Climate Change Response Program
Natural Resources Stewardship and Science

National Park Service
U.S. Department of the Interior



Planning for a Changing Climate in National Parks

Self-guided Workbook for
Scenario-based Climate Adaptation

Contents

About the Workbook 1
Introducing Climate Adaptation Planning 3
Step 1: Inform the Planning Process 8
Step 2: Assess Climate Vulnerabilities and Risks 11
Step 3: Evaluate Climate Implications for Management Goals 14
Step 4: Identify Potential Adaptation Strategies 16
Step 5: Evaluate and Select Priority Adaptation Strategies 20
Step 6: Implement Adaptation Strategies and Track Effectiveness 23

About the Workbook

Target audience

- Park Management Teams
- Natural Resource Managers
- Cultural Resource Managers
- Visitor Use Managers
- Facilities Managers

Purpose

This workbook is intended to help park managers identify climate change adaptation strategies for focal resources and assets. This can be done in a formal planning effort (e.g., a Resource Stewardship Strategy) or to inform decisions outside of formal planning efforts (e.g., decisions about whether/how to manage a particular wildlife species).

This workbook builds on Planning for a Changing Climate – the National Park Service's official guidance on how to do climate-smart planning.

Product(s)/Output(s)

Following the steps in the workbook will result in a spreadsheet that identifies priority adaptation strategies for a focal resource or asset and next steps for implementing those strategies.

How to use this workbook

This workbook should be used by a small group (1-8 people) focused on a single resource or asset. The group will use park background information, the park's climate futures (and/or other sources of climate change information), and the group's own expertise to identify the following:

1) Current management goals and practices and how those should be updated to be climate smart
2) Climate change vulnerability of focal resources/assets under multiple climate futures
3) Adaptation strategies for focal resources/assets
4) Implementation steps for priority adaptation strategies

This workbook can be completed in 2-4 hours(?) (continuous or spread over several meetings). The process requires 1 hour of background reading by all participants and an additional 1 hour of preparation by the process leader. Each step that follows contains more specific information how to fill out the worksheet.

What you need to get started

This workbook is most effective when you have the following materials ready at the outset:

1) Existing park planning and management documents that identify current management goals and strategies for the focal resource (e.g., the park's Foundation Document, General Management Plan or Resource Stewardship Strategy)
2) Your park's climate futures summary, which can be found here: CONUS Park Climate Future Summaries (NPS DataStore)
3) Subject matter experts who know the focal resource at the park (see Roles section below)

Roles

The workbook is designed to work best for a group that contains the following – note that individuals can play multiple roles at any given time:

1) Process lead – needs to be familiar with this guidance (preferably have taken P4CC training); organizes meeting(s); assembles background materials; leads group through the steps
2) Park manager(s) – understands current and long-term management goals and societal context of the park; attends meeting(s); helps implement priority strategies
3) Subject matter expert(s) – responsible for helping to determine how climate change might impact focal resources/assets and identifying potential adaptation strategies; reads background materials; attends meeting(s); helps implement priority strategies
4) Notetaker – helps fill out worksheets for each step

Introducing Climate Adaptation Planning

What is climate change adaptation?

Climate change is having far-reaching impacts on natural and cultural resources, facilities, operations, and the visitor experience. **Climate change adaptation** is an intentional management response to observed climate changes or plausible future changes that involves identifying, preparing for, and responding to those changes.

However, parks face a major challenge in anticipating future impacts: not knowing their exact timing and nature. A single forecast is likely to be inaccurate, so it is risky to rely on any one prediction of the future to make management decisions.

Scenario planning—a longstanding military and private-sector tool adapted by the NPS and partners in recent years for NPS purposes—addresses this challenge. It offers a framework for working with uncertainty and preparing for a wide range of plausible future conditions. As displayed in figure 1 below, this structured process identifies a small set of scenarios—descriptions of potential future conditions that characterize a range of critical uncertainties—and uses them to inform planning. Climate change adaptation that incorporates scenario planning to work with climate uncertainty is known as Scenario-Based Climate Change Adaptation.



Figure 1: Forecast-based planning (left) uses predictions of a single future. Scenario-based climate change adaptation (right) works with a set of plausible futures that capture a broad range of conditions, providing a framework to support decisions under conditions that are uncertain and uncontrollable. NPS image

A useful set of scenarios is plausible (based on best available science), relevant (focused on the management question), divergent (characterizes a range of future conditions), challenging (effective for examining established practices and assumptions and fostering creative thinking),

and memorable (the main ideas is powerful and relatively easy to communicate). Working across scenarios, managers can identify:

- current practices likely or unlikely to succeed in the future,
- critical uncertainties around which monitoring or new science could be developed, and
- updated goals or strategies that are robust to an uncertain and dynamic future.

Cornerstones of NPS Adaptation Planning and Management

Two overarching themes anchor the NPS approach to planning and management in an era of climate change:

- ***Develop forward-looking goals*** that consider future climatic conditions.
- ***Consider more than one scenario*** of the future.

Additionally, several fundamental principles distinguish climate-informed planning and decisions from "business as usual:

- ***Act with intentionality***; link strategies to climate impacts
- ***Manage for change***, not just persistence
- ***Reconsider management goals***, not just strategies and actions

This workbook can help you utilize these principles to develop forward-looking goals and adaptation strategies for priority resources and/or assets.

