

FOREST ADAPTATION PLANNING AND PRACTICES

~ ONLINE COURSE ~

Session 4 Discussion: Identifying Adaptation Strategies, Approaches, and Tactics

Wednesday February 13, 2018

Discussion session: Please feel free to join the discussion on webcam or by phone – we want to hear from you!



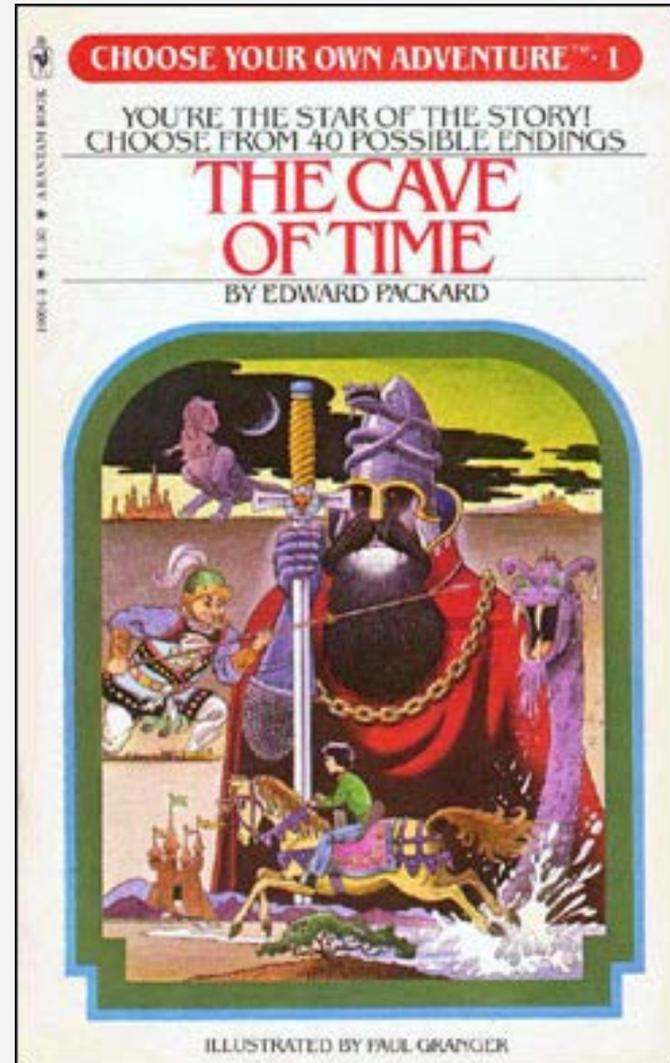
Welcome back!

Discussion: 1:00-1:45 pm

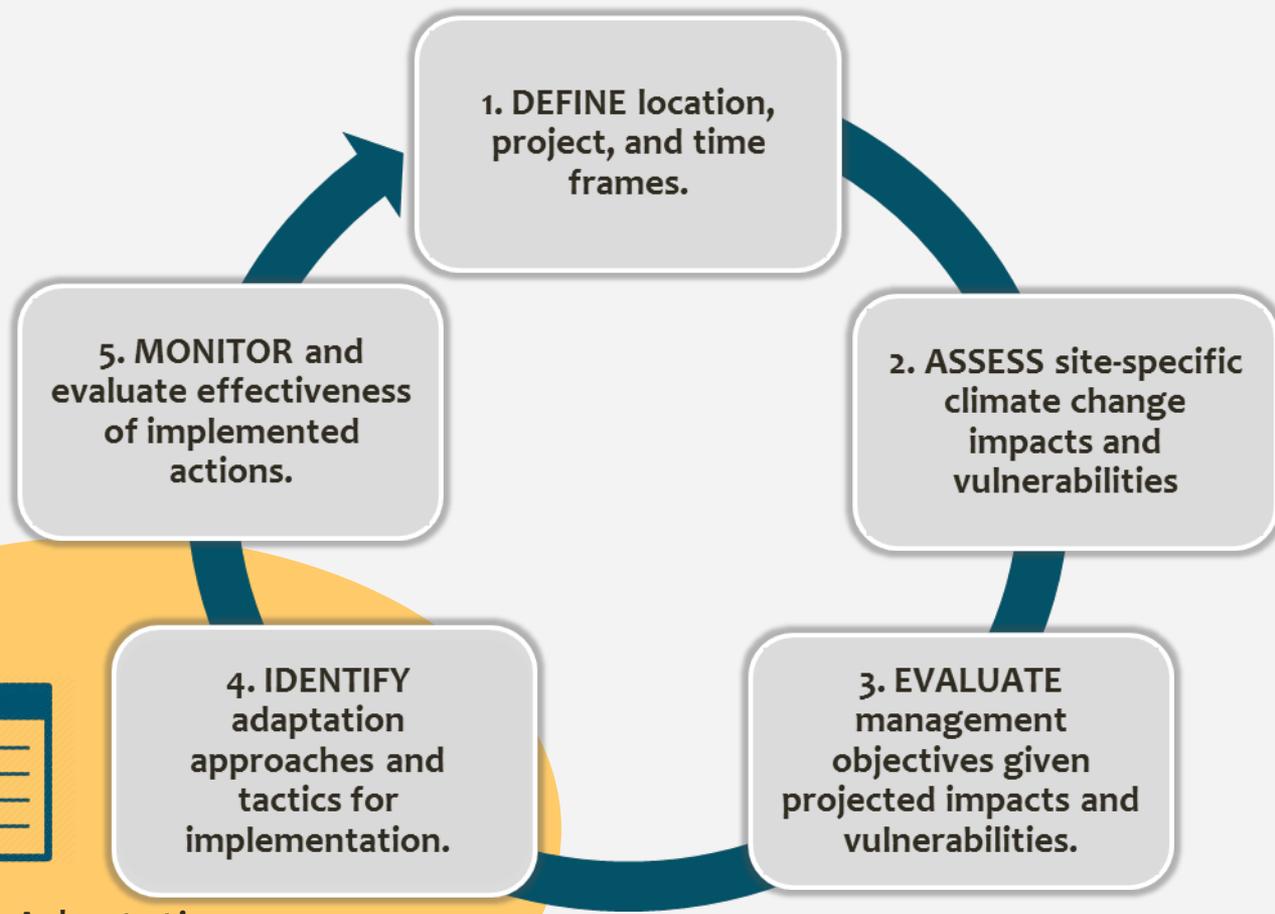
- Step 4 review
- What adaptation actions are you considering?

Lecture: 2:00-2:45 pm

- Step 5: Monitoring
- Assignment for Feb 20



Adaptation Workbook Process



Resource: Adaptation Strategies & Approaches

Step 4: IDENTIFY adaptation approaches and tactics for implementation.

Key Question:

What actions can enhance the ability of the ecosystem to adapt to anticipate changes *and* meet management goals?

