Web session etiquette. Please:

• If you are using a phone, turn off your computer speakers to avoid feedback and terrible noises.

• Mute your line unless you are speaking to the group.
Hello again!

Today’s Agenda

Discussion:
- Review Step 2
- Impacts activity

Lecture:
- Step 3 introduction and demonstration
- This week’s assignment!

National Absurdity Day  November 20
www.NationalDayCalendar.com
1. **DEFINE** area of interest, management objectives, and time frames.

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

3. **EVALUATE** management objectives given projected impacts and vulnerabilities.

4. **IDENTIFY** and implement adaptation approaches and tactics.

5. **MONITOR** and evaluate effectiveness of implemented actions.

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**Menu of Adaptation Strategies & Approaches**

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**Vulnerability assessments, scientific literature, and other resources**

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**LAST WEEK – Step 2**
Step 2: ASSESS site-specific climate change impacts and vulnerabilities.

Key Question:
- How might the area be uniquely affected by climatic change and subsequent impacts?
- How might regional impacts be different in the project area?
### Step 2.1: ASSESS site-specific climate change impacts and vulnerabilities.

#### Regional Climate Impacts
- Based on regional info

#### Site-specific Impacts
- Based on your expertise

<table>
<thead>
<tr>
<th>Mgmt. Unit/ Topic</th>
<th>Climate Change Impacts and Vulnerabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Regional</td>
</tr>
<tr>
<td>From vulnerability assessments</td>
<td>Based on your knowledge of the site</td>
</tr>
<tr>
<td>Upland forest</td>
<td>More extreme precipitation events</td>
</tr>
<tr>
<td></td>
<td>Increased potential for summer drought</td>
</tr>
</tbody>
</table>
I understand the potential local impacts of climate change on the lands that I manage.
What additional information would have been helpful?
Step 2.2: Vulnerability determination

• How will potential climate change impacts affect this place?

• How resilient is this place to climate change impacts or disturbance?
How Vulnerable Are You?

Number of Projects in Each Category

- Low
- Low-moderate
- Moderate
- Moderate-high
- High
Vulnerability = Impacts + Adaptive Capacity

**Impacts**
- Physical factors
- Biological factors
- Human factors

**Adaptive Capacity**
- Biological factors
- Organizational/technical factors
- Economic factors
- Social factors
Impacts Activity

- Time to put on your thinking caps!
- Virtual white board will have post-it notes with the key impacts you mentioned in your homework.
- For each impact, we’ll ask you if there were site-level considerations that made those impacts more or less severe
Post-it Note Activity

http://note.ly/brandtleslieagmailcom

Physical Impacts

- Increases in temperature
- Lake effect?
- Urban heat island
- Sea level rise
- More variable precipitation: heavy rain events, droughts
- More extreme weather events/storms
- More severe hurricanes
- More variable snowfall
- Changes in soil moisture

Biological Impacts

- Changes in species composition
- Loss of low-elevation species due to flooding
- Increased non-native species invasion
- Current dominant species expected to do poorly
- Invasive plant introduction from ornamental plantings
- Lack of tree canopy diversity
- Loss of nursery stock and diversity from 2007/08 recession
- Diverse street tree population
Vulnerability = Impacts + Adaptive Capacity

Impacts
- Physical factors
- Biological factors
- Human factors

Adaptive Capacity
- Economic factors
- Biological factors
- Organizational/technical factors
- Social factors
What are some factors you identified that enhanced your adaptive capacity?

Consider: biological, organizational, economic, and social factors!
What are some factors you identified that reduced your adaptive capacity?

Consider: biological, organizational, economic, and social factors!
Other Feedback on Step 2?
Today – Step 3!

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

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

3. EVALUATE management objectives given projected impacts and vulnerabilities.

4. IDENTIFY and implement adaptation approaches and tactics.

5. MONITOR and evaluate effectiveness of implemented actions.

Menu of Adaptation Strategies & Approaches

Vulnerability assessments, scientific literature, and other resources
Step 3: EVALUATE management objectives given projected impacts and vulnerabilities.

Key Question:
- What management challenges or opportunities might occur?
- Can current management meet management goals?
- Do goals need to change?
Step 3 Course Materials

As you consider how potential climate change impacts will affect your ability to achieve your management goals and objectives, it is possible that some of these may no longer be feasible. Think about the following questions, which will be useful in completing your Homework, and which we will use for our group discussion:

- What are the biggest challenges that you see for meeting your management objectives?
- What are the biggest opportunities?

View Session 3 slides.

If you encounter technical issues with the Workbook or have suggestions for improvements, send us an email using this link.
Step 3: Evaluate management objectives

In this step, you will evaluate whether your management objectives are robust, or whether any might need to be changed. You will consider whether climate change might make them harder or easier to achieve. This is a critical step to determine whether your management objectives are under current management.

For example:

Let’s say your objective was to plant an additional 10,000 trees per year for the next 10 years. Potential challenges related to climate change might include that some species on your planting list are projected to decline over the next century, and more variable precipitation patterns will increase risk for newly planted saplings. An opportunity might be that colder winters could allow you to add new species to your planting list. You might decide that this objective had moderate feasibility due to reduced sapling survival and lack of sufficient nursery supply of new species and cultivars.

Thinking ahead...

If you find yourself brainstorming adaptation actions that could address climate-related challenges, jot down these ideas to capture them for the next step. You can also skip ahead to Step 4 momentarily, and your work on this page will be saved.
Expandable Impacts List

Review Regional Climate Impacts
Step 3

Challenges
- More invasive species to manage
- Shorter pruning window
- Some species can’t be planted anymore

Opportunities
- Can plant new species
- Longer growing season-more growth!

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

**Challenges to Meeting Management Objective with Climate Change**
– Things that will make it harder to achieve the management objective due to climate change.

**Focus on challenges within control of your management (not global markets, policies, etc.)**
## Examples of challenges

<table>
<thead>
<tr>
<th>Objective</th>
<th>Challenge from Climate Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restore hydrology through grading and installation of berm</td>
<td>Extreme events may inundate beyond project specifications and erode water control features</td>
</tr>
<tr>
<td>Plant 1000 trees per year</td>
<td>Reduced survival of planted trees from summer drought</td>
</tr>
<tr>
<td>Reduce invasive species cover by 20%</td>
<td>New invasive species may be arriving with milder winters</td>
</tr>
<tr>
<td>Promptly remove hazard trees</td>
<td>Increased storm events may increase the number of trees needed to be removed</td>
</tr>
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</table>
Challenges

List different ways climate impacts may make it more difficult to achieve your management goals and objectives.

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

Opportunities to Meeting Management Objective with Climate Change
– Things that will make it easier to achieve the management objective due to climate change.

**Focus on opportunities within control of your management (not global markets, policies, etc.)**
## Examples of Opportunities

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<th>Opportunity from Climate Change</th>
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<tr>
<td>Restore hydrology through grading and installation of berm</td>
<td>Extreme events may inundate beyond project specifications and erode water control features</td>
<td>Soil rehabilitation will increase infiltration &amp; storage, reducing the risks of runoff and erosion during severe rain or snowmelt</td>
</tr>
<tr>
<td>Plant 1000 trees per year</td>
<td>Reduced survival of planted trees from summer drought</td>
<td>Longer planting window.</td>
</tr>
<tr>
<td>Reduce invasive species cover by 20%</td>
<td>New invasive species may be arriving with milder winters</td>
<td>Some invasive plants may be negatively affected by climate change</td>
</tr>
<tr>
<td>Promptly remove hazard trees</td>
<td>Increased summer storm events may increase the number of trees needed to be removed</td>
<td>Fewer ice storm events are projected to occur in the area, reducing damage in winter.</td>
</tr>
</tbody>
</table>
Opportunities

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

Feasibility – Can you meet your management objectives using current (business-as-usual) management actions?

High: We can do it!
Opportunities > Challenges

Low: We’ll need more resources or effort.
Challenges > Opportunities
Feasibility

Rank: Low

Opportunities:
- New species could potentially be planted.

Feasibility Under Current Management:
- Low
- Medium
- High

Goal #2: Increase species diversity
Objective: Increase the percent of species that are native.

Challenges:
List different ways climate change impacts and associated vulnerabilities may make it more difficult to achieve your management objective.
**Step 3:** EVALUATE management objectives given projected impacts and vulnerabilities.

**Other Considerations**
– Social, financial, or other factors that also affect your ability to meet objectives.
## Other considerations

<table>
<thead>
<tr>
<th>Objective</th>
<th>Challenge from Climate Change</th>
<th>Opportunity from Climate Change</th>
<th>Feasibility</th>
<th>Other considerations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Restore hydrology through grading and installation of berm</td>
<td>Extreme events may inundate beyond project specifications and erode water control features</td>
<td>Soil rehabilitation will increase infiltration &amp; storage, reducing the risks of runoff and erosion during severe rain or snowmelt</td>
<td>Medium</td>
<td>Archaeological features present.</td>
</tr>
<tr>
<td>Plant 1000 trees per year</td>
<td>Reduced survival of planted trees from summer drought</td>
<td>Longer planting window.</td>
<td>Medium</td>
<td>Have a grant to do this work.</td>
</tr>
<tr>
<td>Reduce invasive species cover by 20%</td>
<td>New invasive species may be arriving with milder winters</td>
<td>Some invasive plants may be negatively affected by climate change</td>
<td>Low</td>
<td>Nursery trade still sells invasive plants</td>
</tr>
<tr>
<td>Promptly remove hazard trees</td>
<td>Increased summer storm events may increase the number of trees needed to be removed</td>
<td>Fewer ice storm events are projected to occur in the area, reducing damage in winter.</td>
<td>Medium</td>
<td>Legally required to do this.</td>
</tr>
</tbody>
</table>
Step 3: EVALUATE management objectives given projected impacts and vulnerabilities.