NPS Adaptation Planning Process

The NPS adaptation planning process (figure 2 below) is an adaptive management framework that reflects familiar stages of planning and specifically addresses the implications of climate change. This workbook will guide you through each step via a worksheet and directions for how to fill it out.

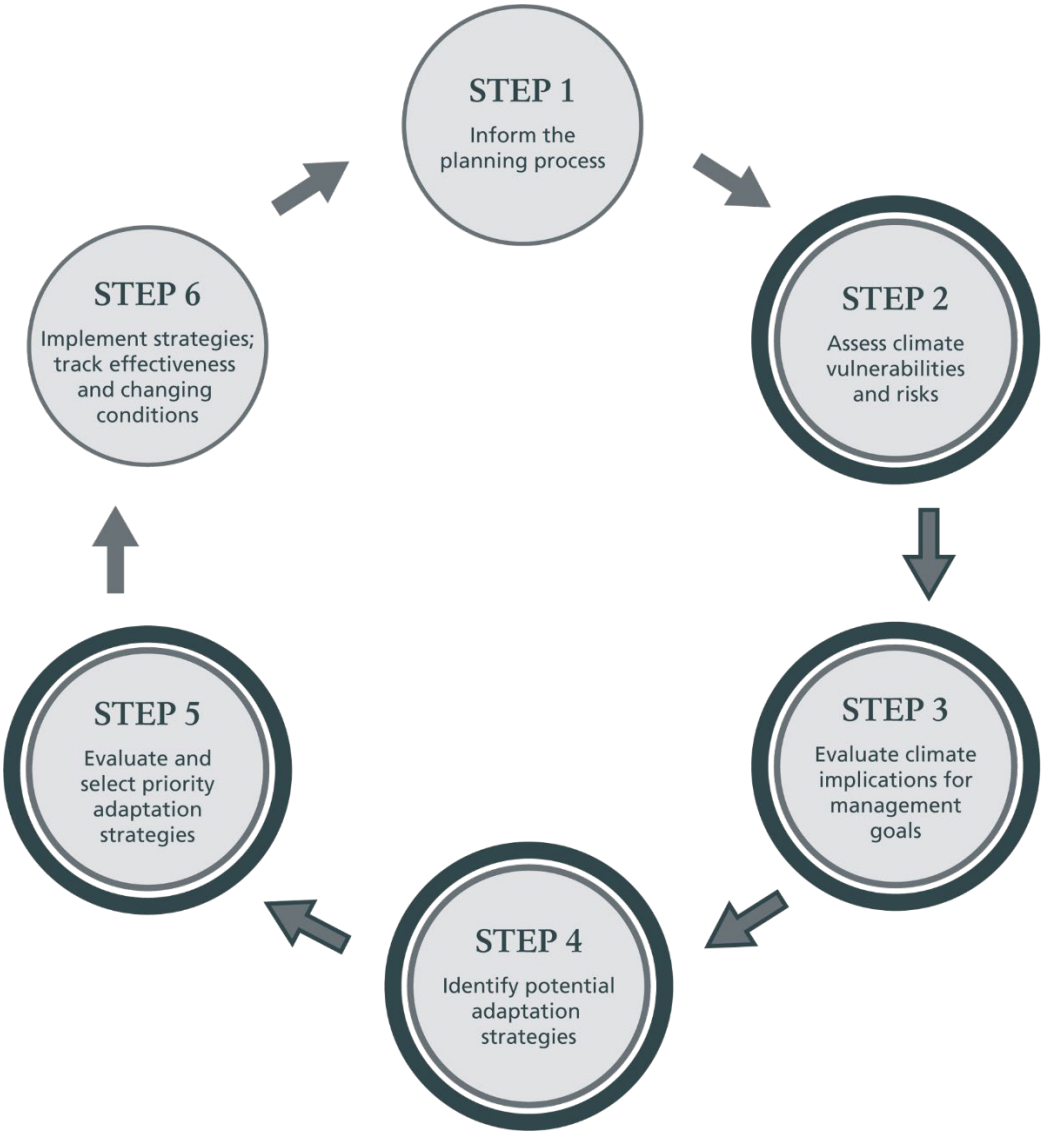


Figure 1. Generalized NPS adaptation planning process. The concentric circles and colored arrows represent multiple scenarios for consideration in Steps 2 through 5. NPS image

Adaptation Planning Cycle – At a Glance

Step 1. Inform the planning process

- Identify the focal resource or asset
- Identify a small group of experts on the resource/asset
- Compile relevant background information and review existing climate change information

Worksheet 1: Document existing management goals for the resource/asset

Step 2. Assess climate vulnerabilities and risks

- Use the park's climate futures summary to identify how climate change might impact the focal resource or asset
- Draw on any existing climate change vulnerability assessments for the region, park and/or focal resource

Worksheet 2: List relevant climate drivers, identify how they will impact the resource/asset, describe impacts in a short paragraph

Step 3. Evaluate climate implications for management goals

- Assess whether existing management goals are still feasible
- Update management goals as needed

Worksheet 3: Determine whether goals are still feasible under climate change. If not, draft updated goals