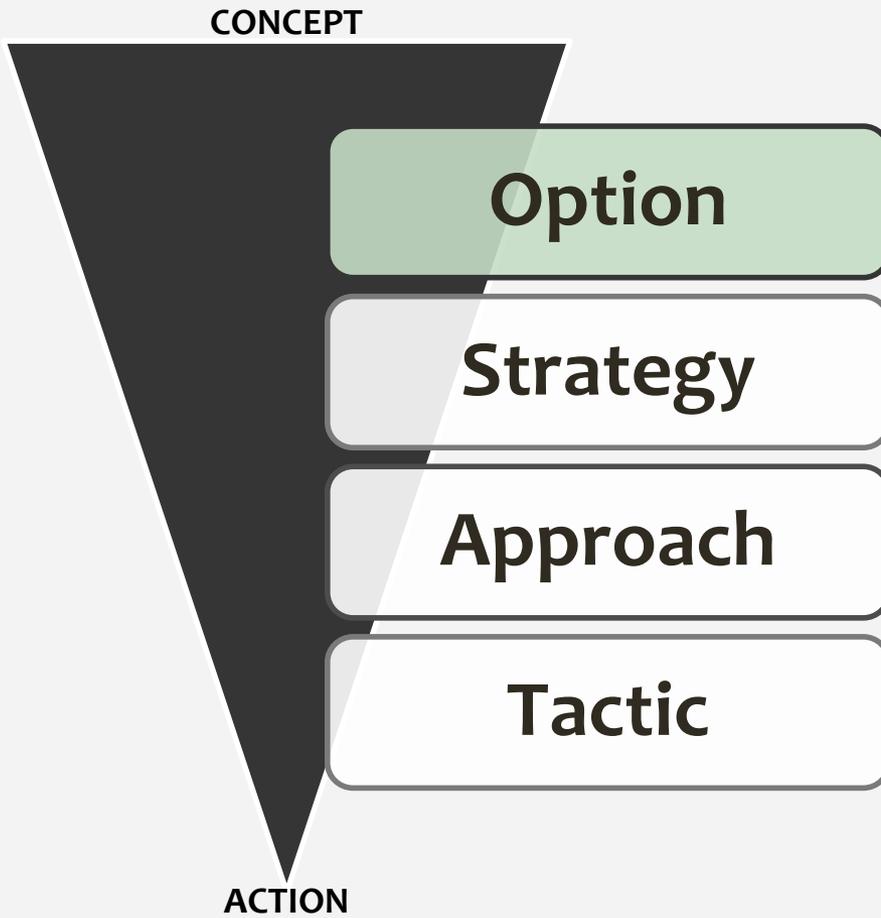
Adaptation Strategies & Approaches



A “menu” of possible actions that allows you to decide what is most relevant for a particular location and set of conditions.

*Find in: Step 4 of online workbook, Chapter 3 of FAR , or
www.adaptationworkbook.org/niacs-strategies
www.adaptationworkbook.org/niacs-strategies/urban*

Adaptation Strategies and Approaches

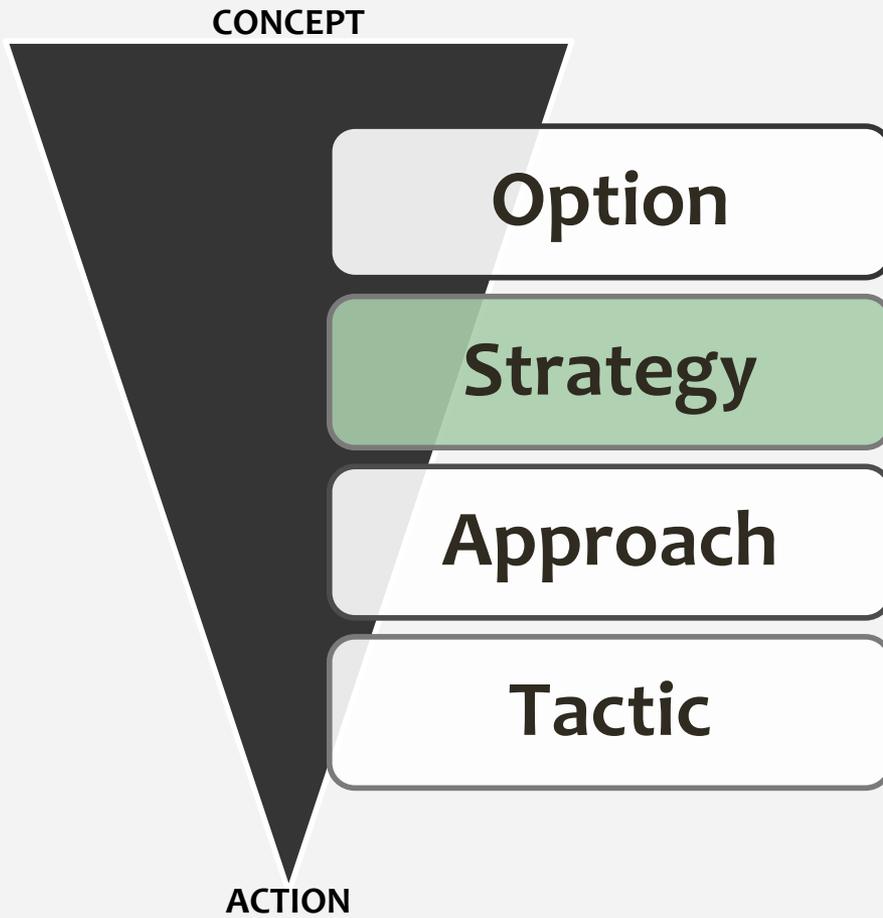


Big ideas

- Increase **resistance**
- Build **resilience**
- Facilitate **transition**

See Step 4 Course Materials for a recorded presentation that provides more details

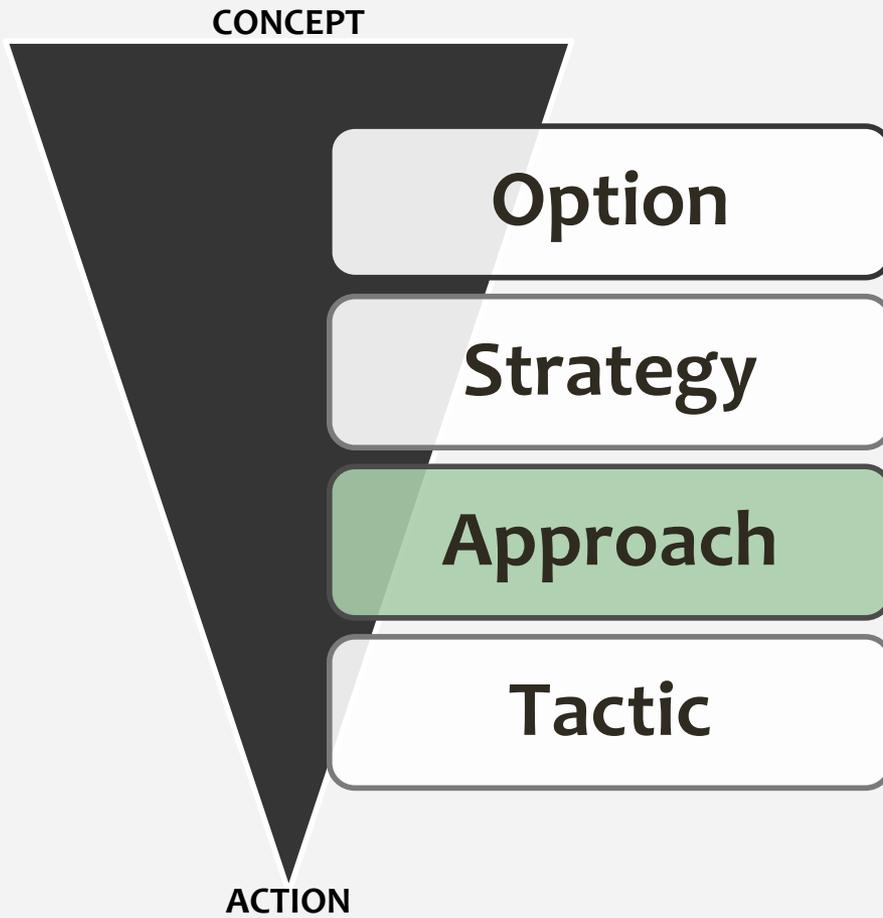
Adaptation Strategies and Approaches



Broad adaptation responses

- Sustain fundamental ecological functions
- Reduce the impact of existing biological stressors
- Maintain and enhance species and structural diversity
- Facilitate community adjustments through species transitions