Slow down!
Are you going to continue with these management objectives?
Are you going to continue with the management objectives you have identified?

If you have high feasibility of meeting your management objectives and these objectives seem like they’ll hold up under projected climate change impacts, proceed to Step 4.

If some or all of your management objectives have low feasibility, or if they no longer seem sensible under climate change (e.g., managing a species that is very likely to experience a severe decline), you may want to reconsider your management objectives or your broader goals.

- If you’d like to create new goals or objectives, use the information you’ve gathered up to this point to create goals and objectives that are more likely to succeed across a range of climate change scenarios.
- If you’re still going to continue with objectives that have low feasibility, you might want to provide a short explanation of your decision.
- You can make all these notes in the “Feasibility” section of Step 3.

Continue working on this step

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

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

3. EVALUATE management objectives given projected impacts and vulnerabilities.

4. IDENTIFY and implement adaptation approaches and tactics.

5. MONITOR and evaluate effectiveness of implemented actions.

...or, RE-EVALUATE
Workbook Cycle: Step 3

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

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

3. EVALUATE management objectives given projected impacts and vulnerabilities.

4. IDENTIFY and implement adaptation approaches and tactics.

5. MONITOR and evaluate effectiveness of implemented actions.

Online Workbook auto-updates Mgmt Goals/Objectives into Step 3 for you.
Original Objective in Step 1

Example:
Objective: Increase the % cover of native species

Step 3 discovered:
Low feasibility given the number of species expected to decline

It’s time to rethink objectives to enhance feasibility given climate change –

*Do this before* moving on to adaptation actions*
Modified Objective

NOTE: Modifying objectives is different from adaptation strategies!

Example:

*Edit Objective:* Increase the % cover of native species

*New Objective:* Increase the % of species that are native or expected to gain habitat in the area

^ This obj. has a higher feasibility of meeting goals given climate change
Automatically updates Step 3

Updates to Step 3: New Objectives

back in Step 3
Key Points on Step 3

- **Challenges and Opportunities** should relate to CLIMATE CHANGE.

- **Other considerations section** is for things not related to climate change (policy, budget, public engagement)

- May seem redundant with Step 2 at times
  - Step 2 focuses on the impacts to the SITE and Step 3 focuses on impacts to OBJECTIVES and overall feasibility given changing conditions

- You may be tempted to list adaptation strategies in this step. **Save your ideas for the next step!**
Homework

Homework 3

What are the most challenging climate impacts/vulnerabilities that could affect your management goals and objectives for your forest or project area?

Are there any climate impacts that present opportunities for meeting your management goals and objectives?

Weighing Feasibility: rate how strongly you agree/disagree with the following self-assessments.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Disagree</th>
<th>Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can explain how climate change may affect my ability to meet management goals and objectives.</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I’ve determined that my project goals and objectives as articulated in Week 1 of the course are still feasible.</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>I would feel comfortable articulating management challenges and opportunities related to climate change to my peers.</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Were there any components of your management goals and objectives that were deemed unfeasible under projected climate changes and impacts? Did you return to Step 1 to refine or alter them? Why?

<table>
<thead>
<tr>
<th>Statement</th>
<th>Disagree</th>
<th>Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Were there any components of your management goals and objectives that were deemed unfeasible under projected climate changes and impacts? Did you return to Step 1 to refine or alter them? Why?</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
To-do list:

- Finish any hanging items from Step 2

- **Complete Step 3:** Evaluate management objectives

- **Complete the Homework** section following Step 3

- **Come to Session 4** (November 27) ready to talk about your management challenges and opportunities
Recommended Reading

General trends/benefits of urban forests (by David Nowak)


Role of urban forests in carbon sequestration

- Nowak et al. 2013: https://www.fs.usda.gov/treesearch/pubs/46254

Webinar and resources on urban trees and stormwater

- https://www.fs.fed.us/research/urban-webinars/integrating-trees
Connecting with Your Classmates on SLACK

urbanwaterfapp.slack.com
Looking Ahead

Session 4 (November 27) will cover Adaptation Strategies!

If you want to read ahead:

Millar et al. 2007:

Urban Forestry Adaptation Strategies and Approaches (Chapter 4) in Forest Adaptation Resources
Questions?