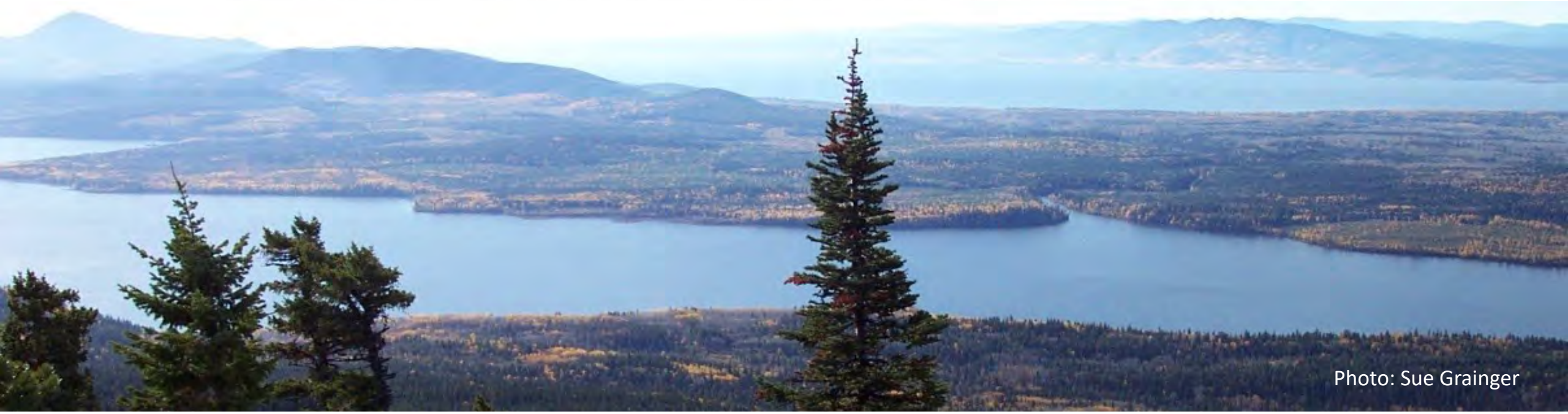
Sub-Boreal Spruce Climate Change Adaptation Workshop



Adaptive Silviculture for Climate Change (ASCC)
at the John Prince Research Forest

June 2, 2021

John Prince Research Forest · Tl'azt'en Nation · UNBC

Natural Resources Canada / Ressources naturelles Canada
Canada

UNBC University of Northern British Columbia

ASCC
Adaptive Silviculture for Climate Change

NAU Northern Arizona University

Forest and Rangeland Stewardship
Colorado State University

NIACS
Northern Institute of Applied Climate Science

Welcome & Land Acknowledgement

Photo: Sue Grainger

Workshop Overview

- **9:00 Introductions and Climate Adaptation Workshop Overview**
  - **Introduction & Welcome** – Kathy Lewis (Acting Vice-President, Research UNBC)
  - **Workshop Background & Purpose** – Ché Elkin (University of Northern British Columbia), Sue Grainger (John Prince Research Forest), & Kristen Waring (Northern Arizona University)
  - **Land Acknowledgement** – Sue Grainger (John Prince Research Forest)
- **9:15 Overview of Federal/Provincial Climate Adaptation Initiatives** – Jason Edwards (NRCan) & Pamela Dyktra (BC Ministry)
- **9:30 Overview of Ecology & Forest Management of Sub-boreal Spruce Forests** – Ché Elkin (UNBC)
- **9:50** Break
- **10:00 Climate Change in Fort St. James** – Vanessa Foord (BC Ministry)
- **10:20 Ecosystem Vulnerabilities of Sub-Boreal Spruce Forests to Climate Change** – Elizabeth Campbell (NRCan) & Colin Mahony (BC Ministry)
- **10:40 Potential Changes to Ecosystem Services Under Climate Change** – Alicia Azpeleta Tarancon (SWCASC/NAU)
- **11:00 Climate Change Considerations for Silvicultural Decision-Making** – Linda Nagel (CSU) & Courtney Peterson (CSU)
- **11:45 Lunch on your own**
- **12:45 Overview of Adaptation and Mitigation** – Linda Nagel (CSU) & Courtney Peterson (CSU)
- **1:05 Breakout Exercise: Developing Adaptation Approaches & Tactics**
- **1:50 Break**
- **2:00 Tell Your Adaptation Story**
- **3:00 Discussion & Next Steps**
- **3:30 Adjourn**

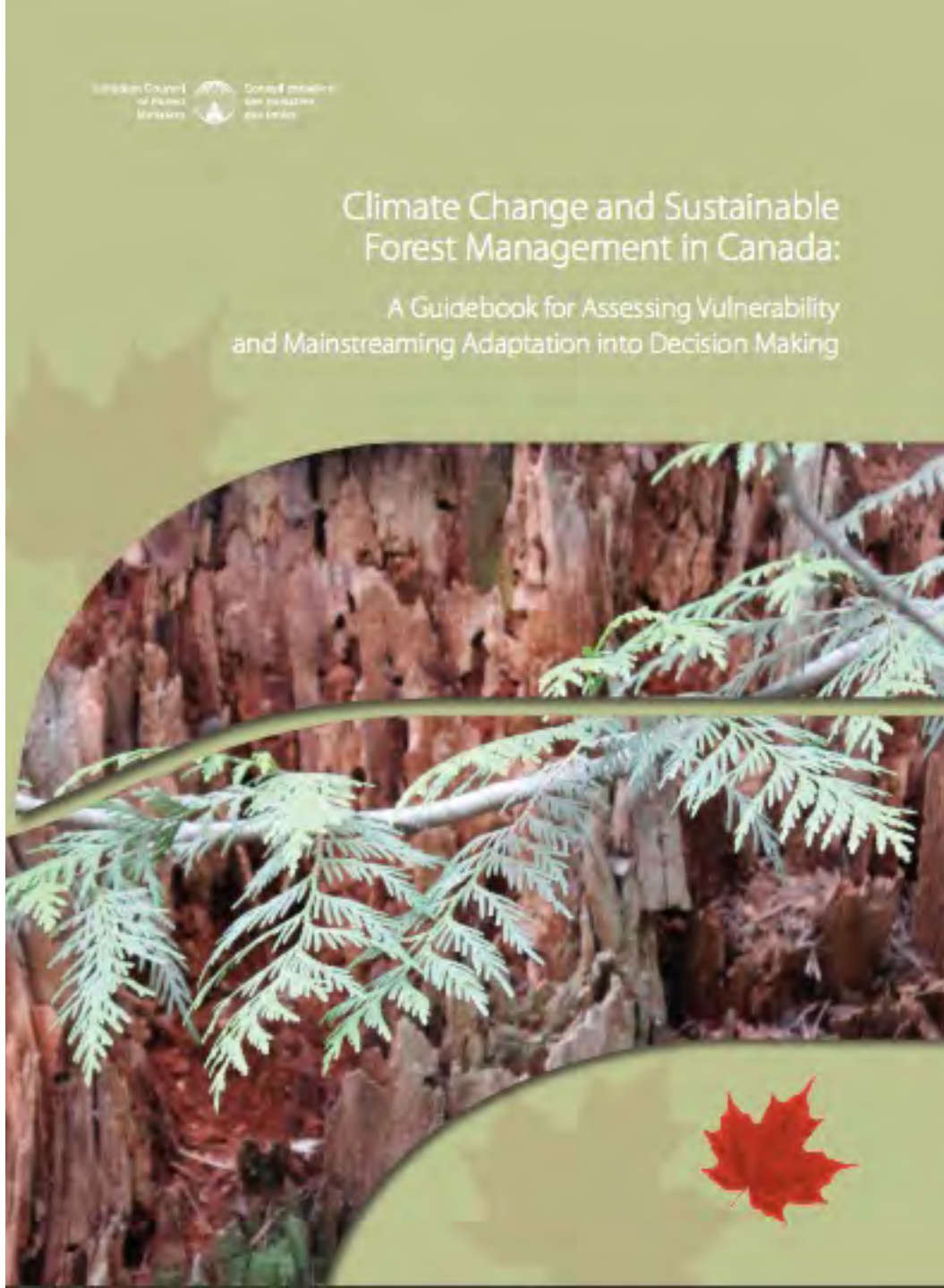
Introductions

- Where are you joining us from today?
- What is one thing you are hoping to get out of this climate adaptation workshop today?

Go to www.menti.com and use the code 2904 9058 or use https://www.menti.com/g2gfjro9vg

Overview of Federal/Provincial Climate Adaptation Initiatives

Jason Edwards (Canadian Forest Service) &
Pamela Dykstra (BC Ministry of Forests, Lands, Natural Resource Operations and Rural Development)



Workshop Goals

- Provide hands-on training in considering climate change information and identifying adaptation actions for sub-boreal spruce forest ecosystems;
- Engage natural resource managers, First Nations, and community partners in conceptual tools and approaches that help integrate climate change into on-the-ground planning and decision-making processes for managing sub-boreal spruce forest ecosystems.

Photo: Sue Grainger

Workshop Guidelines

- Focus on what matters
- Contribute your thinking and experience
- Listen to understand
- Connect ideas
- Listen together for patterns, insights and deeper questions
- Honor everyone’s time
- Be present - mentally and physically
- Equal airtime - all participate, no one dominate
- We are recording the workshop

Virtual Workshop Expectations

Please mute if not speaking

Add name and organization to Zoom info and pronouns if desired

If you need to turn off video, that is fine, please participate

Speak up, Raise hand and use chat functions

In small groups, create and maintain expectations

Activity: Climate Change Considerations for Silvicultural Decision-Making

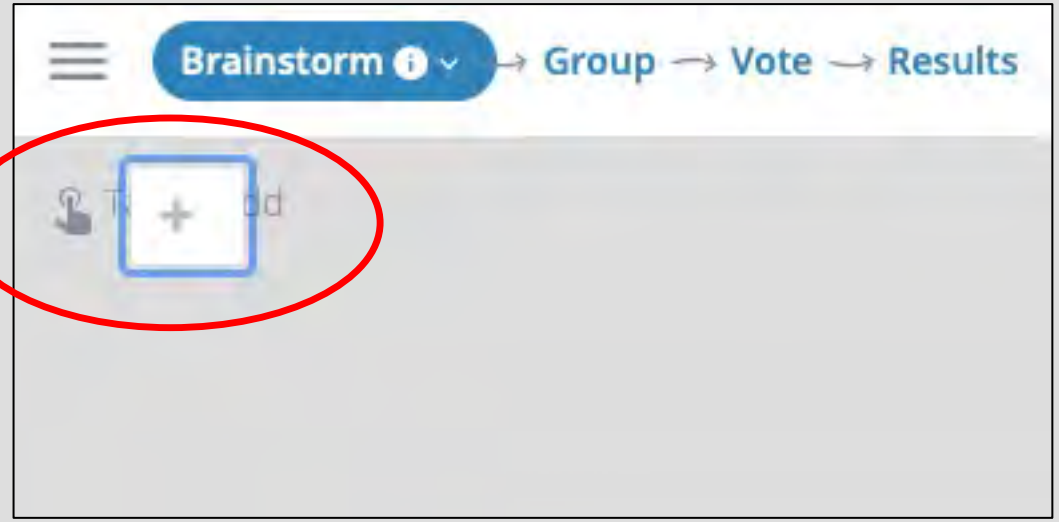
What new or different considerations do we need to think about when managing forests in the face of climate change?