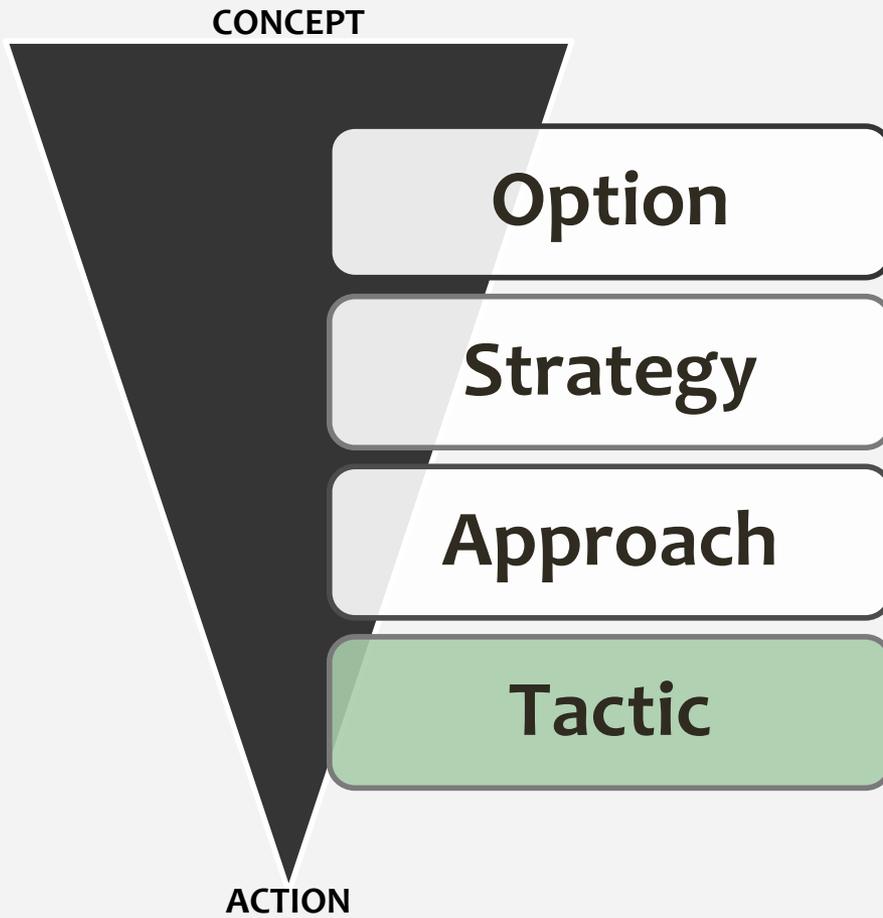
Adaptation Strategies and Approaches



More specific actions

- Promote diverse age classes
- Maintain and restore diversity of native tree species
- Identify and move species to sites that are likely to provide future habitat

Adaptation Strategies and Approaches



Prescriptive actions
selected by producer that
are designed for individual
site conditions and
management objectives
→ **YOU DECIDE!**

Adaptation Strategies and Approaches

Management Goals
& Objectives

Climate Change
Impacts

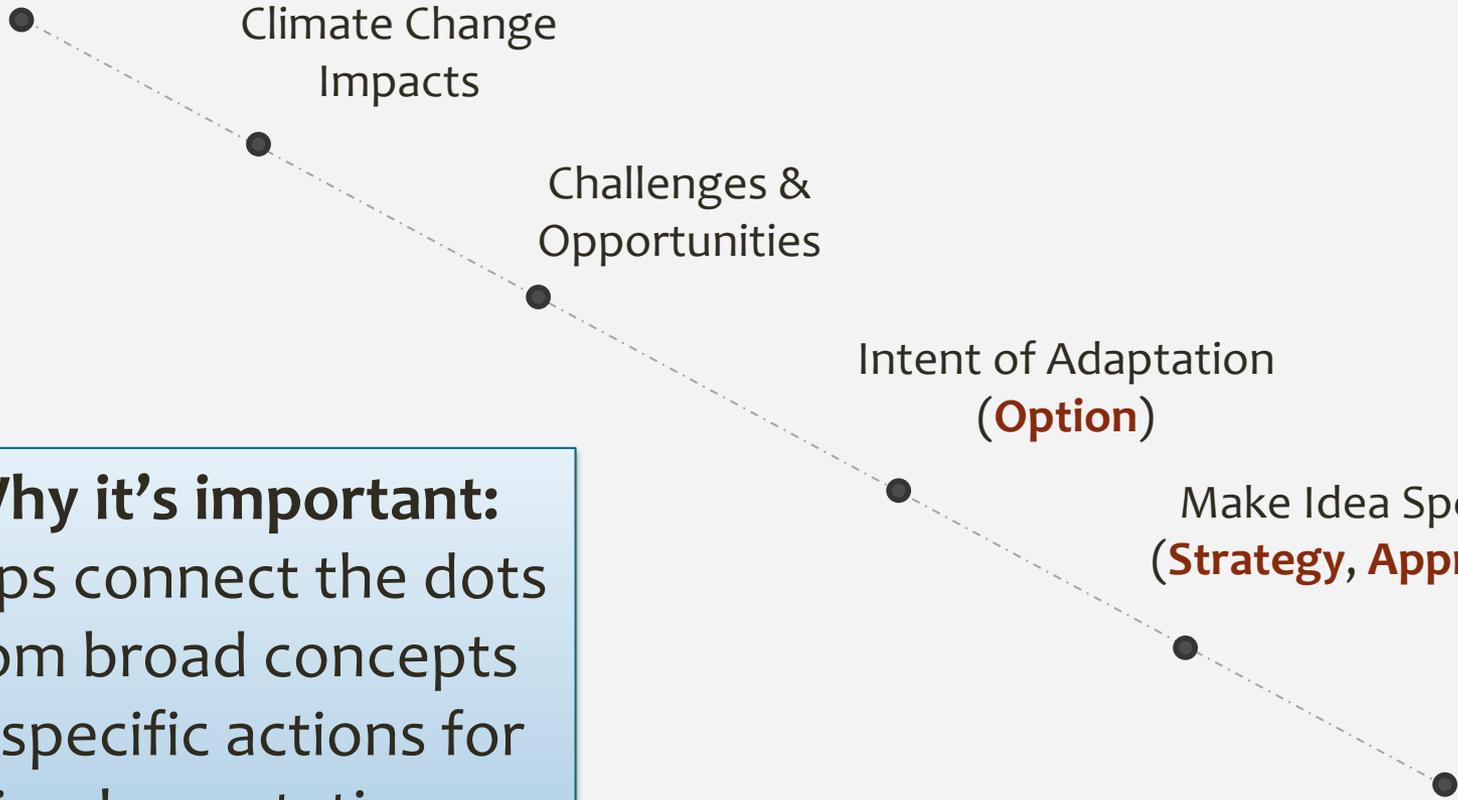
Challenges &
Opportunities

Intent of Adaptation
(**Option**)

Make Idea Specific
(**Strategy, Approach**)

Action to Implement
(**Tactic**)

Why it's important:
Helps connect the dots
from broad concepts
to specific actions for
implementation.



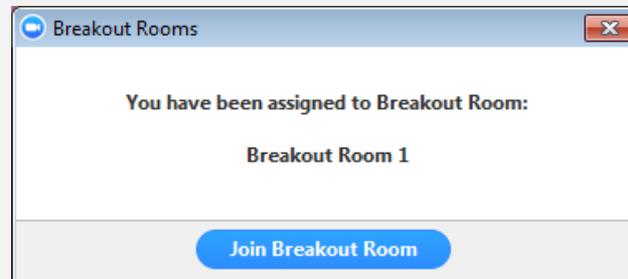
Breakout Discussions

Consider:

- What adaptation actions are you considering?
- Do they address your major impacts or challenges?
- Would you consider these actions to be resistance, resilience, transition, or a mix?

Breakout Discussions

We'll split into two groups. Click **“Join breakout room.”**”



From Step 3...