Step 4. Identify potential adaptation strategies

- Brainstorm an array of strategies to help the focal resource/asset adapt to climate change
- Use the RAD Framework to explore all the options

Worksheet 4: Brainstorm as many adaptation strategies as the group can think of. Ensure you've identified ways to Resist, Accept, and Direct change

Step 5. Evaluate and select priority adaptation strategies

- Evaluate and rank brainstormed adaptation strategies from Worksheet 4
- Select 3-5 priority adaptation strategies to try out

Worksheet 5: Score and rank the adaptation strategies from Step 4. Pick the top 3-5 strategies you want to implement

Step 6. Implement strategies; track changing conditions and adaptation effectiveness

- Identify next steps to implement priority adaptation strategies
- Monitor changing conditions and the effectiveness of adaptation strategies; adjust as needed

  Worksheet 6: Identify next steps to implement the top 3-5 adaptation strategies for the resource/asset

Step 1: Inform the Planning Process

Objectives

- Identify the focal resource or asset.
- Assemble a small team with relevant expertise.
- Plan when, where, and how the group will meet to complete the process.
- Review background info and document existing management goals on *Worksheet 1*.
- Review the park's climate futures summary.

Choose a Focal Resource or Asset

For this workbook, you will focus on one distinct focal resource or asset. Limiting the scope to a specific resource or asset will allow you to complete the rest of the workbook efficiently with a small group.

Examples:

- Natural resources: riparian vegetation, black bears
- Cultural resources: historic visitor center, a specific archeological site
- Facilities: culverts along a specific road, park staff housing
- Visitor use: backcountry permit open/close dates, shade structures for a specific trail

Write the focal resource or asset in the lefthand column of Worksheet 1

Assemble a (Small) Group of Experts

Identify the relevant experts within the park staff. It is best to keep the group between 2-8 people total in order to move through the process efficiently.

You can consider including relevant expertise from outside the park, but should limit external group members to close partners already working with the park who are familiar with resource conditions and management goals and activities.

Once you have identified your team, assign the following roles. Note that individuals can play multiple roles at any given time:

1) Process lead – needs to be familiar with this guidance (preferably have taken P4CC training); organizes meeting(s); assembles background materials; leads group through the steps
2) Subject matter expert(s) – responsible for helping to determine how climate change might impact focal resources/assets and identifying potential adaptation strategies; reads background materials; attends meeting(s); helps implement priority strategies
3) Notetaker – helps fill out worksheets for each step

Plan When, Where and How the Group will Meet to Complete the Process

This process is designed to be completed in 2-4 hours (not including prep time). The process can be completed in a single sitting, or over the course of multiple meetings.

The Process Lead will need to identify when and where the group will meet and send calendar invitations. The process can be completed in-person or virtually. We recommend that all participants either be in-person or virtual – hybrid meetings make it challenging to complete the process efficiently.

All participants should review relevant background materials and the park's climate futures summary prior to the meeting. The Process Lead should provide these materials to participants ahead of time.

Record Current Management Goals

Review the current management goals and/or desired conditions for the focal resource or asset. Good sources to review for existing management goals include Foundation Documents and existing management plans (General Management Plans, Resource Management Plans, etc.).

Write the current management goal or goals in the middle column of Worksheet 1.

Note: this can be done with the full group or independently by the Process Lead prior to the meeting. The Process Lead should share relevant background materials with other group members prior to the first meeting.

Assess Scope and Timeframe

Identify the stated (or assumed!) geographic scope and time frame of existing management goals. Record your response in the righthand column of Worksheet 1. The geographic scope is often assumed to be parkwide and timeframe is often assumed to be in perpetuity unless otherwise stated. Step 1 is simply about recording existing goals—you will revisit and potentially update them in Step 3.

Note: this can be done with the full group or independently by the Process Lead prior to the meeting.

Review the Park's Climate Futures Summary

Download a copy of your park's climate future summary here: CONUS Park Climate Future Summaries (NPS DataStore)

Gather other relevant climate change information for the park and/or the focal resource/asset. Share copies of climate futures (and other relevant info) with all group members – everyone should review this information prior to the meeting.

Step 1 Worksheet: Inform the Planning Process

Focal Resource/Asset *What is the resource or asset you want to focus on?*	**Current Management Goal(s)** *What do you hope to achieve?*	**Geographic Scope & Timeframe** *What area(s) are you focusing on? What is your timeframe for achieving management outcomes?*
EXAMPLE: Wet meadows and fens	No net loss of wet meadows and fens	Geographic Scope: Park-wide Timeframe: In perpetuity
Focal Resource/Asset:		Geographic Scope: Timeframe:

Step 2: Assess Climate Vulnerabilities and Risks

Objectives

- Review the climate futures summary.
- Identify what climate drivers (or metrics) are most relevant for the focal resource/asset.
- Use the group's expertise to identify potential climate change impacts to the resource/asset.
- Describe what the future might look like for the focal resource/asset for each climate future.

Review the Park's Climate Futures Summary

Review the information contained in your park's climate futures summary (CONUS Park Climate Future Summaries (NPS DataStore). Review any other relevant climate change information for the park and/or focal resource/asset. This could include searching IRMA for existing climate change vulnerability assessments and other climate information that could be relevant for your park.

