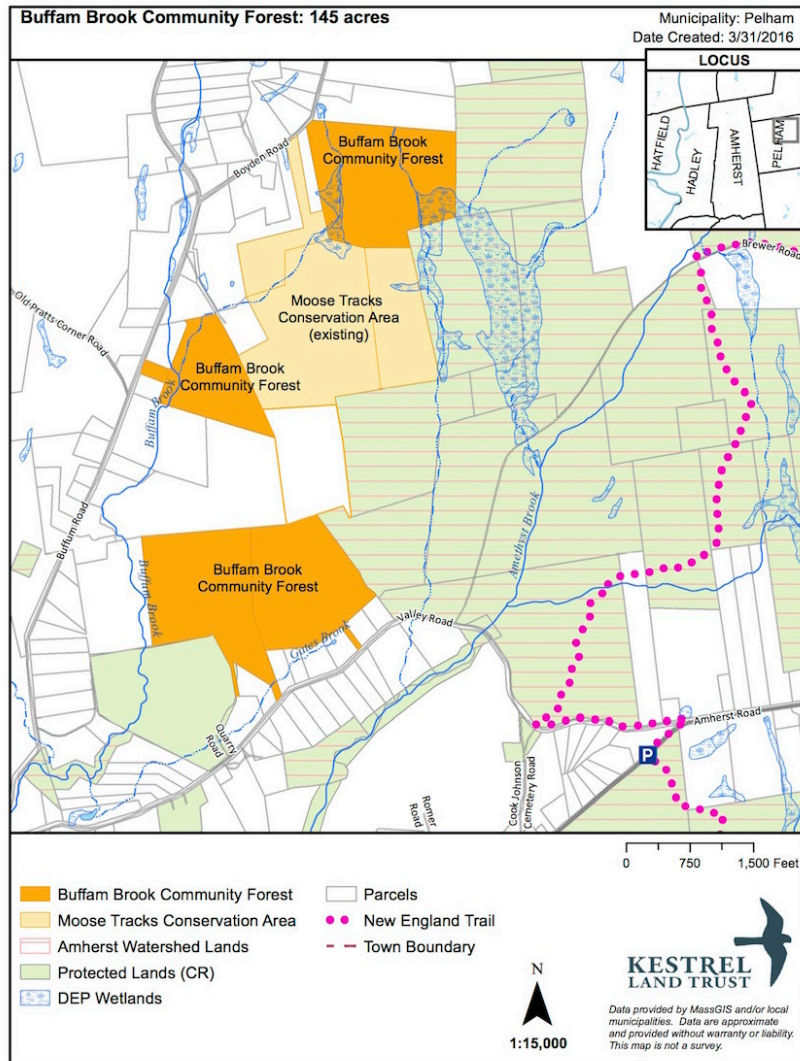
- Embrace flexibility to make changes as needed – important to MONITOR adaptation outcomes

Creativity

- Think outside the box!



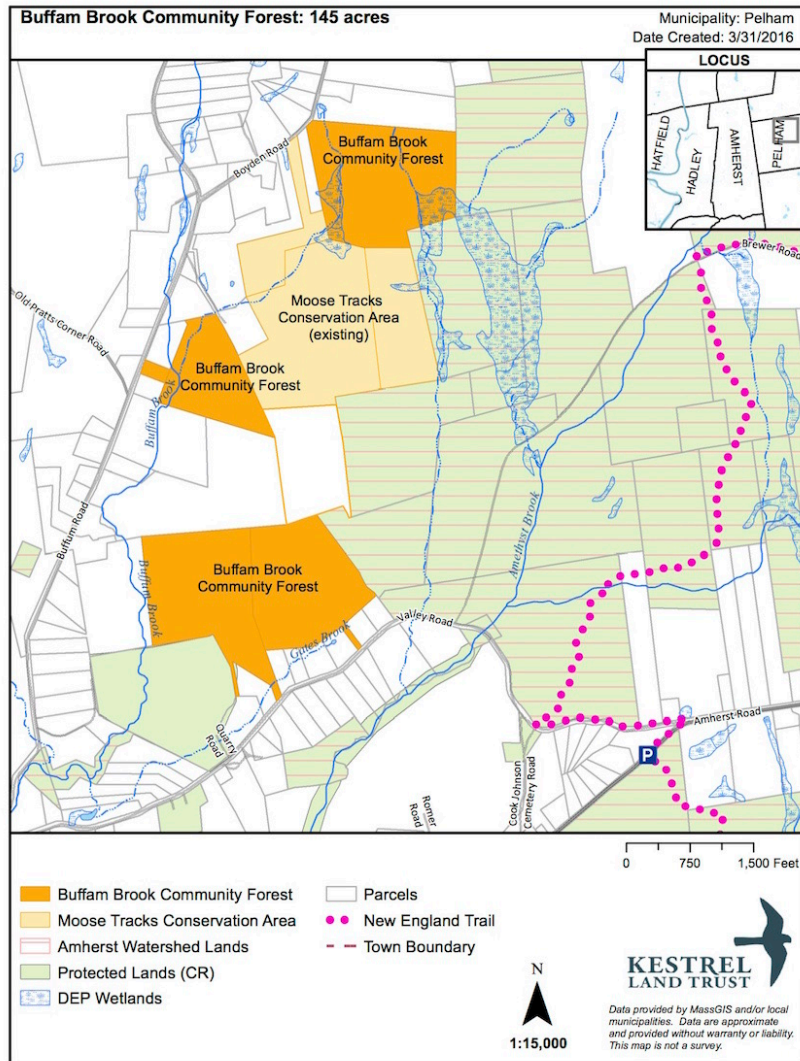
Case Study: Buffam Brook Community Forest