Arnot	✓ regeneration	✗ impediments (deer, beech)
Brown Lots	softwood component	✗ ✓
C.S. Besse Park	✗✗	✓✓✓ softwood (hemlock, white pine)
Cedardale	✗ cedar in groundwater-fed forest (uncertainty)	✓✓
Chestnut Hill	✗	✓ maintain vigorous forest cover
Cold Hollow		
Elm Hill	✗✗	✓✓ invasive plants
Frye Mtn. WMA	✓	✗ softwood component/deer wintering areas
Garfield	Hemlock woolly adelgid	✗
Manski	across project area-- fast change	✗ ✓
Palmerton Zirc	creating a chestnut oak forest	✓ ✗
Red Mountain	regenerating oak (deer, drought)	✗
Richmond Town	planning/gathering information	✓ ✗
Sykes Mountain	✓ retain softwood component	✗
Wilbraham & Monson	✓✓ invasives (plants)	
1899 County Rd	invasives (plants)	✓✓ ✗

FOREST ADAPTATION PLANNING AND PRACTICES

~ ONLINE COURSE ~

Session 5 Lecture: Monitoring and Evaluating Effectiveness

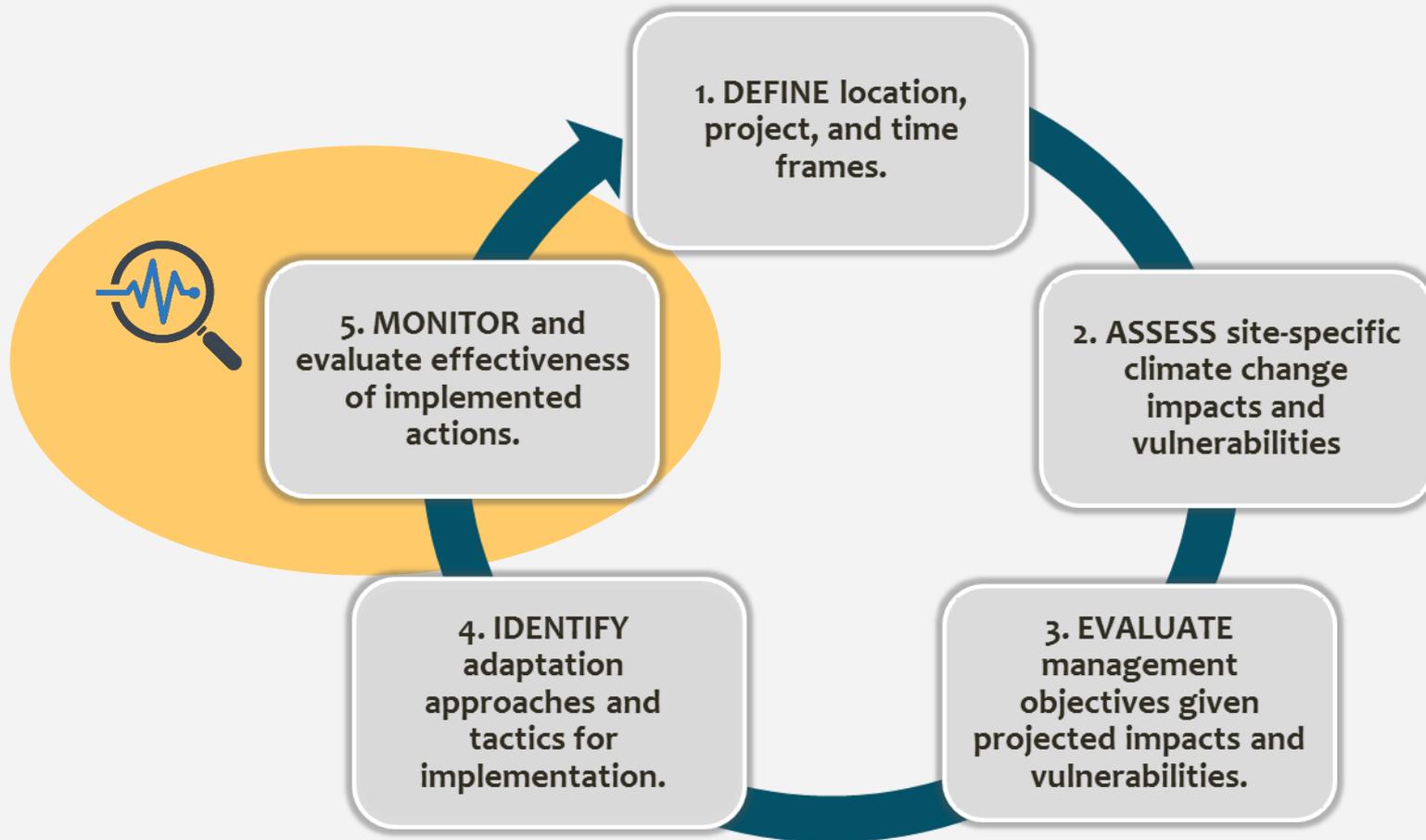
Wednesday February 13, 2018

Web session etiquette:

- Mute your phone/microphone unless you are speaking to the group.
- If using the phone, turn off your computer speakers to avoid feedback and terrible noises.



Adaptation Workbook Process



A Few Thoughts About Monitoring...

Be VERY CLEAR about your **objectives**! What question you are asking guides your monitoring approach:

- **Scientific research** = Is this outcome statistically significant compared to a control? Could we expect similar results elsewhere?
- **Impact/ response monitoring** = What changes are occurring?
- **Implementation monitoring** = Did we do the action?
- **Effectiveness monitoring** = Did our actions actually have the desired effect?

Step 5: MONITOR and evaluate effectiveness of implemented actions.

Adaptation Monitoring Variable – What you will measure

Items that can tell you whether you have achieved your management goals & objectives.

If possible, use an item that also helps evaluate a particular tactic.

For example:

- *Planted seedling survival*

Step 5: MONITOR and evaluate effectiveness of implemented actions.

Criteria for Evaluation – a value or threshold that is meaningful for assessing effectiveness or informing future decisions

What is success?

*What you're monitoring or measuring: **What are the units on your data?***

For example:

- *60% survival of non-local genotypes.*

Step 5: MONITOR and evaluate effectiveness of implemented actions.

Monitoring Implementation– How you will gather the information

How the monitoring will actually get done.

Take advantage of existing monitoring when possible!

For example:

- *Regular post-planting stocking surveys.*
- *Supplemental surveys at 10 years.*

An example: Responding to Oak Wilt on the Menominee Forest



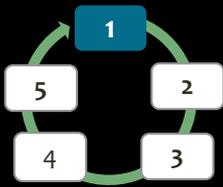
**OAK WILT DISEASE
POCKET**

This area was logged and stumps overturned in 2011 to prevent the spread of the non-native oak wilt fungal disease. The objective is to protect the health of the remaining oak trees in the forest.

MTE Management
Technology
Education

For further information contact:
MTE Forestry Center 715-799-3896

MTE Forestry Center
2115 Hwy 20, Suite 100
Menominee, WI 54751
www.mte.com

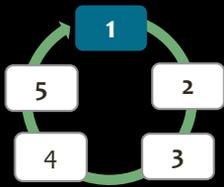


DEFINE management goals and objectives

General goals across the Menominee Forest

- Foster diversity
- Favor sawtimber species
- Provide for cultural resources



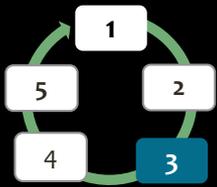


DEFINE management goals and objectives

Project objective: Reforest oak wilt pockets

- **More than 350 oak wilt pockets found across forest during 2008-2013**
- **Identified 10 sites for climate informed reforestation**





EVALUATE management objectives given projected impacts and vulnerabilities

Climate Change & the Menominee Forest

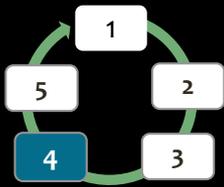
CHALLENGES

- Forest contains many northern species **expected to decline.**
- Oak wilt sites are highly disturbed, with increased potential for **establishment of invasion species.**

OPPORTUNITIES

- Forest is located at the transition zone with more **southerly species present** or relatively nearby.
- Menominee Forest has **high species diversity** compared to nearby forests.