Identify the most relevant climate drivers, or climate metrics, for the focal resource/asset. List those metrics for each climate future in the second column of Worksheet 2.

Assess Impacts & Vulnerabilities

Use the group's expertise to identify how the focal resource/asset might be impacted by the different climate futures.

List the different ways each climate future might impact your focal resource/asset in the third column of Worksheet 2.

Summarize in a Narrative Paragraph

Create a brief (2-3 sentence) narrative story about what the resource or asset might look like in 2050 under each climate future. Consider adding a catchy title. This description and title will help you remember and refer to the climate scenarios for your resource in the remaining steps.

Provide a brief description of the climate scenario with a catchy title in the righthand column of Worksheet 2.

Step 2 Worksheet: Assess Climate Vulnerabilities and Risks

Resource/Asset/Value *(copy focal resource/asset from Step 1 worksheet)*	**Climate Futures** *What are the most relevant climate drivers (or metrics) for your focal resource/asset, and how are they changing?*	**Impacts/Vulnerabilities** *Under each climate future, what are the potential impacts to your focal resource/asset?*	**Focal Resource/Asset Scenario** *Develop a brief (1-3 sentence) narrative describing what the scenario might look like in 2050. Add a catchy title to help you remember it better!*
EXAMPLE: Wet meadows and fens	Climate Future: Warm Wet • Temperature rises 3.1°F by 2050. • Precipitation increases by 1.1 inches per year on average by 2050, but with high interannual variability. • More precipitation will come in extreme rain events. So less frequent, but heavier rain events. Droughts will occur more frequently, but will be similar in duration and severity as in the past.	• High snowpack increases; but still declines at lower elevations • Rain-on-snow more frequent, with spikes in runoff and flooding • River and stream flow more erratic • Rivers and creeks are more erosive, turbid • Higher nutrient and contaminant loads in aquatic environments • Frequent flash droughts and flash floods	By 2050, wetlands already degraded with incised channels become further degraded with more extensive and deeper gully systems. The growing season lengthens for wetland plants, productivity increases, and species composition shifts. Wetlands oscillate frequently between flash droughts and flooding. At the highest elevations, existing wetlands expand due to more snowpack and warmer temperatures. Lower elevation wetlands contract and some dry out completely. **Scenario Name**: Soggy & Flashy
	Climate Future: Hot Dry • Temperature rises 5.6°F by 2050 • The average number of days per year over 93°F increases by 30 days • Precipitation decreases by 1.4 inches per year on average by 2050, but with high interannual variability. • Drought frequency, duration and intensity will all increase significantly – most years will be drought years • Climatic water deficit will increase significantly. • Wildfire frequency and intensity will increase.	• Snowpack declines and snow melts much earlier • Runoff higher in winter, lower in summer • Much higher climatic water deficit stresses vegetation • Lower stream flows • Reduced plant growth • Fire season is weeks longer, higher fire severity, area burned increases when fires start • Wet areas will be drier, and some may no longer hold water through the summer.	By 2050, wetlands dry out by May/June and only hold water in the summer after heavy rain events. Species compositions shifts to upland plant species with more bare ground. Meanwhile, obligate wetland plants decline, and drying peat decomposes and causes organic soil loss. There is more invasion by non-native plants, and establishment of upland woody species into meadows. Large wetlands become small, and small wetlands disappear. **Scenario Name**: Drying Out & Burning Up

Step 2 Worksheet: Assess Climate Vulnerabilities and Risks (Continued)

Resource/Asset/Value *(copy focal resource/asset from Step 1 worksheet)*	**Climate Futures** *What are the most relevant climate drivers (or metrics) for your focal resource/asset, and how are they changing?*	**Impacts/Vulnerabilities** *Under each climate future, what are the potential impacts to your focal resource/asset?*	**Focal Resource/Asset Scenario** *Develop a brief (1-3 sentence) narrative describing what the scenario might look like in 2050. Add a catchy title to help you remember it better!*
Focal Resource/Asset:	**Climate Future Name:** •		Narrative Description: Scenario Name:
	Climate Future Name: •		Narrative Description: Scenario Name:

Step 3: Evaluate Climate Implications for Management Goals

Objectives

- Assess whether existing management goals are still feasible
- Update management goals as needed

Note: This step is meant to help you identify when goals may no longer be realistic and draft updated management goals. Don't get stuck wordsmithing goal language!

Assess Climate Implications for Current Goals

Using the climate impacts/vulnerabilities and scenario names and narratives you developed in Step 2, assess the viability of current management goals for both climate futures. Current goals will sort into three possible categories:

- Goals that continue to appear achievable under all scenarios
- Goals that may be achievable (or partially so) under some scenarios but not others
- Goals that do not seem achievable under any of the scenarios

Re-write the focal resource/asset and current management goal(s) in column 1 in Worksheet 3. Copy over the scenario names from Worksheet 2. Discuss and record the group's conclusion about whether or not a goal is still feasible under each climate scenario in column 2 in Worksheet 3.

Update Climate-compromised Goals

Reframe your management goals to reflect what might be realistic under future climate conditions. Updates may not require wholesale revision, but rather modifications to just one or two of the following components:

- What (focal resources, assets, and values)
- Why (intended outcomes or conditions)
- Where (relevant geography)
- When (relevant time frame)

Record (draft) updated goals in column 3 of Worksheet 3.