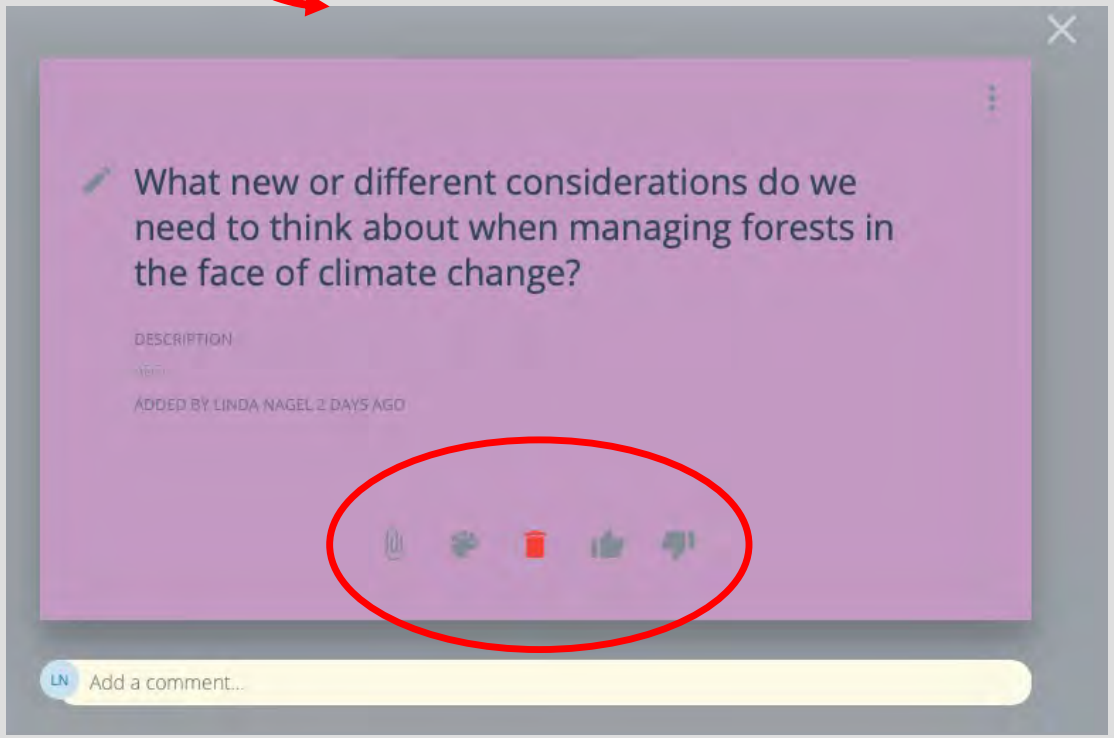
GroupMap!

Brainstorm → Group → Vote → Results Climate Change Impacts Brainstorming CHAT PARTICIPANTS 1/51 INVITE

Tap to add

What new or different considerations do we need to think about when managing forests in the face of climate change?





The Adaptive Silviculture for Climate Change (ASCC) Network

ASCC
Adaptive Silviculture for Climate Change

Linda Nagel
Professor & Department Head
Forest and Rangeland Stewardship Department
Colorado State University
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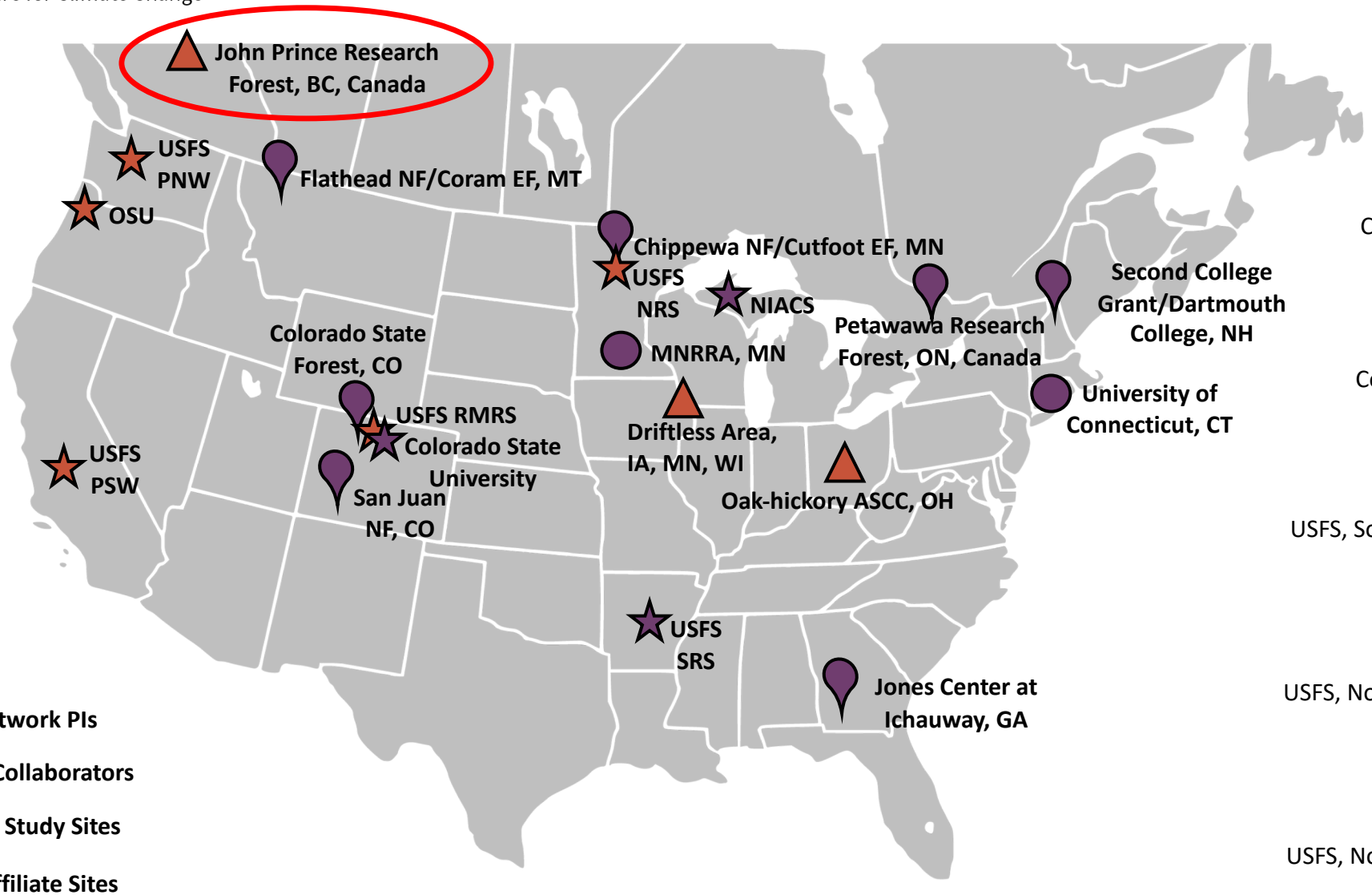
FOREST AND RANGELAND STEWARDSHIP
COLORADO STATE UNIVERSITY

NIACS
Northern Institute of Applied Climate Science

The University of Vermont
University of Minnesota
UCONN Natural Resources and the Environment
Dartmouth
Michigan Technological University
Forest Service U.S. Department of Agriculture
FOREST AND RANGELAND STEWARDSHIP
COLORADO STATE UNIVERSITY
NIACS
Northern Institute of Applied Climate Science
The Jones Center at Ichauway
Colorado State Forest Service
Natural Resources Canada / Ressources naturelles Canada
Mississippi Park Connection

Adaptive Silviculture for Climate Change Network

ASCC
Adaptive Silviculture for Climate Change



- ASCC Network PIs
- Science Collaborators
- Network Study Sites
- Urban Affiliate Sites
- Prospective Sites

Linda Nagel, Lead PI
Professor & Dept Head
Colorado State University

Courtney Peterson, ASCC Coordinator
Colorado State University
NIACS

Jim Guldin, Lead FS PI
USFS, Southern Research Station
**retired*

Chris Swanston, Co-PI
USFS, Northern Research Station
Director, NIACS

Maria Janowiak, Co-PI
USFS, Northern Research Station
Deputy Director, NIACS

ASCC Network Website: www.adaptivesilviculture.org

Adaptive Silviculture for Climate Change Network

Chippewa National Forest/Cutfoot Experimental Forest, MN

- Brian Palik, USFS Northern Research Station
- Tony D'Amato, University of Vermont

San Juan National Forest, CO

- Mike Battaglia, USFS Rocky Mountain Research Station
- Matt Tuten, San Juan National Forest

Second College Grant, NH

- Tony D'Amato, University of Vermont
- Chris Woodall, USFS Northern Research Station
- Kevin Evans, Dartmouth University

The Jones Center at Ichauway , GA

- Steven Brantley, The Jones Center at Ichauway
- Jeff Cannon, The Jones Center at Ichauway
- Andy Whelan, The Jones Center at Ichauway

Flathead National Forest/Coram Experimental Forest, MT

- Justin Crotteau, USFS Rocky Mountain Research Station
- Terrie Jain, USFS Rocky Mountain Research Station
- Amanda Rollwage, Flathead National Forest

Mississippi National River and Recreation Area, Saint Paul, MN

- Mary Hammes, Mississippi Park Connection
- Marcella Windmuller-Campione, University of Minnesota
- Leslie Brandt, USFS Northern Research Station

Petawawa Research Forest, ON, Canada

- Michael Hoepting, Natural Resources Canada
- Jeff Fera, Natural Resources Canada
- Trevor Jones, Natural Resources Canada

Southern New England Exurban Affiliate, CT

- Tom Worthley, University of Connecticut
- Bob Fahey, University of Connecticut
- Will Hochholzer, Mohegan State Forest
- Daniel Evans, Mohegan State Forest

Colorado State Forest, CO

- Mike Battaglia, USFS Rocky Mountain Research Station
- Blair Rynearson, Colorado State Forest Service
- Ethan Bucholz, Colorado State Forest Service

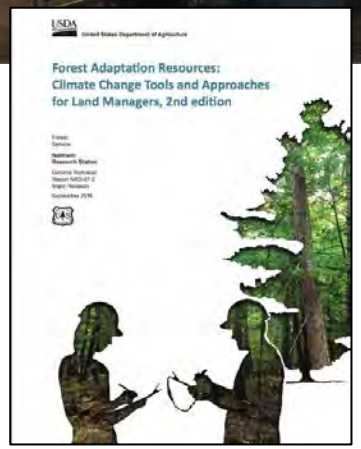
Adaptive Silviculture for Climate Change (ASCC) Network