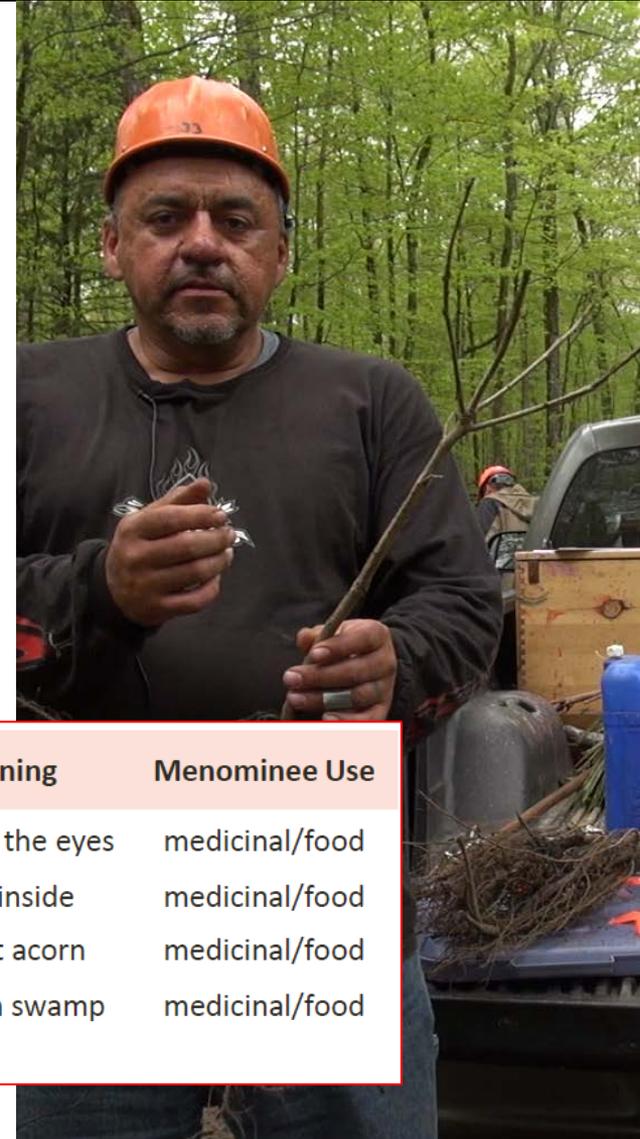
IDENTIFY adaptation approaches and tactics for implementation.

Adaptation approaches:

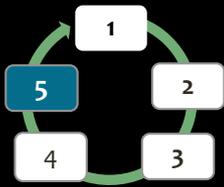
- Reduce biological stressors
- Maintain and enhance diversity
- Promote future adapted species
- Enhance genetic diversity

ADAPTATION ACTION: Restore sites with future-adapted species

- Seed understory species
- Tree species selection based on projected habitat increases/ new habitat



Tree Species	Notes	Menominee Name	Meaning	Menominee Use
White Oak	60% of site	Askeqtemaehnak	Good for the eyes	medicinal/food
Black Oak	30% of site	Anipahkahkuehtek	Black inside	medicinal/food
Bur Oak	8% of site	Mahkemenah maeqtekomen	Biggest acorn	medicinal/food
Swamp Oak	1% of site	Maskik-askeqtemaeh	Found in swamp	medicinal/food
Post oak	1% of site			



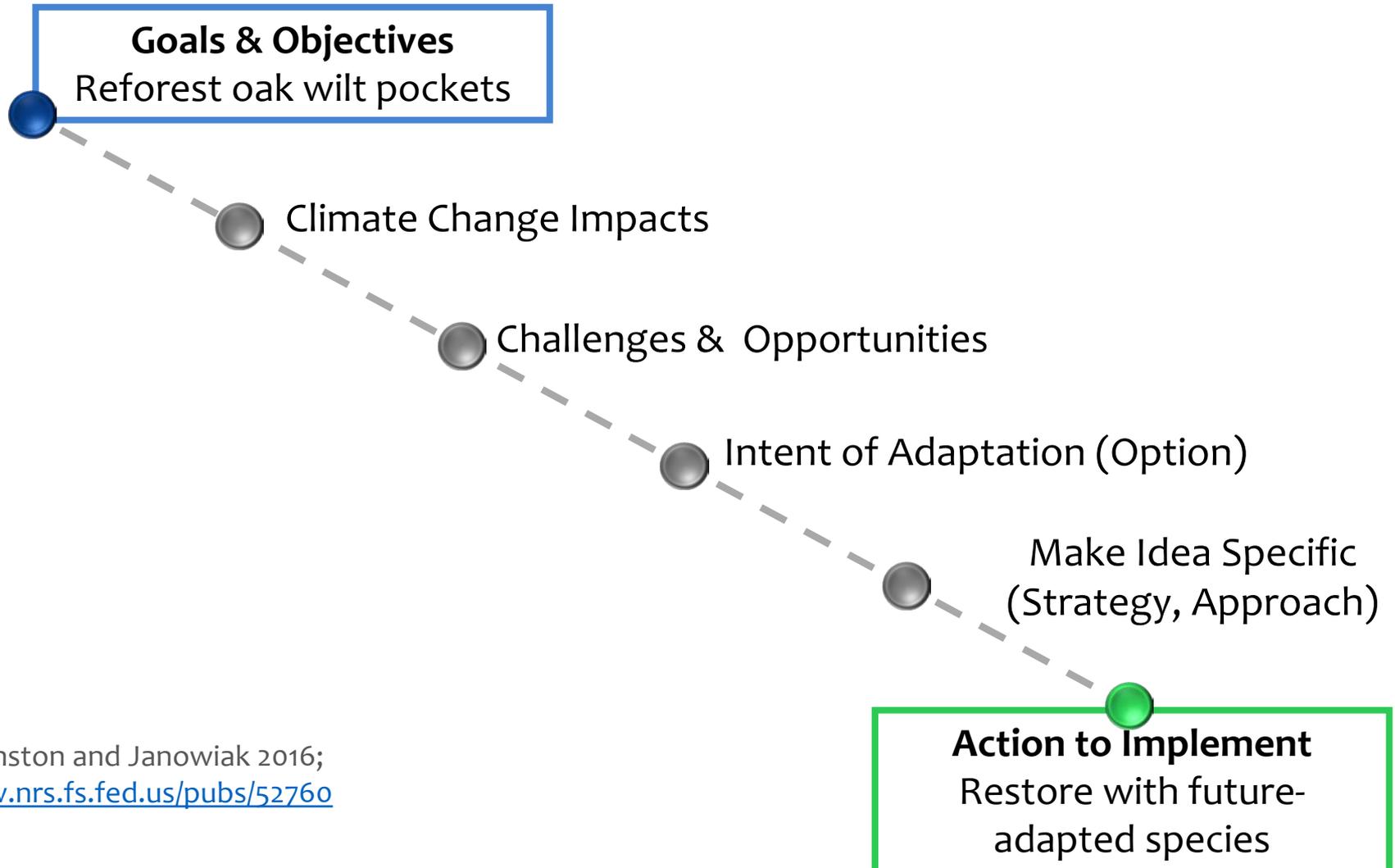
MONITOR and evaluate effectiveness of implemented actions



<u>Monitoring Item</u>	<u>Metric</u>	<u>Criteria</u>	<u>Implementation</u>
Oak wilt control	>95% control	Halt spread	Surveys 5 yrs post-treatment
Invasive spp.	Presence/ absence	Eradication	Ongoing
Planting	% survivorship	?	Surveys
TSI	Trees/acre	Desired species	Regeneration surveys