Step 3 Worksheet: Evaluate Climate Implications for Management Goals

Resource/Asset & Current Goal(s) *Copy focal resource/asset and management goal(s) from Step 1 worksheet*	**Climate Implications for Existing Goal(s)** *Copy scenario names over from Worksheet 2. Is the current goal feasible under each scenarios?*	**Climate-Informed Goal(s)** *What might be a realistic goal under future scenarios?*
EXAMPLE: Resource: Wet meadows and fens Current Goal: No net loss of wet meadows and fens	Scenario Name: Soggy & Flashy Goal feasibility: marginal wetlands will still convert to uplands due to warmer conditions, but upper elevation and larger wetlands could expand or remain stable under wetter conditions. Scenario Name: Drying Out & Burning Up Goal feasibility: there is no practical way to keep most wetlands – maybe some wetlands will remain at the highest elevations. Most wetlands will dry out and convert to uplands.	Draft New Goal: Minimize loss of high value wetlands, promote native upland vegetation and limit invasives where wetlands are converting.
Focal Resource/Asset: Current Goal(s):	Scenario Name: Goal Feasibility: Scenario Name: Goal Feasibility:	

Step 4: Identify Potential Adaptation Strategies

Objectives

- Brainstorm an array of strategies to help the focal resource/asset adapt to climate change
- Use the resist-accept-direct (RAD) Framework to explore the full range of adaptation options

Time to Brainstorm

Now for the fun part! As a group, brainstorm as many adaptation strategies as you can think of for the focal resource or asset. Ultimately, the challenge of addressing climate change will necessitate developing innovative strategies. So stretch your thinking and be creative!

Copy the Focal Resource/Asset into column 1 in Worksheet 4. Copy the scenarios from Worksheet 2 in column 2. Then list brainstormed ideas in column 3.

Get RAD!

The resist–accept–direct (RAD) framework (Figure 3 below) offers three distinct choices we may make in response to human-driven climate change and the prospect of large changes and/or transformation. They are, very simply, to resist, accept, or direct the trajectory of change. Identifying these choices can provide clarity regarding types of strategies that parks can consider and aid in brainstorming a more robust array of strategies.

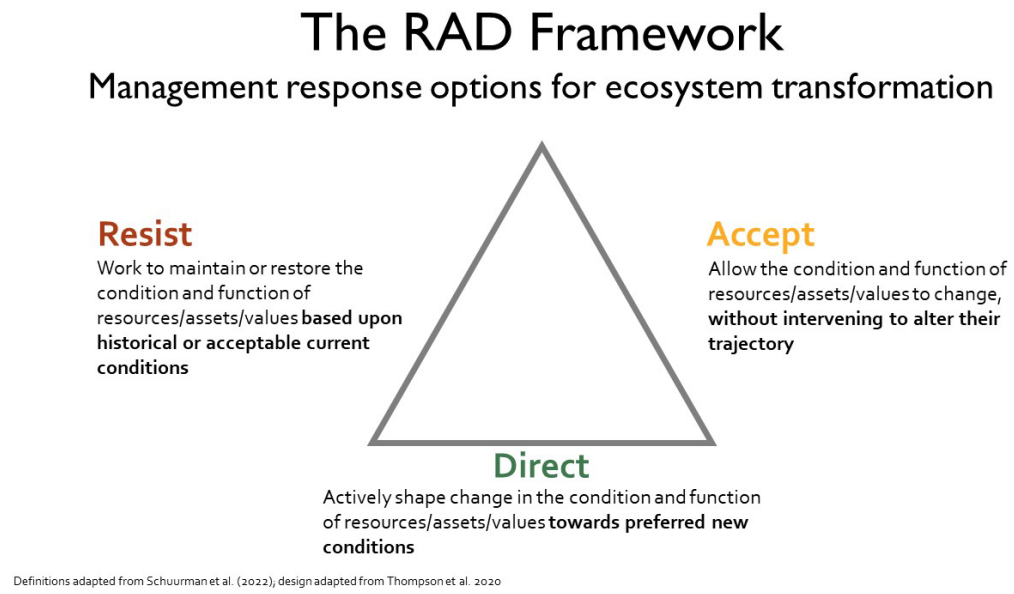


Figure 3: The Resist-Accept-Direct Framework. NPS image

Use the RAD framework to make sure your brainstorm includes all the different options. Try to identify at least one Resist, Accept, and Direct strategy. Figure 4 below can help you decide whether a brainstormed strategy is resisting, accepting, or directing. Don't worry too much about getting the label exactly right – the whole point of RAD is to stretch our thinking and consider new strategies that allow us to manage for change, and not just persistence. The most important thing is to be creative!