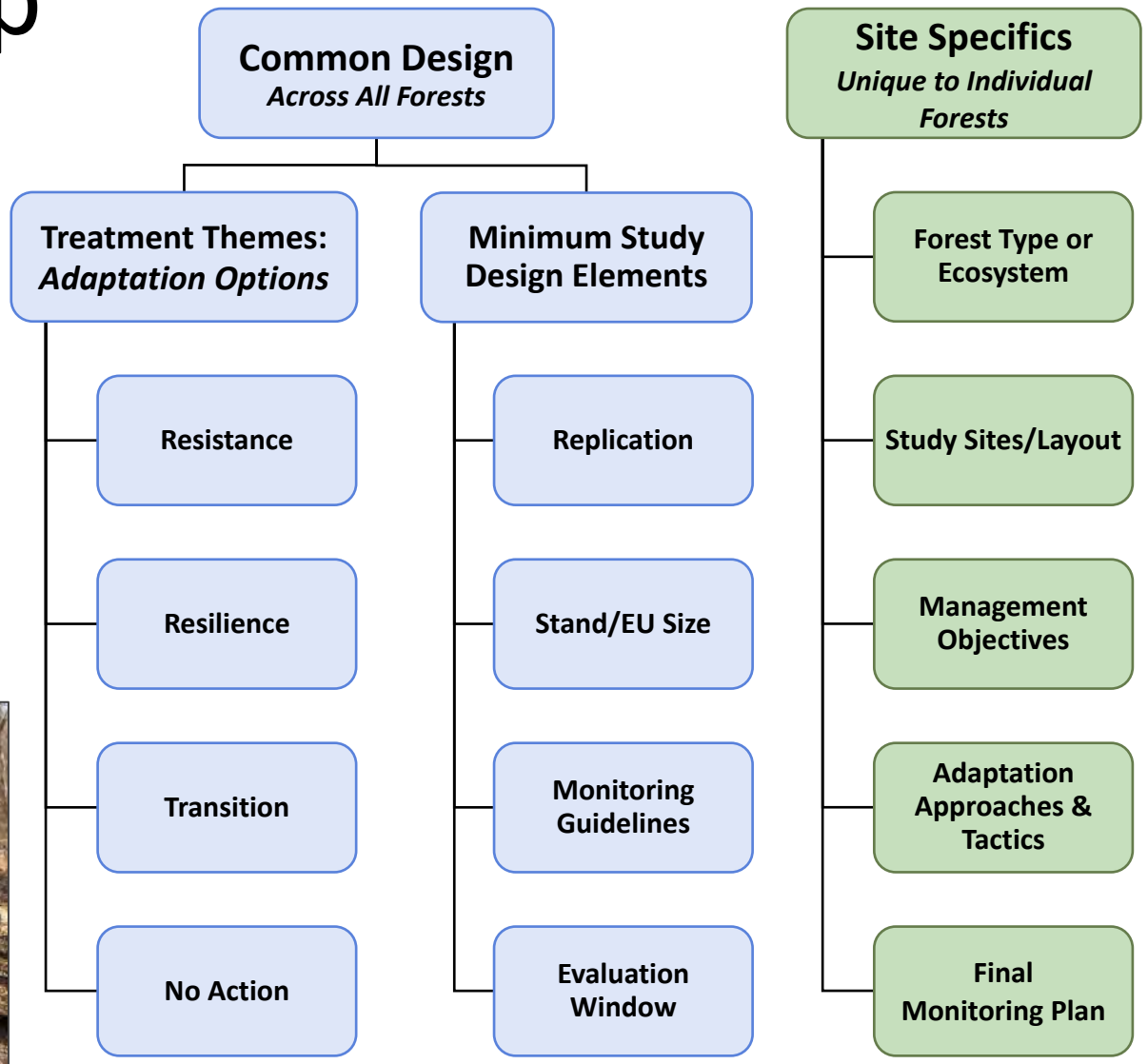
ASCC
Adaptive Silviculture for Climate Change

Project Goals:

1) Introduce managers to tools and approaches to integrate climate change into silvicultural decision making that meets management goals and objectives
2) Co-develop robust, operational examples of how to integrate climate change adaptation into silvicultural planning and on-the-ground actions to foster resilience to the impacts of climate change and enable adaptation to uncertain futures

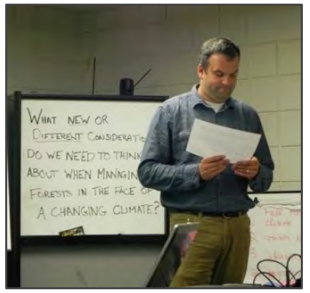
ASCC Study Design and Collaborative Workshop





Collaborative Workshop

Developing the Experimental Treatments



First workshop: MN, June 2013

Most recent workshop: CO, Dec 2020

For <u>each</u> experimental treatment (Resistance, Resilience, Transition):

DFC

↓

Management objectives

↓

Silvicultural practices (tactics)

What is the desired structure and function (*desired future condition*)?

<u>Keep in mind key variables/outcomes</u>:

- **Species composition**
- **Forest health**
- **Forest productivity**
- **Response to disturbance**

<u>For each silvicultural practice (tactic)</u>:

- **Timeframes**
- **Benefits**
- **Drawbacks and Barriers**
- **Practicality**

Identifying Adaptation Tactics

Forest Adaptation Resources: Climate Change Tools & Approaches for Land Managers

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

Vulnerability assessments, scientific literature, and other resources

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

Are desired future conditions reasonable given likely climate trajectories and impacts?

3. EVALUATE management objectives given projected impacts and vulnerabilities.

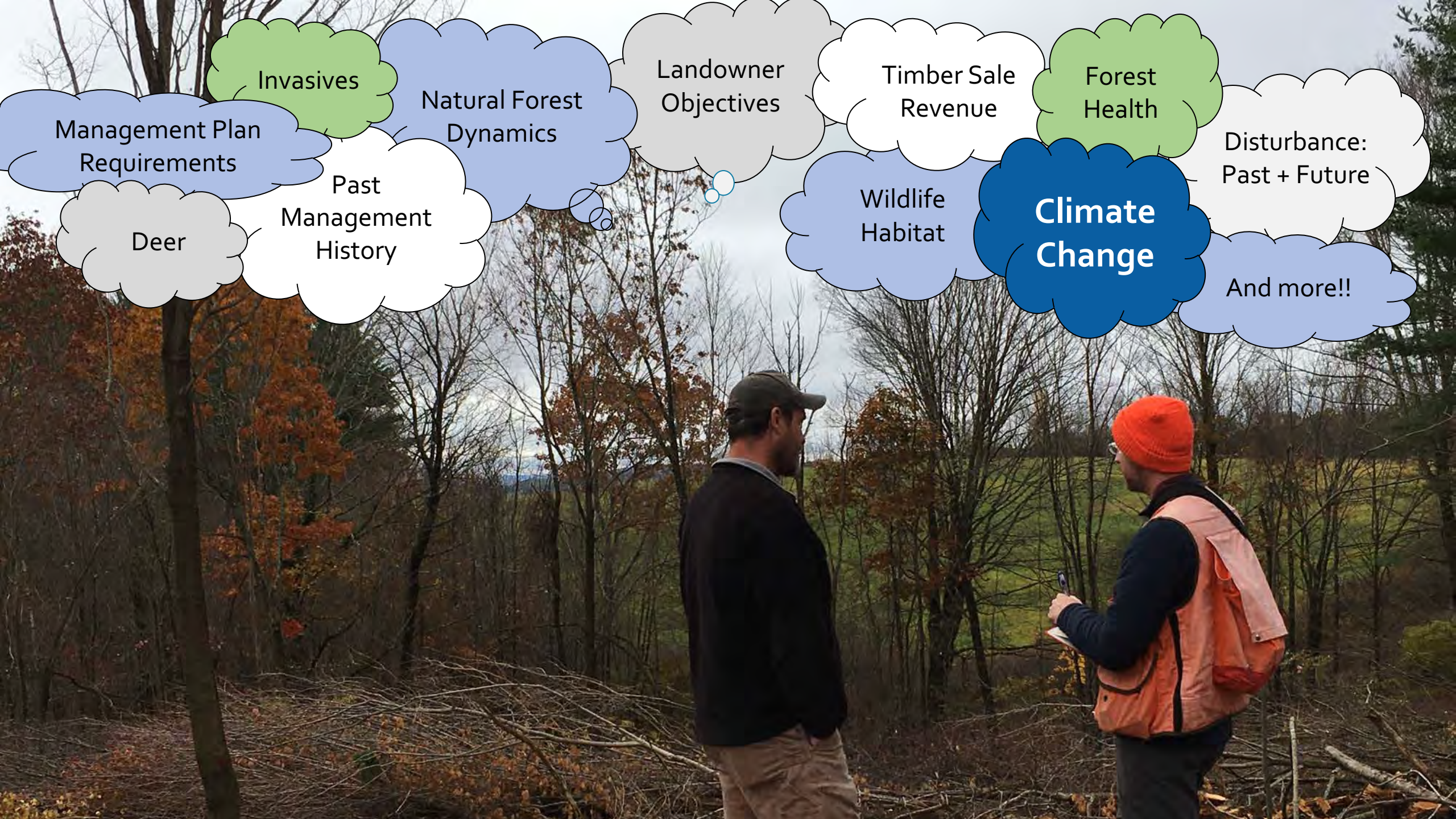
4. IDENTIFY and implement adaptation approaches and tactics.

Adaptation Strategies and Approaches

5. MONITOR and evaluate effectiveness of implemented actions.

Swanston et al. 2016 https://www.nrs.fs.fed.us/pubs/52760; Janowiak et al. 2014

Adapting to Climate Change


Invasives
Natural Forest Dynamics
Landowner Objectives
Timber Sale Revenue
Forest Health
Management Plan Requirements
Disturbance: Past + Future
Deer
Past Management History
Wildlife Habitat
Climate Change
And more!!

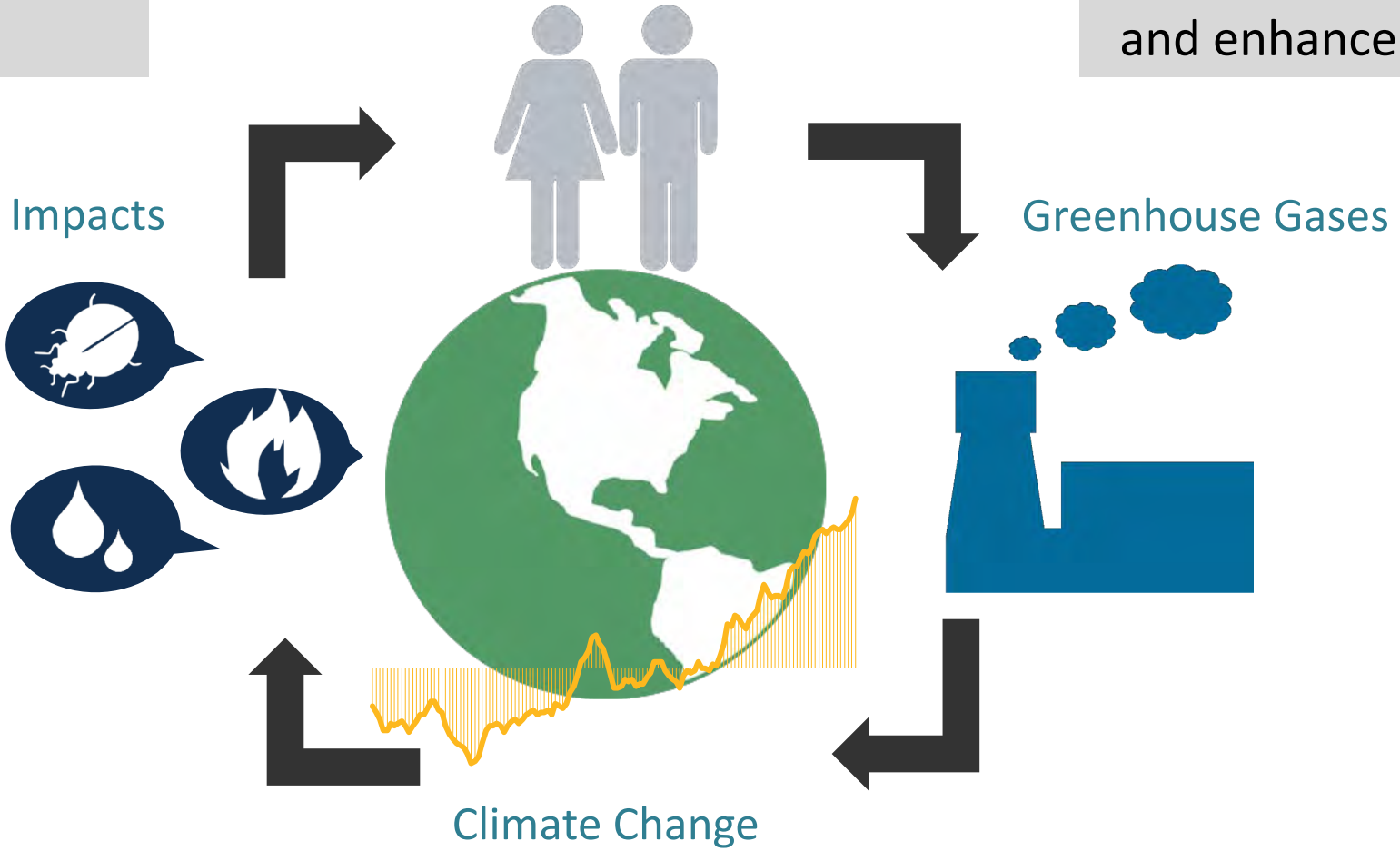
How can we respond to climate change?