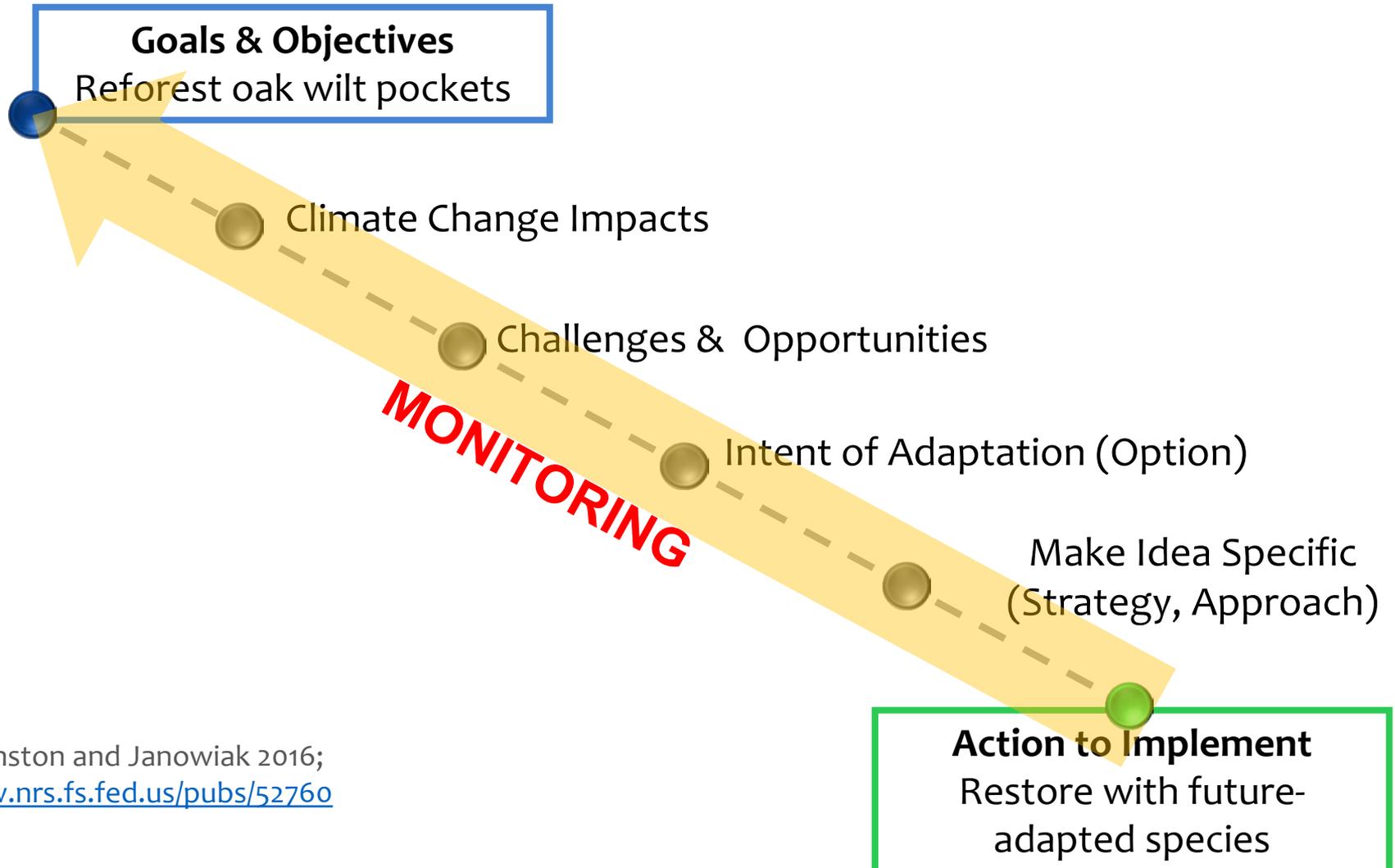
Connecting the Dots

A clear train of thought shows *intentionality*



Connecting the Dots

A clear train of thought shows *intentionality*



Course Material Landing Page

The screenshot shows a web interface for a course material landing page. On the left is a dark sidebar with a navigation menu. The main content area is white and contains information about 'Step 5 course materials'. At the bottom of the main area is a large grey rectangle, likely a placeholder for an image or video. Navigation links for 'Previous' and 'Next' are at the bottom.

Management Area

- Progress Summary
- Step 1
 - Define Management Topics
 - Management Goals and Objectives
 - Homework 1
- Step 2
 - Climate Impacts and Vulnerability
 - Vulnerability Determination
 - Homework 2
- Step 3
 - Evaluate Objectives
 - Homework 3
- Step 4
 - Adaptation Actions
 - Tactic Recommendations
 - Homework 4
- Step 5**
 - Monitoring Plan**
 - Homework 5
 - Homework 6
- Export and Share Plan

Monitoring Plan instructions

Step 5 course materials

View Session 5 slides.

Assignment 5

Complete the following tasks by Tuesday, February 20. Set aside 2-4 hours for completion, as time will vary based upon your project.

- Read Janowiak et al. 2017: [Assessing Stand-Level Climate Change Risk Using Forest Inventory Data and Species Distribution Models](#)
- Complete Step 5 of the Adaptation Workbook.
- Complete Homework 5 at the end of Step 5.

If you encounter technical issues with the Workbook or have suggestions for improvements, send us an email using [this link](#).

« Previous
Homework 4

Next »
Homework 5

Step 5 Landing Page

- Management Area
- Progress Summary
- Step 1
 - Define Management Topics
 - Management Goals and Objectives
 - Homework 1
- Step 2
 - Climate Impacts and Vulnerability
 - Vulnerability Determination
 - Homework 2
- Step 3
 - Evaluate Objectives
 - Homework 3
- Step 4
 - Adaptation Actions
 - Tactic Recommendations
 - Homework 4
- Step 5**
 - Monitoring Plan**
 - Homework 5
 - Homework 6

Step 5: Monitor and evaluate effectiveness of implemented actions

Monitoring is critical for understanding if management actions are effective over time or if management should be altered in the future to account for new information. The final step of the Adaptation Workbook is to identify monitoring items that may be used to answer these kinds of questions.

The outcome of this step is a list of items that can be monitored over time. Try to think of at least one monitoring item for each of your management objectives. You should especially consider monitoring items that will help judge the effectiveness of your recommended adaptation tactics.

Time and resources can often limit monitoring efforts, so **focus on creating a monitoring plan that is realistic and feasible.**

For example:

If you're managing a red pine plantation and your objective is to increase native tree species diversity in the understory, you may have designed an adaptation tactic to conduct variable-density thinning and scarify the soil in created gaps. An appropriate monitoring item would be to measure the abundance and diversity of tree seedlings in these gaps each year for the next 5 years.



- ▲ A red triangle indicates fields are incomplete
- ▲ An orange triangle indicates fields are partially complete
- ℹ Hover to learn more about a particular item
- ↕ Expand/collapse a section

« Previous
Homework 4

Next »
Homework 5

Add a Monitoring Variable

The screenshot shows a web application interface with a dark sidebar on the left and a main content area on the right. The sidebar contains a navigation menu with the following items: Management Area, Progress Summary, Step 1 (Define Management Topics, Management Goals and Objectives, Homework 1), Step 2 (Climate Impacts and Vulnerability, Vulnerability Determination, Homework 2), Step 3 (Evaluate Objectives, Homework 3), Step 4 (Adaptation Actions, Tactic Recommendations, Homework 4), Step 5 (Monitoring Plan, Homework 5, Homework 6). The 'Monitoring Plan' item is highlighted with a yellow arrow. The main content area has a header with 'Monitoring Plan instructions' and 'Step 5 course materials', both with dropdown arrows. Below this is a section titled 'Monitoring Variables' with a red warning triangle icon. It displays '0 monitoring variables' and the text 'Please define Management goals and objectives.' A large blue arrow points from this text to a yellow button labeled 'Add A Monitoring Variable' with a plus icon. At the bottom of the main area, there are navigation links: '« Previous Homework 4' on the left and 'Next » Homework 5' on the right.

Management Area

Progress Summary

Step 1

Define Management Topics

Management Goals and Objectives

Homework 1

Step 2

Climate Impacts and Vulnerability

Vulnerability Determination

Homework 2

Step 3

Evaluate Objectives

Homework 3

Step 4

Adaptation Actions

Tactic Recommendations

Homework 4

Step 5

Monitoring Plan

Homework 5

Homework 6

Monitoring Plan instructions

Step 5 course materials

Monitoring Variables

0 monitoring variables

Please define Management goals and objectives.

Add A Monitoring Variable

« Previous
Homework 4

Next »
Homework 5

Add a Monitoring Variable

Monitoring Variable

Monitoring Variable

Planting success.

Criteria For Evaluation

Survival of planted seedlings should be 75% at 5 years after planting.

Monitoring Implementation

Planted tree surveys can be conducted at the same time as regeneration surveys in the treated oak wilt pockets.

Save

Adaptation Workbook

My dashboard

Log out

Resources ▾

Menominee Oak Wilt Project

Progress Summary

Step 1

Define Management Topics

Management Goals and Objectives

Step 2

Climate Impacts and Vulnerability

Vulnerability Determination

Step 3

Evaluate Objectives

Step 4

Adaptation Actions

Tactic Recommendations

Step 5

Monitoring Plan

Export and Share Plan

« Previous
Tactic Recommendations

Next »
Export and Share Plan

Apply to Objectives

Adaptation Workbook

My dashboard

Log out

Resources

Menominee Oak Wilt Project

Progress Summary

Step 1

Define Management Topics

Management Goals and Objectives

Step 2

Climate Impacts and Vulnerability

Vulnerability Determination

Step 3

Evaluate Objectives

Step 4

Adaptation Actions

Tactic Recommendations

Step 5

Monitoring Plan

Export and Share Plan

Monitoring Plan instructions

Monitoring Variables

3 monitoring variables

Monitoring Variable: Planting success.