- Acquisition of 161 acres of land in Pelham, MA for use as a community forest
- Partnership between the Kestrel Land Trust and the Pelham Conservation Commission
- Will serve as a demonstration forest for the climate adaptation benefits of sustainable forestry techniques

<https://forestadaptation.org/adapt/demonstration-projects/kestrel-land-trust-buffam-brook-community-forest>

Case Study: Buffam Brook Community Forest



- Used MA-based webtool (Conservation Analysis Priority System) to determine that the area represents high-quality habitat capable of supporting biodiversity as the climate changes
- Used the NIACS Adaptation Workbook to assess climate change vulnerability and develop management options
- Developed a forest stewardship plan that explicitly incorporates climate change



Case Study: Buffam Brook Community Forest

2017 Buffam Brook Community Forest Stewardship Plan

Forest History

or dwelled on here, but do need to be mentioned. Now, adding to this, we are faced with uncertain but potentially harmful changes in the **climate** that could cause, for example, greater periods of drought triggered by unprecedented rain patterns or warmer winters that trigger a different type of drought stress, ill-timed patterns of leafing and flowering, greater survival of overwintering pests, etc. But we don't really know what will happen.

Forest Health

populations. Taken together, this is a very troubling set of factors. When you add to this projected changes in climate which, it is said, may bring with them a number of harmful effects such as an increase drought, harmful timings of spring frosts, more favorable temperatures for overwintering pests, etc., it is difficult to maintain a rosy attitude. But an awareness of these threats can help motivate actions that can be beneficial to the overall condition of the forest during our watch.

Climate Adaptation

The Buffam Brook Community Forest has several features that may enhance its ability to adapt to a changing climate, including a diverse mix of tree species and relatively low levels of stress from insect pests, diseases, and invasive plant species. Forest management activities can be used to respond to



Case Study: Trabuco Creek Restoration Project



- Project in Cleveland National Forest focused on improving stream and riparian habitat quality, function, and connectivity
- Primary activities included adding channel complexity, removing invasive plants, and removing barriers to fish passage
- Purpose was to re-evaluate project goals and activities in light of climate impacts and vulnerabilities to determine if planned activities help reduce impacts and identify additional activities that could also help minimize vulnerabilities



Case Study: Trabuco Creek Restoration Project



STEP 1. IDENTIFY CLIMATE + NON-CLIMATE IMPACTS

- Flooding, drought, invasive plants, recreation

STEP 2. DETERMINE WHETHER PLANNED ACTIONS COULD REDUCE IMPACTS

- ACTION: Add channel complexity
 - ✓ Slows floodwaters to minimize erosion
 - ✓ Increases water availability by creating pools

Case Study: Trabuco Creek Restoration Project



STEP 2 (CON'T). DETERMINE WHETHER PLANNED ACTIONS COULD REDUCE IMPACTS

- ACTION: Remove invasive vegetation
 - ✓ Increases habitat quality and functioning
 - ✓ Reduces erosion risk
- ACTION: Remove barriers to fish passage
 - ✓ Allow movement in response to changing conditions (e.g., access to thermal refugia)



Case Study: Trabuco Creek Restoration Project



STEP 3. IDENTIFY ADDITIONAL ACTIVITIES

- ACTION: Manage recreation in sensitive areas
 - ✓ Maintains habitat quality and functioning
 - ✓ Reduces erosion risk
- ACTION: Build a system water budget to better manage water and multiple uses
 - ✓ Increases habitat availability and connectivity and maintains water availability

<https://www.cakex.org/case-studies/trabuco-creek-watershed-improvement-project-southern-california-climate-change-adaptation-case-study>

Questions?