Adaptation

Actions to reduce the vulnerability of systems to climate change effects.

Mitigation

Actions that reduce greenhouse gas emissions and enhance carbon sinks.



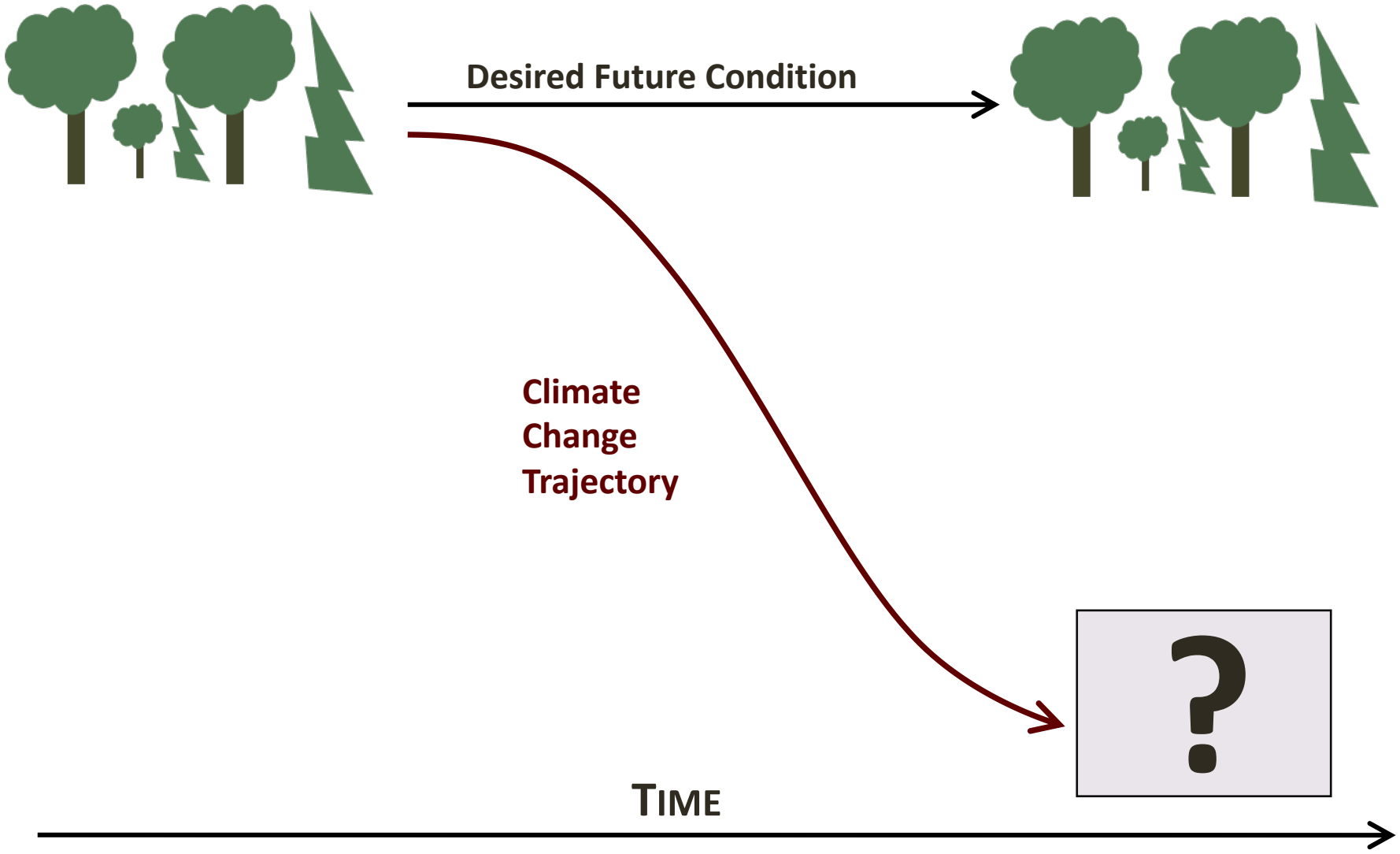
Adaptation - the adjustment of systems in response to climate change.

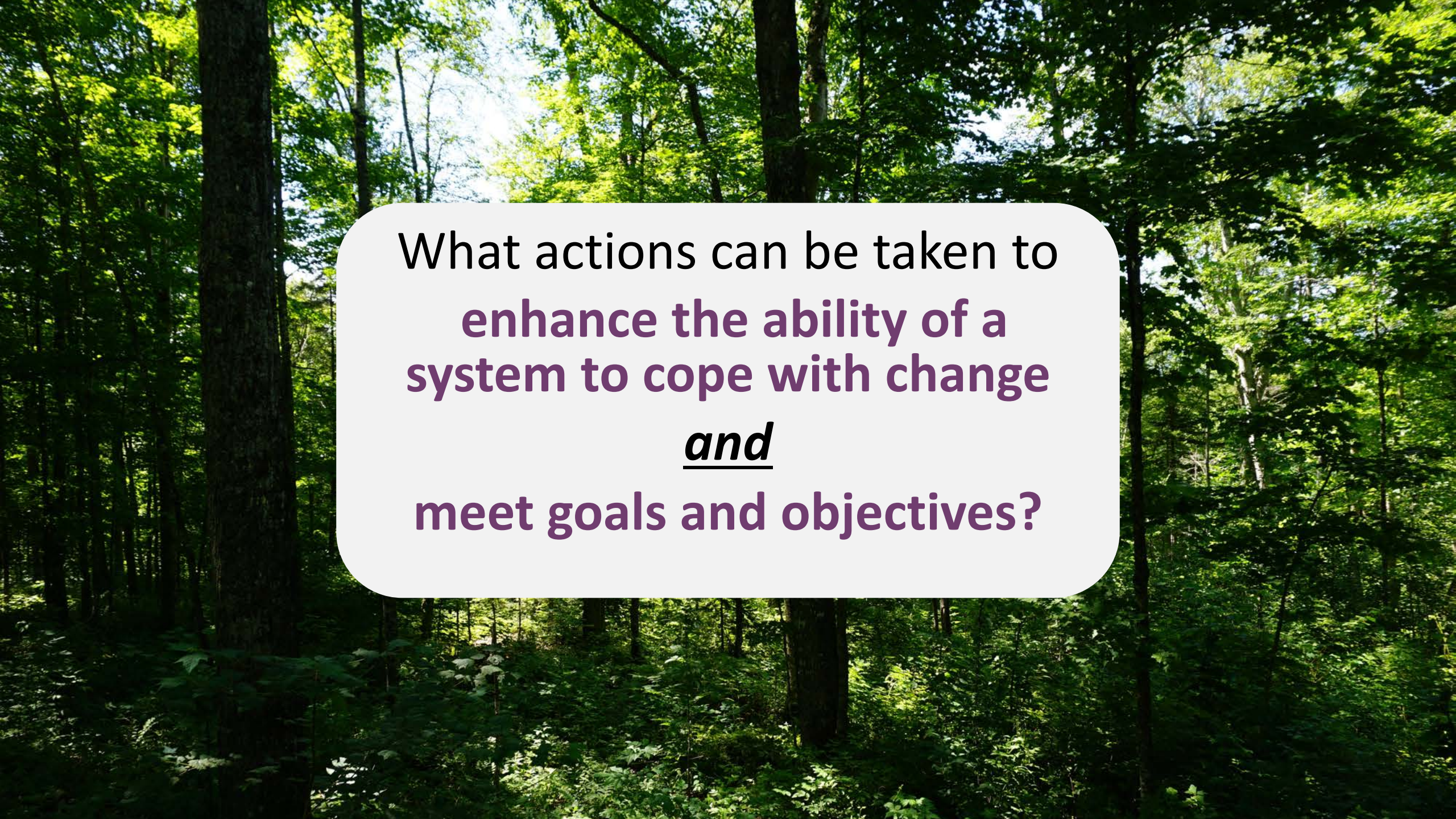



Ecosystem-based adaptation activities build on sustainable management, conservation, and restoration.

- What do you value?
- How much risk are you willing to tolerate?

Climate-Driven Changes



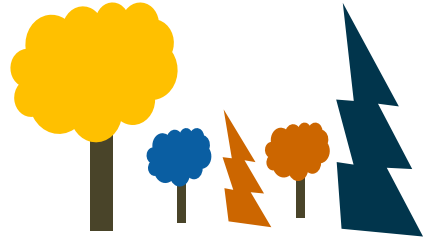

What actions can be taken to
enhance the ability of a system to cope with change
and
meet goals and objectives?

Adaptation Options

RESISTANCE

RESILIENCE

TRANSITION



Identify and implement actions that are

robust across a range of potential future conditions

Millar et al. 2007, Swanston et al. 2016, Nagel et al. 2017

Resistance

Improve the defenses of the system against anticipated changes or directly defending against disturbance in order to maintain relatively unchanged conditions.