Applicable to 1 objectives

Monitoring Variable
Planting success.

Criteria For Evaluation
Survival of planted seedlings should be 75% at 5 years after planting.

Monitoring Implementation
Planted tree surveys can be conducted at the same time as regeneration surveys in the treated oak wilt pockets.

Does this monitoring variable apply to these objectives?

<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes	Management Topic: Oak > Goal: Maintain diverse species and habitats for cultural and ... Objective: Conduct pre-commercial thinning and crop tree pruning to encourage high-quality, valuable, large trees.
<input type="checkbox"/> No	<input checked="" type="checkbox"/> Yes	Management Topic: Oak > Goal: Maintain diverse species and habitats for cultural and ... Objective: Favor a diversity of tree species through active forest management.
<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes	Management Topic: Oak > Goal: Respond and treat an on-going oak wilt infestation. Objective: Salvage affected or potentially infected oak trees and remove stumps from the ground.
<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes	Management Topic: Oak > Goal: Respond and treat an on-going oak wilt infestation. Objective: Allow natural regeneration after treatment - northern red oak, white pine, and other species.
<input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes	Management Topic: Oak > Goal: Respond and treat an on-going oak wilt infestation.

« Previous
Tactic Recommendations

Next »
Export and Share Plan

Homework

The screenshot shows a web-based homework assignment interface. On the left is a dark sidebar with a navigation menu. The main content area is white with a light blue border. The title 'Homework 5' is at the top left of the main area. Below it is a text prompt: 'What are the key questions you'll want to be able to answer to determine the effectiveness of your recommended tactics for climate change adaptation? What are the metrics needed to answer these questions, and how/when will you collect the necessary measurements?'. A text input box contains a similar question. Below this is a Likert scale section titled 'Monitoring and Evaluating Effectiveness: rate how strongly you agree/disagree with the following statements.' It contains two statements with five-point scales. The first statement is 'I can identify monitoring metrics to assess the effectiveness of my management tactics.' and the second is 'I understand how the measurements collected through my monitoring plan could help me adjust future management.' The scales are currently empty. Below the scales is another text prompt: 'What information do you already have to help you measure the effectiveness of your climate adaptation tactics?'. A text input box contains a similar question. At the bottom left of the main area are 'Previous' and 'Monitoring Plan' links. At the bottom right are 'Next' and 'Homework 6' links. The sidebar menu includes: Resources, Chicago project, Progress Summary, Step 1, Define Management Topics, Management Goals and Objectives, Homework 1, Step 2, Climate Impacts and Vulnerability, Vulnerability Determination, Homework 2, Step 3, Evaluate Objectives, Homework 3, Step 4, Adaptation Actions, Tactic Recommendations, Homework 4, Step 5, Monitoring Plan, Homework 5 (highlighted with an orange arrow), Homework 6, and Export and Share Plan.

Resources ▾

Chicago project

Progress Summary

Step 1

Define Management Topics

Management Goals and Objectives

Homework 1

Step 2

Climate Impacts and Vulnerability

Vulnerability Determination

Homework 2

Step 3

Evaluate Objectives

Homework 3

Step 4

Adaptation Actions

Tactic Recommendations

Homework 4

Step 5

Monitoring Plan

Homework 5

Homework 6

Export and Share Plan

Homework 5

What are the key questions you'll want to be able to answer to determine the effectiveness of your recommended tactics for climate change adaptation? What are the metrics needed to answer these questions, and how/when will you collect the necessary measurements?

What are the key questions you'll want to be able to answer to determine the effectiveness of your recommended tactics for climate change adaptation? What are the metrics needed to answer these questions, and how/when will you collect the necessary measurements?

Monitoring and Evaluating Effectiveness: rate how strongly you agree/disagree with the following statements.

	Disagree					Agree				
I can identify monitoring metrics to assess the effectiveness of my management tactics.	<input type="radio"/>									
I understand how the measurements collected through my monitoring plan could help me adjust future management.	<input type="radio"/>									

What information do you already have to help you measure the effectiveness of your climate adaptation tactics?

What information do you already have to help you measure the effectiveness of your climate adaptation tactics?

« Previous
Monitoring Plan

Next »
Homework 6

Climate-Informed Inventory

What can commonly collected forest inventory data tell us about climate change risks or adaptability?

Repurposed metrics:

Inventory Metric	Normally would be used to...	In the context of climate change...
Tree Species Richness Tree Species Evenness	Give an indication of stand- or forest-level diversity	Higher species evenness and richness may have greater adaptive capacity/ lower risk
Regeneration	Show effectiveness of regen treatments; inform future actions	Regeneration may be most influenced by climate change; potential early indication of change or future issues

New Climate Risk Metrics

Are the trees in this stand/forest/area at risk from climate change?

- Integrates Climate Change Tree Atlas projections, which are part of published vulnerability assessments
- “At risk” species identified for an ecoregion
 - Suitable habitat reduced >20% by 2100
 - Classified as decrease or large decrease
- ***IMPORTANT: Metric signals that species is at risk of decline across a general region, but it is up to manager to evaluate that information given local knowledge***

New Risk Metrics

Northern Hardwood Stand:

Species	Basal Area	Stems Per Acre	Freq. (%)	Proportion of Stand (IV %)
Sugar maple	79.0	117.1	100.0	40.8
White ash	33.1	30.7	96.2	17.9
American basswood	18.5	23.7	73.1	12.3
Yellow birch	7.7	12.4	53.8	7.0
Bigtooth aspen	10.0	16.1	15.4	5.5
Red maple	4.2	8.6	42.3	5.0
Northern red oak	1.5	0.7	42.3	3.2
American elm	0.4	0.4	34.6	2.4
Paper birch	1.9	5.3	11.5	2.0
Black ash	1.5	2.6	7.7	1.2
Black cherry	0.4	0.2	15.4	1.1
Eastern hemlock	1.2	1.9	3.8	0.8
Quaking aspen	0.8	0.6	7.7	0.8
Total	160.2	220.3		100.0

New Risk Metrics

Northern Hardwood Stand:

Low (PCM B1)

Species	Basal Area	Stems Per Acre	Freq. (%)	Proportion of Stand (IV %)	Future: Current Habitat	Change Class	At-risk Proportion of Stand (%)
Sugar maple	79.0	117.1	100.0	40.8	0.8	No Change	0.0
White ash	33.1	30.7	96.2	17.9	1.6	Increase	0.0
American basswood	18.5	23.7	73.1	12.3	1.1	No Change	0.0
Yellow birch	7.7	12.4	53.8	7.0	0.8	Decrease	7.0
Bigtooth aspen	10.0	16.1	15.4	5.5	1.0	No Change	0.0
Red maple	4.2	8.6	42.3	5.0	1.0	No Change	0.0
Northern red oak	1.5	0.7	42.3	3.2	1.3	Increase	0.0
American elm	0.4	0.4	34.6	2.4	2.3	Increase	0.0
Paper birch	1.9	5.3	11.5	2.0	0.7	Decrease	2.0
Black ash	1.5	2.6	7.7	1.2	0.7	Decrease	1.2
Black cherry	0.4	0.2	15.4	1.1	2.4	Large Increase	0.0
Eastern hemlock	1.2	1.9	3.8	0.8	1.2	Increase	0.0
Quaking aspen	0.8	0.6	7.7	0.8	0.6	Decrease	0.8
Total	160.2	220.3		100.0		Proportion at-risk:	11.0

New Risk Metrics

Northern Hardwood Stand:

Low (PCM B1)