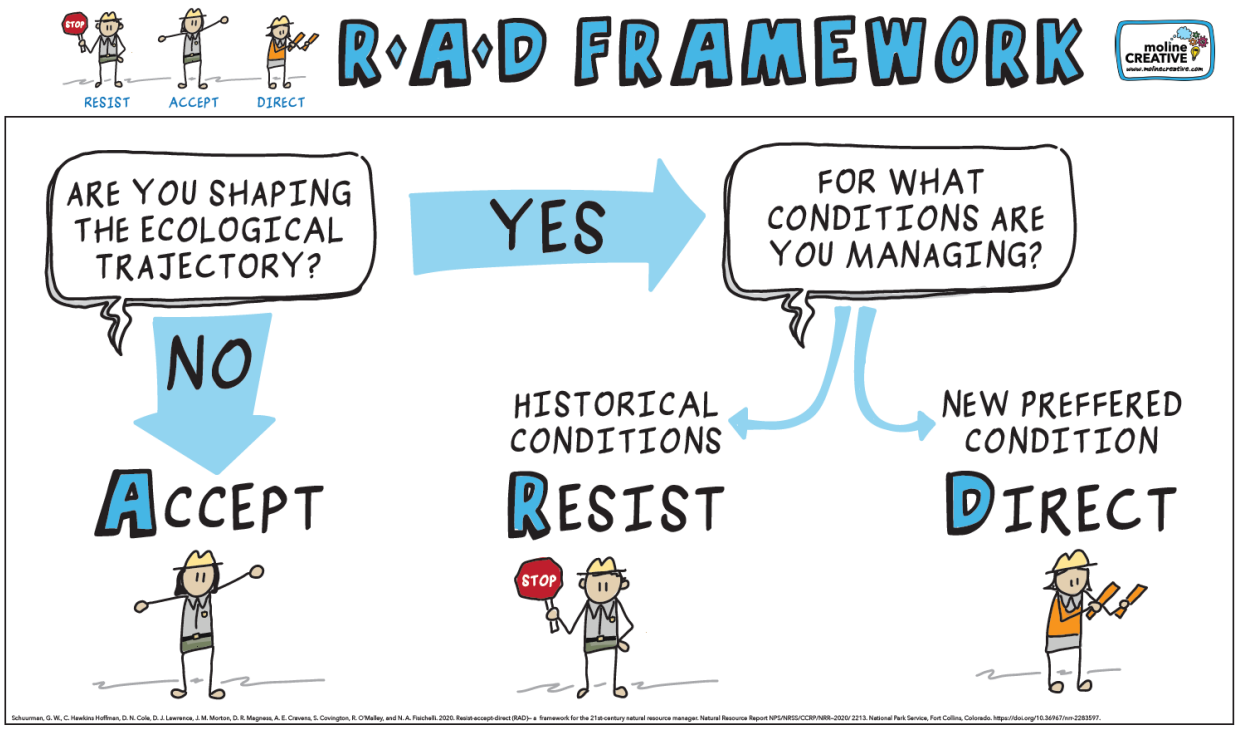


Figure 4: How to know if a management strategy should be considered Resist, Accept, or Direct. Image credit: Moline Creative (adapted from Schuurman et al., 2020)

If you'd like to learn more about the RAD framework, consider starting with the NPS's RAD webpage: Resist-Accept-Direct Framework (nps.gov).

Step 4 Worksheet: Identify Potential Adaptation Strategies

Resource/Asset *Copy focal resource/asset*	**Climate Scenarios** *Copy scenarios from Worksheet 2*	**Adaptation Strategies** *Brainstorm potential adaptation strategies.*

EXAMPLE: Wet meadows and fens	Scenario Name: Soggy & Flashy
	
	Narrative Description: Wetlands already degraded with incised channels become further degraded with more extensive and deeper gully systems. The growing season lengthens for wetland plants, productivity increases, and species composition shifts. Wetlands oscillate frequently between flash droughts and flooding. At the highest elevations, existing wetlands expand due to more snowpack and warmer temperatures. Lower elevation wetlands contract and some dry out completely.
		• Resist:
		  ○ Channel restoration for high-priority wetlands.
		  ○ Test methods to retain moisture in wetlands (reintroduce beavers, artificial beaver dams, etc.).
		  ○ Install snow fencing to retain snow near high-priority wetlands.
		  ○ Pull/spray invasives around high-priority wetlands.
		• Accept:
		  ○ Allow lower priority wetlands to convert to uplands. Interpret environmental changes as they occur.
		• Direct:
		  ○ Identify locations where wetlands could expand under wetter conditions and explore methods to facilitate expansion (e.g., excavation around wetlands to allow them to hold more water after heavy rainfall events).
		  ○ Consider managed relocation of wetland species from lower elevations and/or south of the park that are under threat, but may do well at higher/northern locations under warmer conditions.

	Scenario Name: Drying out & Burning Up
	
	Narrative Description: Wetlands dry out by May/June and only hold water in the summer after heavy rain events. Species compositions shifts to upland plant species with more bare ground. Meanwhile, obligate wetland plants decline, and drying peat decomposes and causes organic soil loss. There is more invasion by non-native plants, and establishment of upland woody species into meadows. Large wetlands become small, and small wetlands disappear.
		• Resist:
		  ○ Test methods to retain moisture in wet meadows and fens (e.g., artificial beaver dams).
		  ○ Create holding ponds above most important wetlands to help retain moisture from extreme precipitation events.
		• Accept:
		  ○ Allow wetlands to convert to uplands. Interpret environmental changes as they occur.
		  ○ Pull/spray invasives around wetlands to limit expansion as wetlands contract.
		• Direct:
		  ○ Identify desirable upland species to plant in areas where wetlands are likely to convert. Have seed mixes ready to disburse after wildfires.