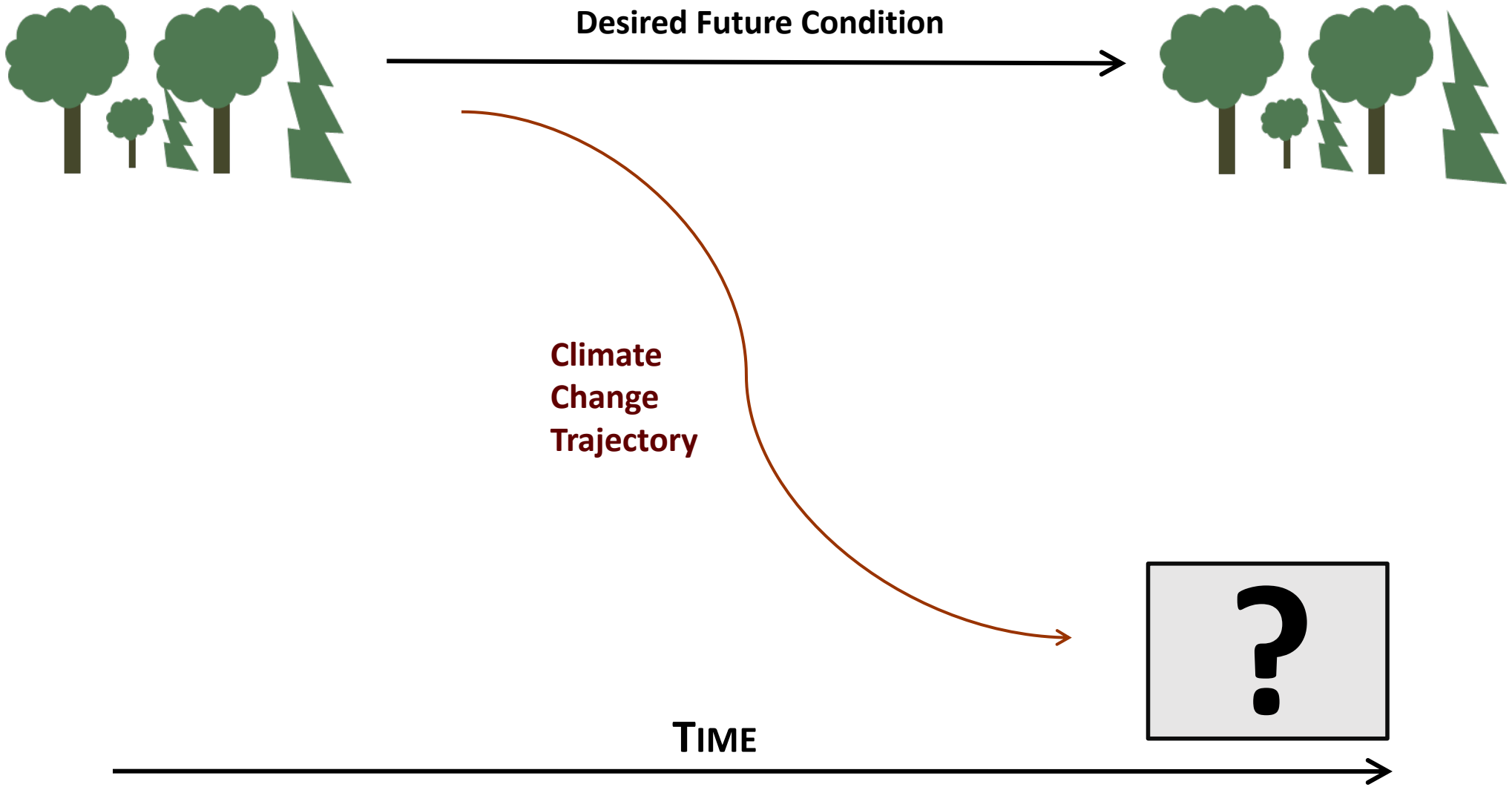
Road crossings that can withstand flood events (USFS, Monongahela NF)

Threatened Dwarf lake iris (FWS)

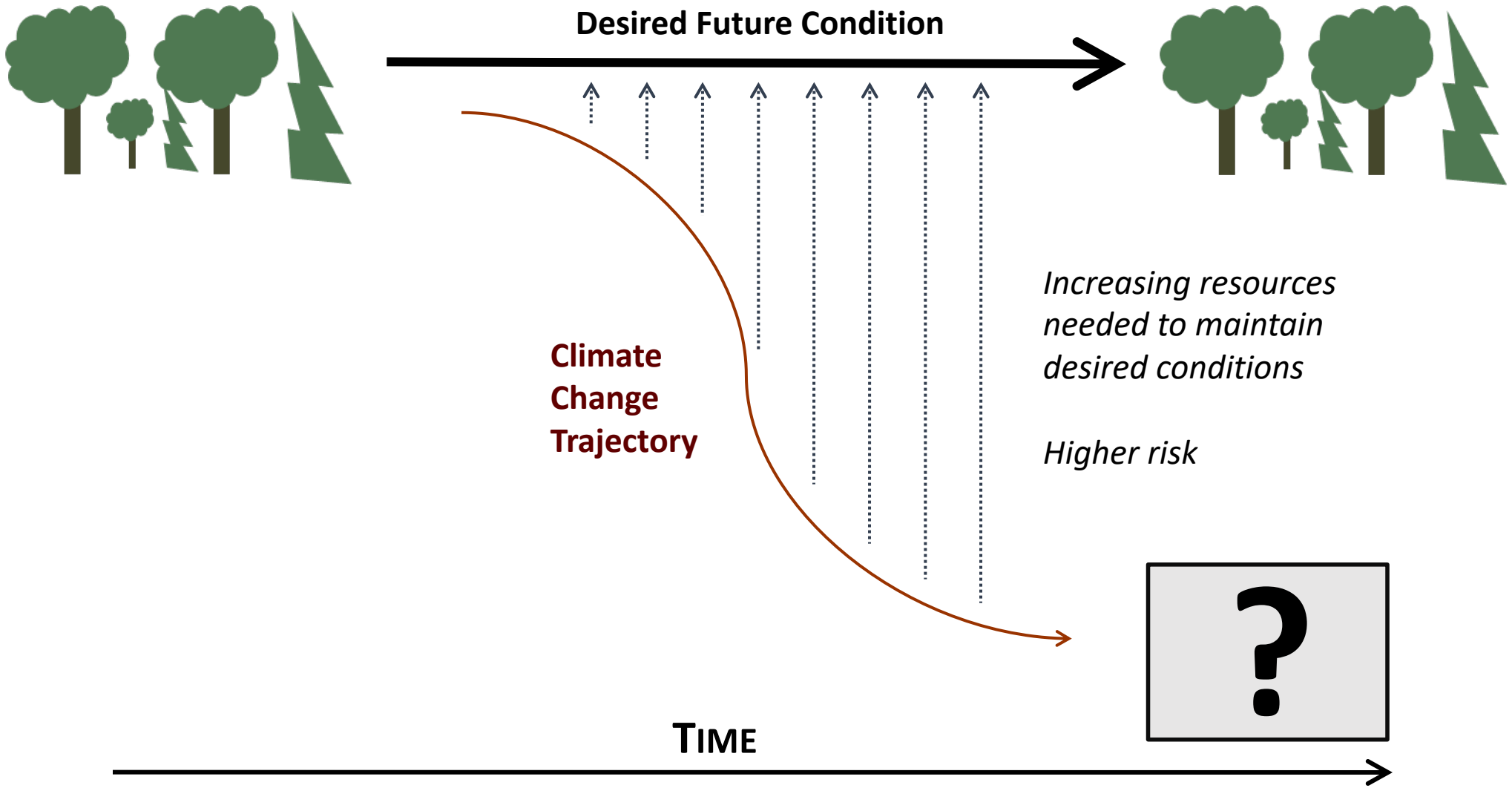
Invasive species management (USFS)

Millar et al. 2007, Swanston et al. 2016, Nagel et al. 2017

Resistance



Resistance


Desired Future Condition
Climate Change Trajectory
Increasing resources needed to maintain desired conditions
Higher risk
?
TIME

Resilience

Accommodate some degree of change or disruption, but be able to return to a similar condition after disturbance.

- Improve overall health & vigor
- Management of vegetation following disturbance

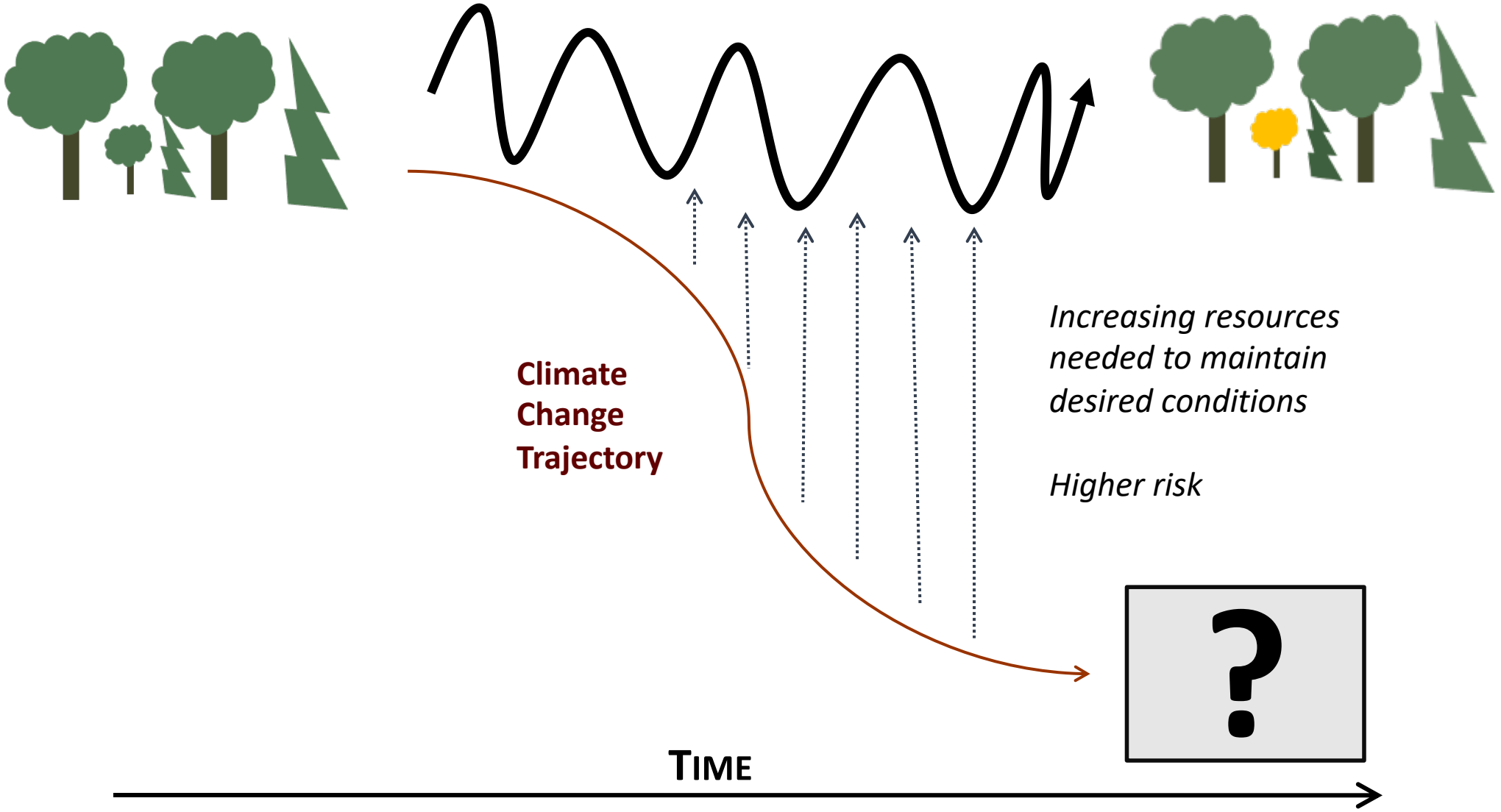
Prescribed burning to regenerate fire-adapted species

Reducing overstocked stands (Tahoe NF)

Increasing setbacks to allow for fluctuating water levels.