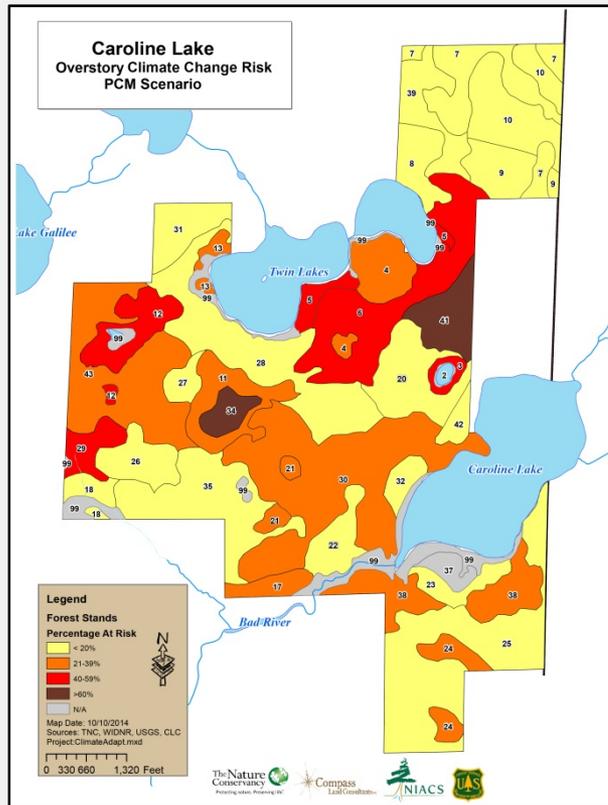
High (GFDL A1F1)

Species	Basal Area	Stems Per Acre	Freq. (%)	Proportion of Stand (IV %)	Future: Current Habitat	Change Class	At-risk Proportion of Stand (%)	Future: Current Habitat	Change Class	At-risk Proportion of Stand (%)
Sugar maple	79.0	117.1	100.0	40.8	0.8	No Change	0.0	0.3	Large Decrease	40.8
White ash	33.1	30.7	96.2	17.9	1.6	Increase	0.0	1.9	Increase	0.0
American basswood	18.5	23.7	73.1	12.3	1.1	No Change	0.0	1.4	Increase	0.0
Yellow birch	7.7	12.4	53.8	7.0	0.8	Decrease	7.0	0.2	Large Decrease	7.0
Bigtooth aspen	10.0	16.1	15.4	5.5	1.0	No Change	0.0	0.4	Large Decrease	5.5
Red maple	4.2	8.6	42.3	5.0	1.0	No Change	0.0	0.6	Decrease	5.0
Northern red oak	1.5	0.7	42.3	3.2	1.3	Increase	0.0	1.1	No Change	0.0
American elm	0.4	0.4	34.6	2.4	2.3	Increase	0.0	3.2	Large Increase	0.0
Paper birch	1.9	5.3	11.5	2.0	0.7	Decrease	2.0	0.2	Large Decrease	2.0
Black ash	1.5	2.6	7.7	1.2	0.7	Decrease	1.2	0.6	Decrease	1.2
Black cherry	0.4	0.2	15.4	1.1	2.4	Large Increase	0.0	1.4	Increase	0.0
Eastern hemlock	1.2	1.9	3.8	0.8	1.2	Increase	0.0	0.4	Large Decrease	0.8
Quaking aspen	0.8	0.6	7.7	0.8	0.6	Decrease	0.8	0.2	Large Decrease	0.8
Total	160.2	220.3		100.0		Proportion at-risk:	11.0		Proportion at-risk:	63.0

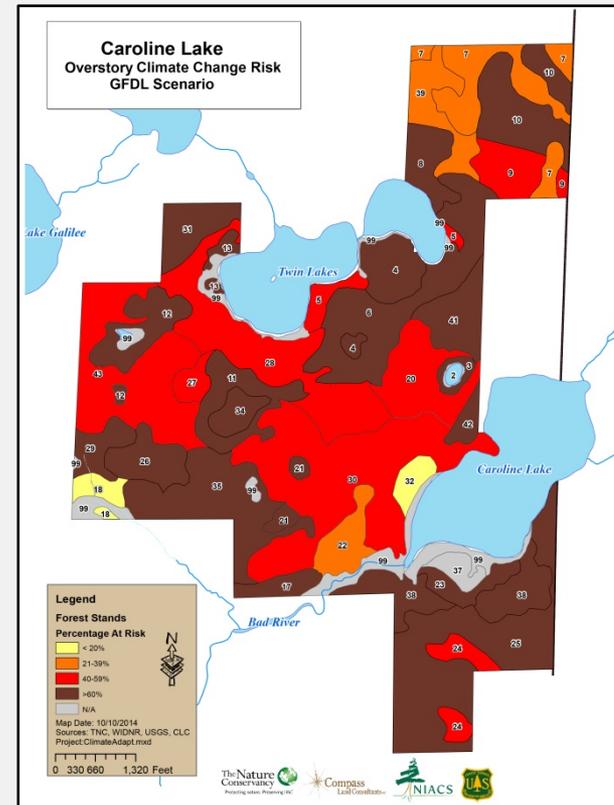
Risk by stand:

Overstory:

Low (PCM B1)

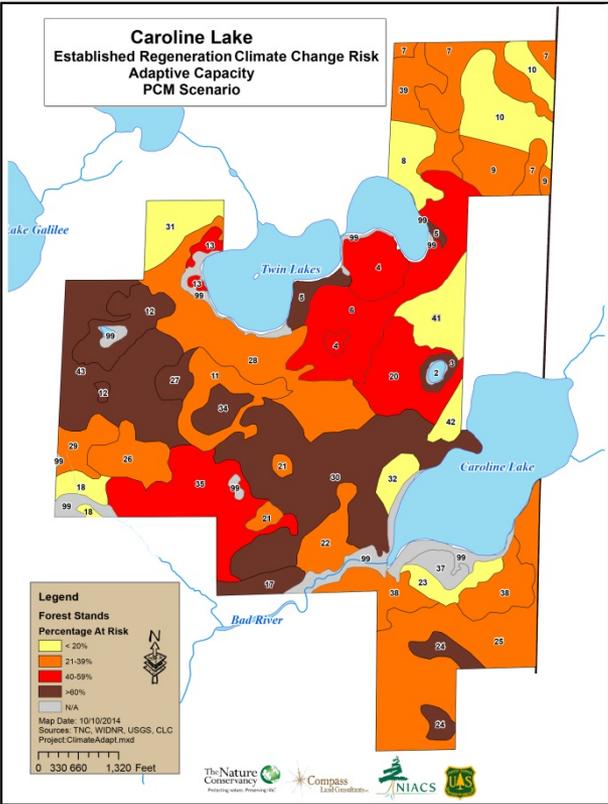


High (GFDL A1F1)

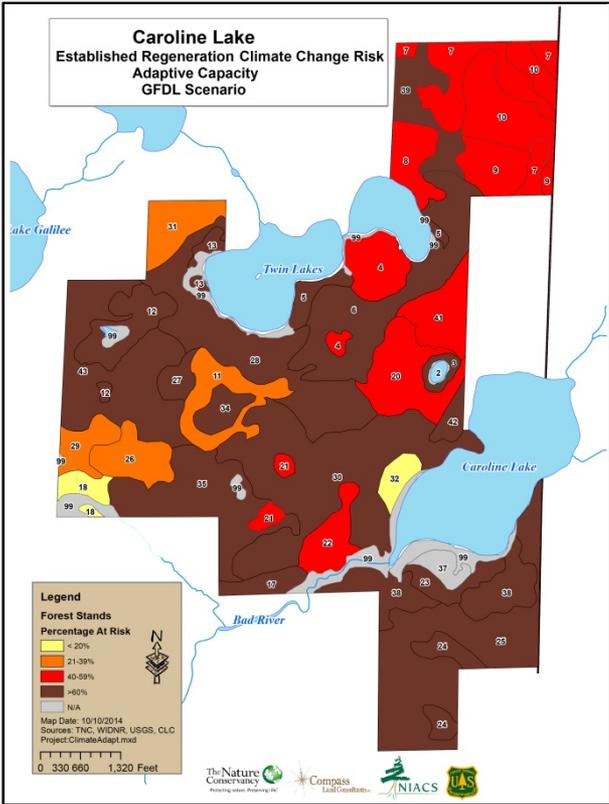


Risk by stand: Established regen/saplings

Low (PCM B1)



High (GFDL A1F1)



Assignment

- Complete **Step 5**: Monitor and evaluate effectiveness
- Complete the **Homework** section after Step 5
- Additional reading:
 - Janowiak et al. 2017
 - Rowland and Cross 2015
- Come to Session 6 (Feb. 20) ready to discuss your monitoring!

Thanks everyone!

Troubleshooting? Stay on the line.