Step 4 Worksheet: Identify Potential Adaptation Strategies

Resource/Asset *Copy focal resource/asset*	**Climate Scenarios** *Copy scenarios from Worksheet 2*	**Adaptation Strategies** *Brainstorm potential adaptation strategies.*
Focal Resource/Asset:	Scenario Name: Narrative Description:	• Resist: ○ ○ ○ • Accept: ○ ○ ○ • Direct: ○ ○ ○
	Scenario Name: Narrative Description:	• Resist: ○ ○ ○ • Accept: ○ ○ ○ • Direct: ○ ○ ○

Step 5: Evaluate and Select Priority Adaptation Strategies

Objectives

- Evaluate and rank brainstormed adaptation strategies from Worksheet 4
- Select 3-5 priority adaptation strategies to try out

Discuss Evaluation Criteria

Review the two evaluation criteria provided in the Step 5 Worksheets:

- Effectiveness in meeting the resource/asset goal under the climate scenarios (copy over the climate-smart goal for the resource/asset from Worksheet 3)
    - Rating 1-5, where 1=not effective and 5=very effective
- Feasibility
    - Rating 1-5, where 1=not feasible and 5=very feasible

As a group, discuss each criteria and make sure the group is clear on what the criteria means and how the rating works. Consider whether there is another crucial evaluation criteria that needs to be considered. If so, add a column to the worksheet with that additional criteria. Do not use more than 3 criteria or the process becomes too burdensome.

Copy over and Evaluate Adaptation Strategies

Copy all of the brainstormed adaptation strategies over from Worksheet 4. This is an opportunity to do some lumping/splitting and refining as needed. Each strategy should go in a row to be scored and ranked. Consider noting whether the strategy is a Resist, Accept, or Direct strategy.

Going row-by-row, discuss and score each adaptation strategy under each criteria. Consider writing a brief phrase or single sentence explaining the score in case you need to return to the table later.

After scoring all of the adaptation strategies, identify which strategies received the highest scores. Highlight the top 3-5 strategies. Discuss as a group if these reflect the highest priority adaptation strategies the park should implement and re-rank as needed. It is best to have at least one Accept and one Direct strategy in your top 5 to ensure that priority strategies span the whole adaptation space.

Step 5 Worksheet: Evaluate and Select Priority Adaptation Strategies

	Evaluation Criteria *Scale of 1-5: 1=Low (not effective or not feasible), 5=High (very effective, very feasible)*		
Focal Resource *Copy focal resource/asset* EXAMPLE: Wet meadows and fens **Adaptation Strategies** *Copy from Worksheet 4*	**Effectiveness in Meeting Goal Under Climate Scenarios** *Copy goal from Worksheet 3* EXAMPLE: Minimize loss of high value wetlands, promote native upland vegetation and limit invasives where wetlands are converting.	**Feasibility** *(add group definition if helpful)* EXAMPLE: Possible given current and likely future park resources and staffing, able to implement in wilderness areas.	**Overall Score & Ranking** *(add scores from columns 2-4 and then rank by score and group consensus)*
Resist: Channel restoration for high-priority wetlands.	Score: 4 Why: More extreme precip likely under both scenarios, channel restoration could help retain water longer and prevent further erosion.	Score: 3.5 Why: Park already doing riparian restoration, could focus more on high-priority wetlands. Manual restoration possible, but challenging in wilderness.	Score: 7.5 Rank: 2
Resist: Install snow fencing to retain snow near high-priority wetlands	Score: 2 Why: Probably effective under soggy & flashy, but not under drying out & burning up – would add dry fuels to high elevations.	Score: 2 Why: Not feasible in wilderness areas, which are most of the high elevation areas.	Score: 4 Rank: 5
Accept: Allow lower priority wetlands to convert to uplands. Interpret environmental changes as they occur. Spray/pull invasives around contracting wetlands.	Score: 4 Why: Can still minimize loss of high value wetlands and limit spread of invasives where conversion is already happening.	Score: 5 Why: Not enough resources to protect all wetlands, will need to focus on high-priority areas. Already doing this by default.	Score: 9 Rank: 1
Direct: Identify locations where wetlands could expand under wetter conditions and explore methods to facilitate expansion.	Score: 4 Why: Would allow high priority wetlands to expand under wetter scenario and allow wetlands to better handle flashy rain events under both scenarios.	Score: 1 Why: Not possible without heavy machinery and most high-priority wetlands are in wilderness. Could consider in non-wilderness areas.	Score: 5 Rank: 4
Direct: Consider managed relocation of wetland species from lower elevations and/or south of the park that are under threat, but may do well at higher/northern locations under warmer conditions.	Score: 5 Why: Best strategy to help retain (regionally) native vegetation and limit invasives. Promotes broader regional biodiversity and genetic stocks. Wetland species better adapted to warmer/drier conditions will help retain wetlands through droughts.	Score: 2 Why: Questions about ability to do this in wilderness and uncertainty around stakeholder support (and potential legal strategy) for managed relocation.	Score: 7 Rank: 3