Holling 1973, Millar et al. 2007, Swanston et al. 2016
See also – Moser et al. 2019

Resilience

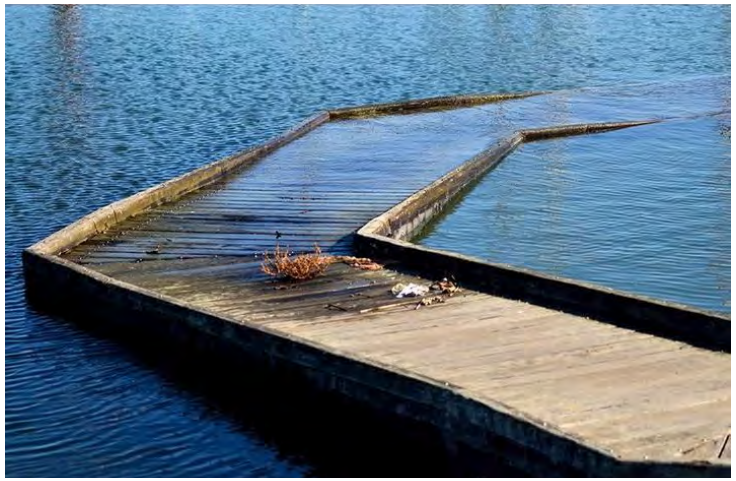

Climate
Change
Trajectory
Increasing resources
needed to maintain
desired conditions
Higher risk
?
TIME

Transition

Intentionally accommodate change and enable ecosystems to adaptively respond to changing and new conditions

- Foster well-adapted native species
- Relocate visitor and recreation infrastructure
- Accommodate new & altered hydrologic processes

Favoring native species that are expected to be adapted to future conditions.

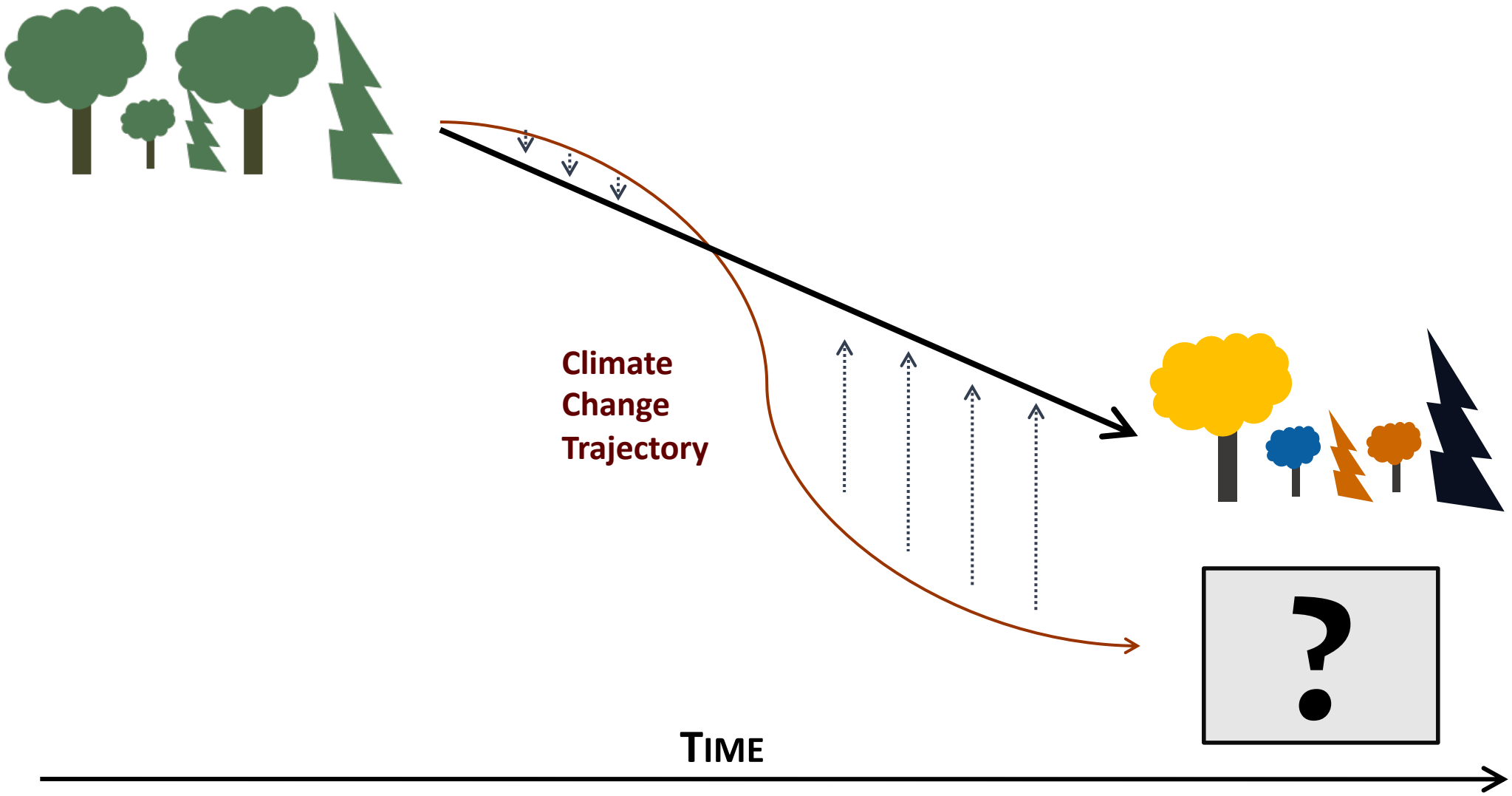


Relocate existing infrastructure to areas with less risk (P:Tom Hilton)

River & riparian area restoration in agricultural fields (P:Joann Kline)

Millar et al. 2007, Swanston et al. 2016, Nagel et al. 2017

Transition



ASCC is testing a spectrum of adaptation options

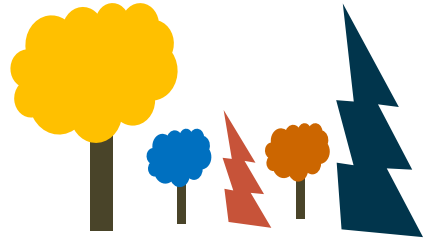
RESISTANCE

- Improve defenses of forest against change and disturbance
- Maintain relatively unchanged conditions

RESILIENCE

- Accommodate some degree of change
- Return to prior reference condition following disturbance

TRANSITION



- Intentionally facilitate change
- Enable ecosystem to respond to changing and new conditions

Reduce impacts/maintain current conditions

Forward-looking/promote change

Millar et al. 2007, Swanston et al. 2016, Nagel et al. 2017

Intentionality

- Explicitly consider and address climate change
- Sure we might get lucky…
- Intentionally assessing risk and vulnerabilities **makes our plans more robust!**

Adaptation Planning

What should I do here?

Adaptation Planning

If you want a single “answer” for how to respond to climate change, it’s

“It depends”

…ecosystem, objectives, climate pressure, risk tolerance, capacity…

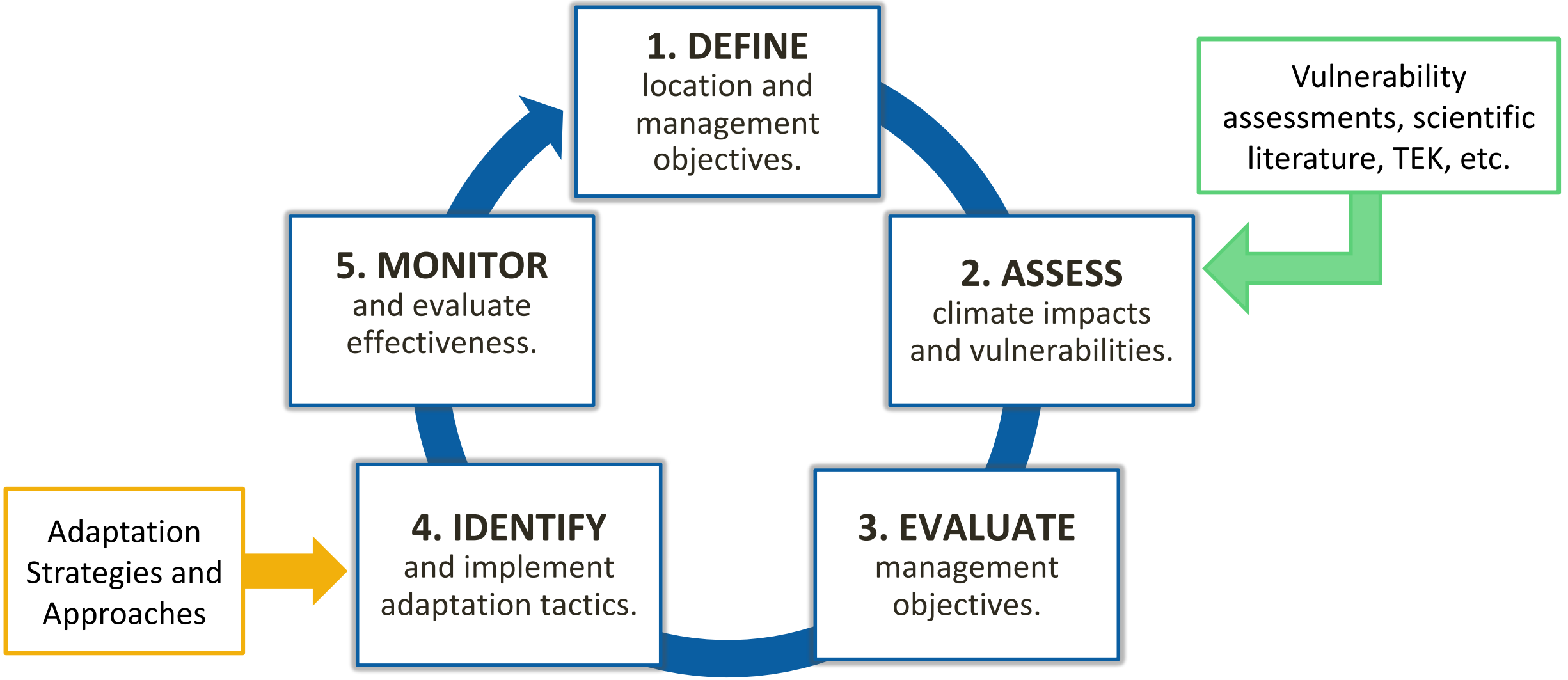
Adaptation Resources

A flexible workbook and menu to address diverse needs

- Designed for a variety of land owners with diverse goals
- Does not make recommendations
- Includes:
  - Adaptation Workbook
  - Adaptation strategies for different resource areas (menus)

Swanston et al. 2016 (2nd edition); www.treesearch.fs.fed.us/pubs/52760; www.adaptationworkbook.org

Adaptation Workbook



Adaptation Tools & Resources

NIACS Adaptation Menus of Strategies & Approaches:

- A collection of possible adaptation actions that allows the user to choose actions that make sense for their situation
- Forest Menu & Workshop Process Handout
- Adaptation Menus for a variety of resource areas: https://forestadaptation.org/adapt/adaptation-strategies

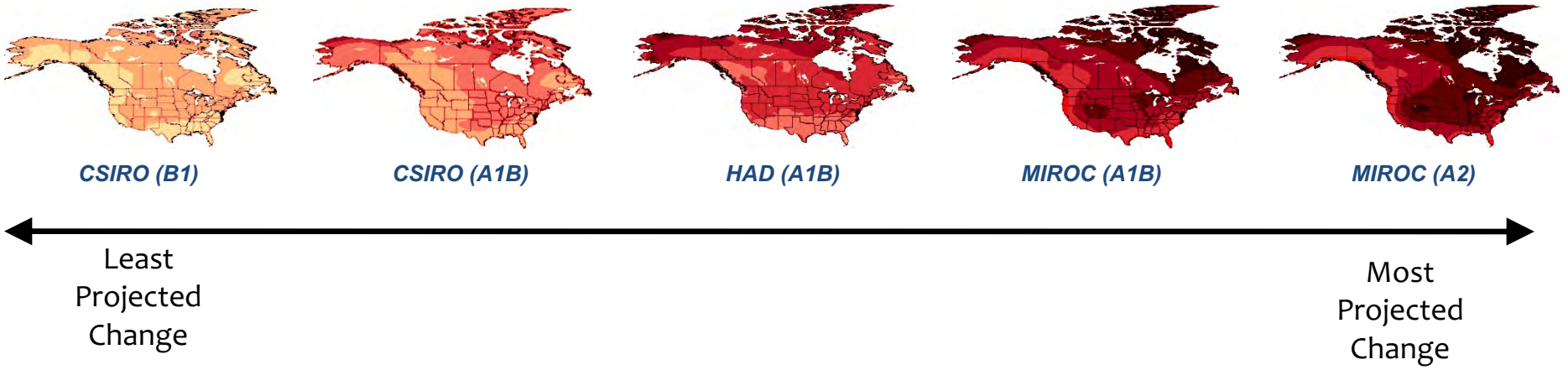
Canadian Council of Forest Ministers:

- Climate change and sustainable forest management in Canada: a guidebook for assessing vulnerability and mainstreaming adaptation into decision making
- Climate Change Adaptation Report Series: Climate Change Adaptation and Sustainable Forest Management: Preparing for the Future

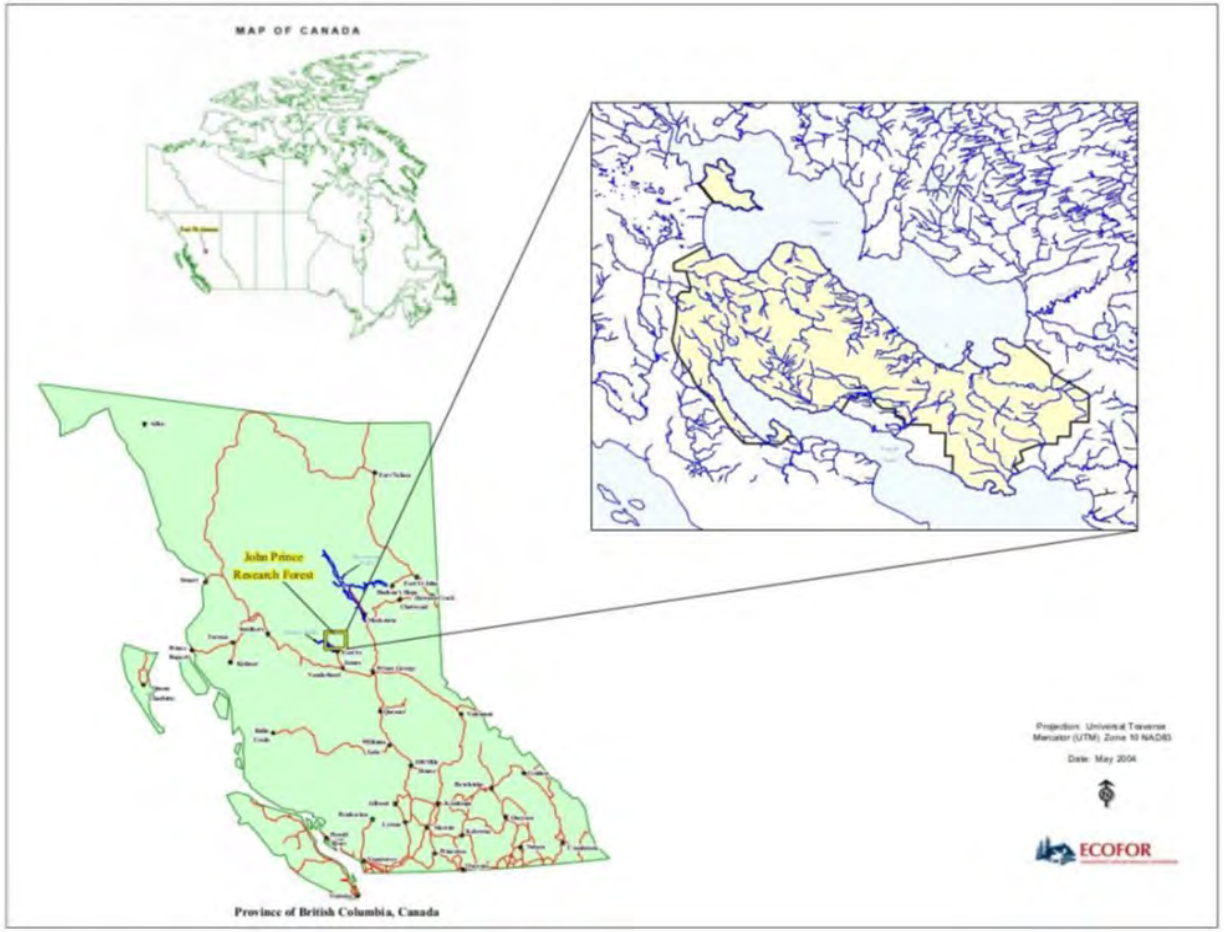
Developing Adaptation Actions for Forests

Breakout Group Activity

In this activity you will use your forestry expertise to illustrate how climate change and uncertainty may affect stand-level management for sub-boreal spruce ecosystems.



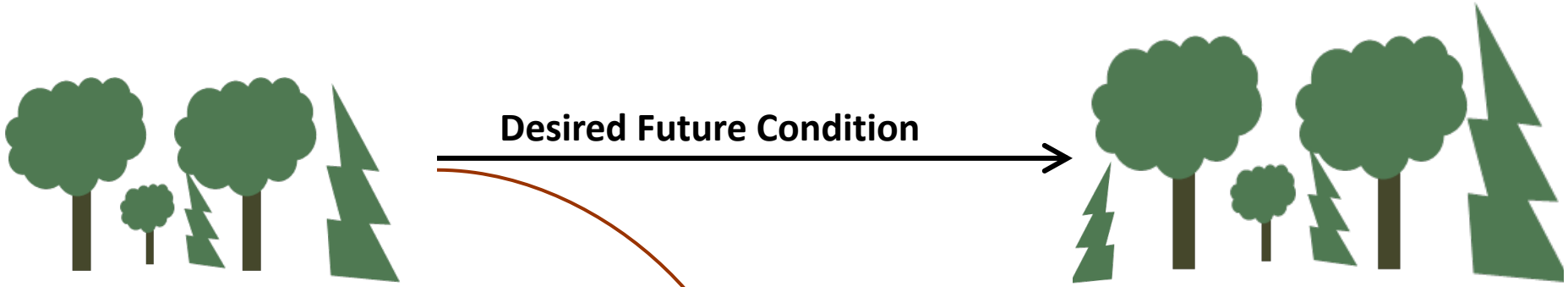
1. Describe the current condition of your stand



"Paint a picture" and describe:

- **Forest Type/Site Condition**
- **Location Characteristics** (e.g., species composition, tree age/size/origin, stand structure, disturbance history)
- **Current Management** (common goals, objectives, and typical prescriptions/management approaches)

2. Consider Potential Climate Impacts



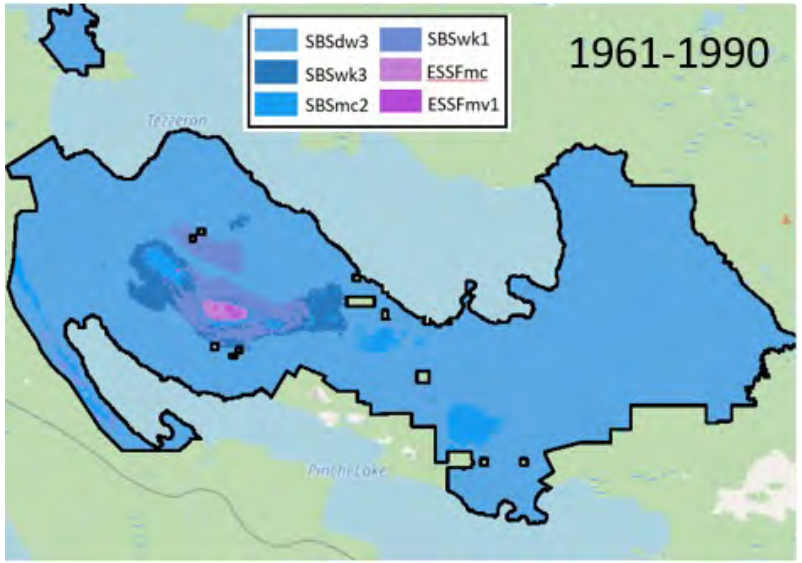
What climate change impacts create challenges or opportunities for meeting your management objectives?

Climate Change Trajectory

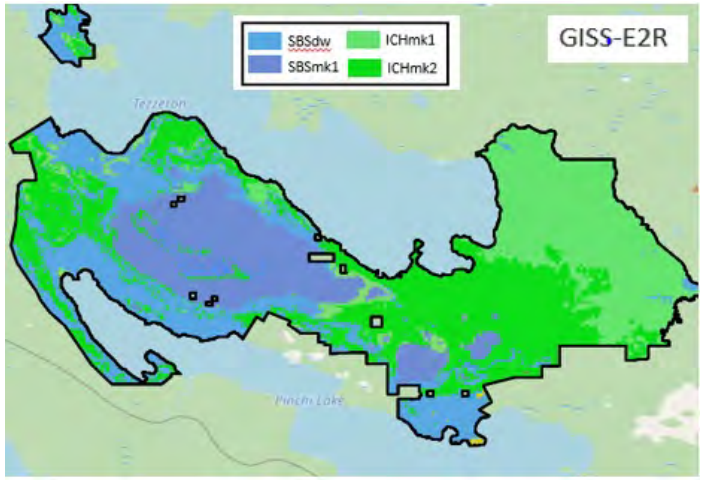
2. Consider Potential Climate Impacts

To help think about climate change in your region:

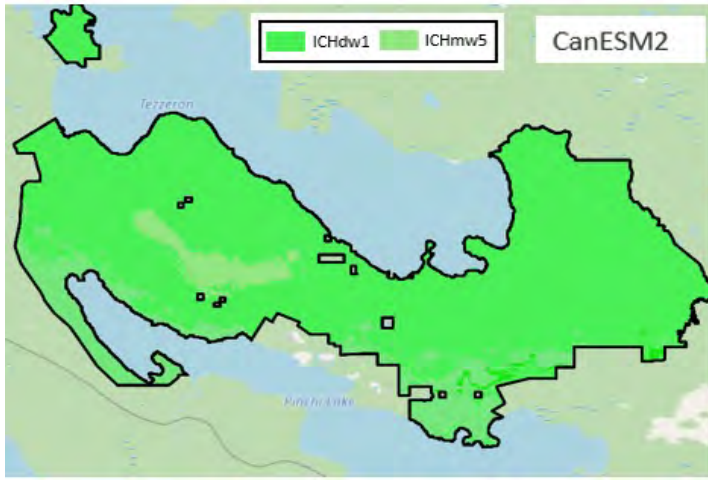
Historic/current conditions:



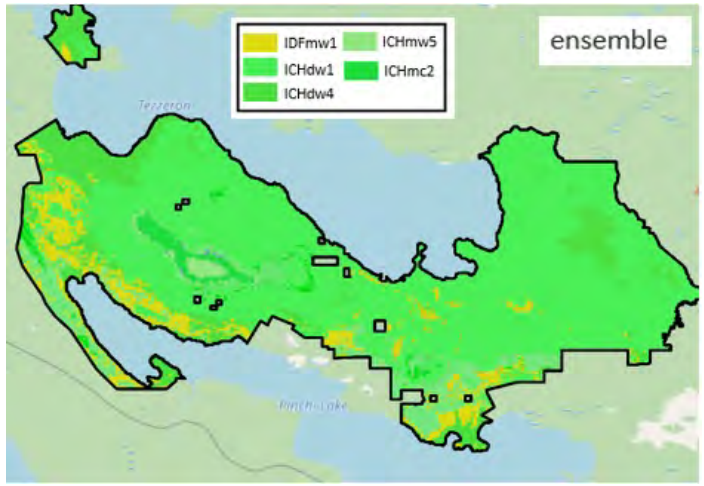
"A little warmer" scenario:



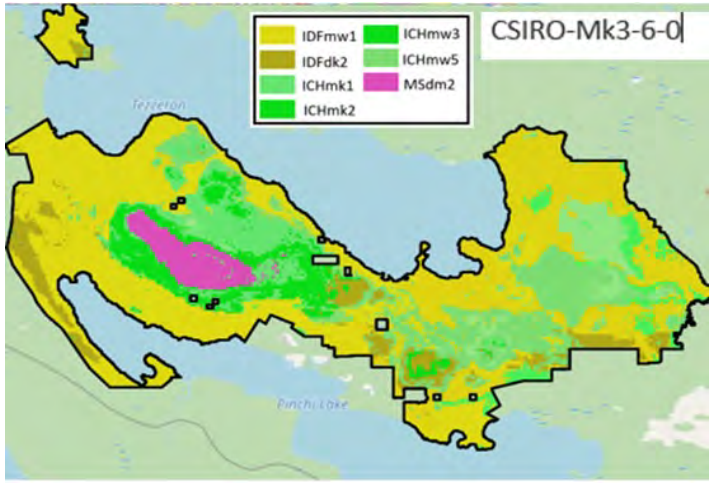
"Warmer & moister" scenario:



"Middle of the road" scenario:



"Hotter & drier" scenario:



See handout for resources on climate change impacts.

Maps/data for this section courtesy of Colin Mahony, BC MFLNRORD

3. Identify Adaptation Actions

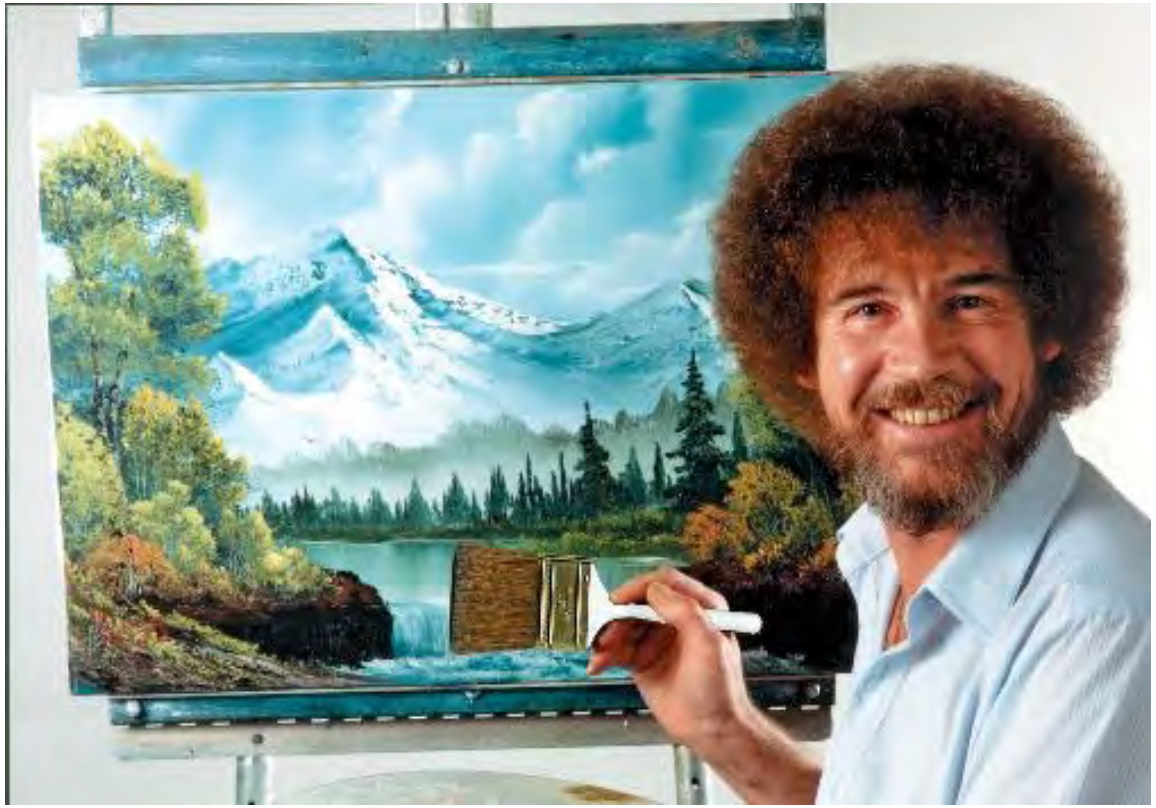
What actions can be taken to enhance the ability of the area to adapt to anticipated changes and meet management goals?

- Consider adaptation actions that will facilitate meeting the stated management objectives while addressing climate change considerations and impacts.
- Describe the desired future condition (DFC) that will meet management objectives.
- Outline the silvicultural approaches that will move the current condition to the DFC, and will help you meet management objectives.

Identify actions that are **robust across a range of potential future conditions**

Presentation Time!

ONE GROUP MEMBER SHOULD BE PREPARED TO PRESENT YOUR RESULTS (3 MINUTES) TO THE LARGER GROUP



GROUP 1

SUB-BOREAL SPRUCE CLIMATE CHANGE ADAPTATION:

Breakout Exercise - Developing Adaptation Approaches & Tactics

What actions can be taken to enhance the ability of the area to adapt to anticipated changes and meet management goals?

Climate Scenario: A little warmer
Primary Management Objectives: Timber, Wildlife, & Cultural Heritage

Expand and re-envision your silvicultural toolbox

Group Names:

Where are you working now? What are the current conditions? What are your forest management goals?

- **Forest Type/Site Condition:**
- **Location Characteristics** (e.g., species composition, tree age/size/origin, stand structure, disturbance history):
- **Current Management** (common goals, objectives, and prescriptions):

What climate change impacts create challenges or opportunities for meeting your goals?

- List top 3 climate impacts

What actions would you recommend to enhance the ability of sub-boreal spruce forests to adapt?

First, describe the **desired future condition (DFC) that will meet your management objectives while incorporating climate change considerations**:

-
-

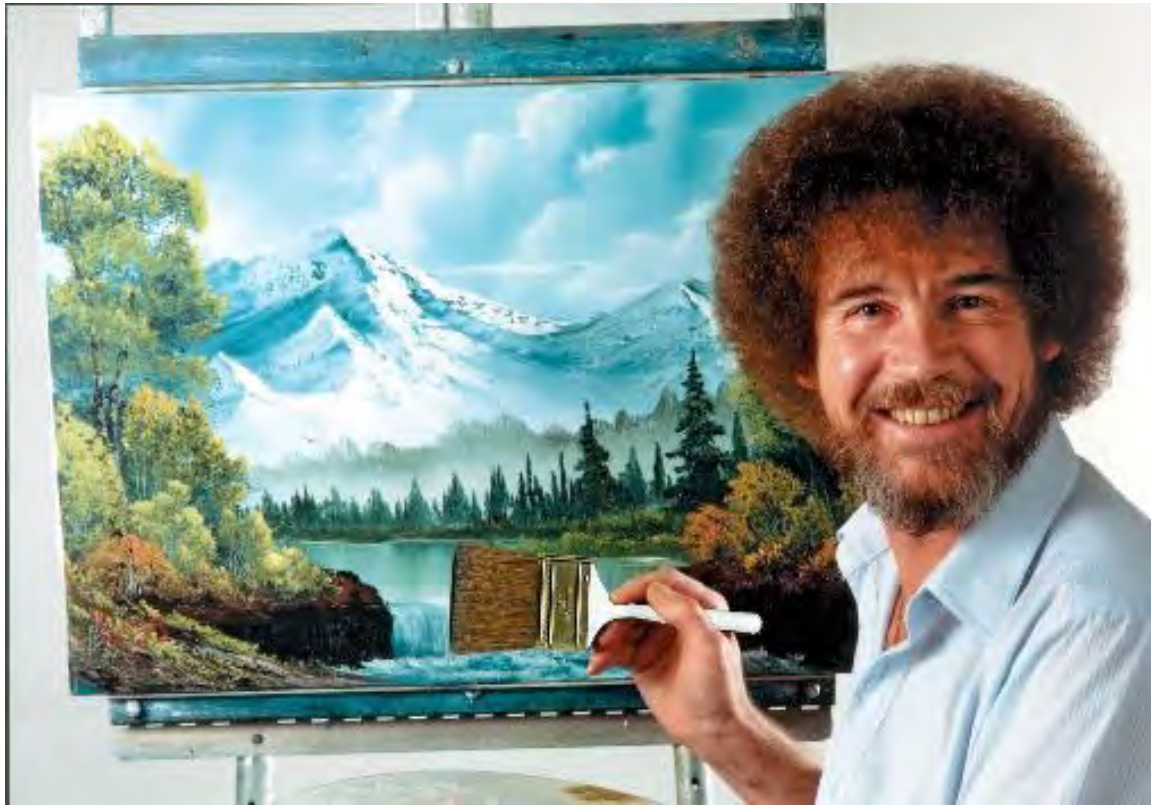
Next, review the list of Adaptation Strategies and Approaches, and i**dentify relevant adaptation actions that could be implemented**:

-
-

Resources

- Sub-boreal spruce climate adaptation workshop webpage
- Forest Menu & Workshop Process Handout
- Adaptation Menus for a variety of resource areas: https://forestadaptation.org/adapt/adaptation-strategies
- Canadian Council of Forest Ministers' Adaptation Guidebook
- Climate Change Adaptation Report Series: Climate Change Adaptation and Sustainable Forest Management: Preparing for the Future
- Swanston et al. 2016. Forest Adaptation Resources: Climate change tools and approaches for land managers. USDA GTR NRS-87
- Nagel et al. 2017. Adaptive Silviculture for Climate Change: A National Experiment in Manager-Scientist Partnerships to Apply an Adaptation Framework. Journal of Forestry 115(3):167-178.
- Millar, Stephenson, Stephens. 2007. Climate change and forests of the future: Managing in the face of uncertainty. Ecological Applications 17(8):2145-2151.

Presentation Time!



Photos: Sue Grainger

How do you plan on integrating climate change into on-the-ground planning and decision-making processes moving forward?

https://www.menti.com/g2gfjro9vg

Thank you!