Step 5 Worksheet: Evaluate and Select Priority Adaptation Strategies

	Evaluation Criteria *Scale of 1-5: 1=Low (not effective or not feasible), 5=High (very effective, very feasible)*		
Focal Resource *Copy focal resource/asset* *Insert here:* **Adaptation Strategies** *Copy from Worksheet 4*	**Effectiveness in Meeting Goal Under Climate Scenarios** *Copy goal from Worksheet 3 (insert here)*	**Feasibility** *(add group definition if helpful)*	**Overall Score & Ranking** *(add scores from columns 2-4 and then rank by score and group consensus)*
	Score: Why:	Score: Why:	Score: Rank:
	Score: Why:	Score: Why:	Score: Rank:
	Score: Why:	Score: Why:	Score: Rank:
	Score: Why:	Score: Why:	Score: Rank:
	Score: Why:	Score: Why:	Score: Rank:
	Score: Why:	Score: Why:	Score: Rank:
	Score: Why:	Score: Why:	Score: Rank:
	Score: Why:	Score: Why:	Score: Rank:
	Score: Why:	Score: Why:	Score: Rank:
	Score: Why:	Score: Why:	Score: Rank:

Step 6: Implement Adaptation Strategies and Track Effectiveness

Objectives

- Identify next steps to implement priority adaptation strategies
- Monitor changing conditions and the effectiveness of adaptation strategies; adjust as needed

Identify next steps to implement priority adaptation strategies

Copy the top 3-5 priority adaptation strategies identified in Step 5 onto Worksheet 6. Then discuss as a group what needs to happen to implement priority strategies. To help with this, Worksheet 6 focuses on the What, Where, When, How and Who for priority adaptation strategies.

- What – the priority adaptation strategies
- Where – where in the park will this strategy be implemented
- When – when should this strategy be implemented? When should the strategy be evaluated for effectiveness?
- How – what are the immediate next steps that need to happen to implement this priority strategy?
- Who – which park staff member is responsible for the next steps? Who else needs to be involved (including any external partners)?

Go Forth and Do Good Work!

Worksheet 6 represents the culmination of the adaptation planning process. You can use this worksheet as the 'final product' from this workbook to help guide implementation over time. Feel free to return to the process as needed to consider additional resources or assets and/or to update priority strategies based on monitoring changing conditions and adaptation strategy effectiveness over time.

Step 6 Worksheet: Next Steps for Priority Adaptation Strategies

Focal Resource/Asset & Updated Management Goal *Copy from Worksheet 3* EXAMPLE: Wet meadows and fens Climate-smart goal: *Minimize loss of high value wetlands, promote native upland vegetation and limit invasives where wetlands are converting.*		
Priority Adaptation Strategies (what) *Copy from Worksheet 5*	**Geographic Scope (where) & Timeframe (when)**	**Next step(s) to get started (how) & Responsible staff (who)**
Accept: Allow lower priority wetlands to convert to uplands. Interpret environmental changes as they occur. Spray/pull invasives around contracting wetlands.	Where: Lower elevation wetlands (under 4,000 ft.) that are already drying and contracting; mid-elevation wetlands with southern/eastern aspects. When: Already happening, so allow to continue. Need to ramp up invasive plant management now through 2030.	How: No action required for wetland contraction; Work with volunteers, trail crews, and Climate Corps on weed pulls/spraying in spring and fall for next two FYs. Monitor invasive status and re-evaluate. Who: Vegetation specialist and volunteer program lead coordinate.
Resist: Channel restoration for high-priority wetlands.	Where: Wetlands above 7,000 feet, wetlands over 2 acres in extent, wetlands fed by groundwater springs, wetlands with northern/western aspects. When: Discontinue riparian restoration work near lower elevation wetlands. Shift work to upper elevations and larger wetlands with incised channels leading in/out. Apply for wetland restoration funds for next 3 FYs.	How: Update wetland inventory and map layer. Shift summer work crews to higher elevation wetlands. Start minimum requirements analysis for channel restoration in wilderness areas. Who: Park NR lead contact USGS hydrologist to update wetland surveys and geospatial data. NR team prepare SCC proposals for restoration funding.
Direct: Consider managed relocation of wetland species from lower elevations and/or south of the park that are under threat, but may do well at higher/northern locations under warmer conditions.	Where: Identify 2 experimental wetlands (one at mid-elevation and one at high-elevation), should be between 3-5 acres in size, ideally one spring-fed. Identify 1 wetland species from outside the park to pilot managed relocation with. When: This FY: begin managed relocation risk analysis, discuss potential NEPA triggers with regional planners. Next FY: work with university partner to design experiment with grad-student lead and long-term monitoring support.	How: Start with managed relocation risk-analysis. Explore potential policy/regulatory hurdles. Identify at-risk wetland species within the region, but currently outside the park. Who: NR team initiate managed relocation risk analysis; park planner explore NEPA requirements; Veg specialist contact regional veg team and I&M network about at-risk species in other network parks.

Step 6 Worksheet: Next Steps for Priority Adaptation Strategies

Focal Resource/Asset & Updated Management Goal *Copy from Worksheet 3* Resource/Asset: Climate-smart goal:		
Priority Adaptation Strategies (what) *Copy from Worksheet 5*	**Geographic Scope (where) & Timeframe (when)**	**Next step(s) to get started (how) & Responsible staff (who)**
	Where: When:	How: Who:
	Where: When:	How: Who:
	Where: When:	How: Who: