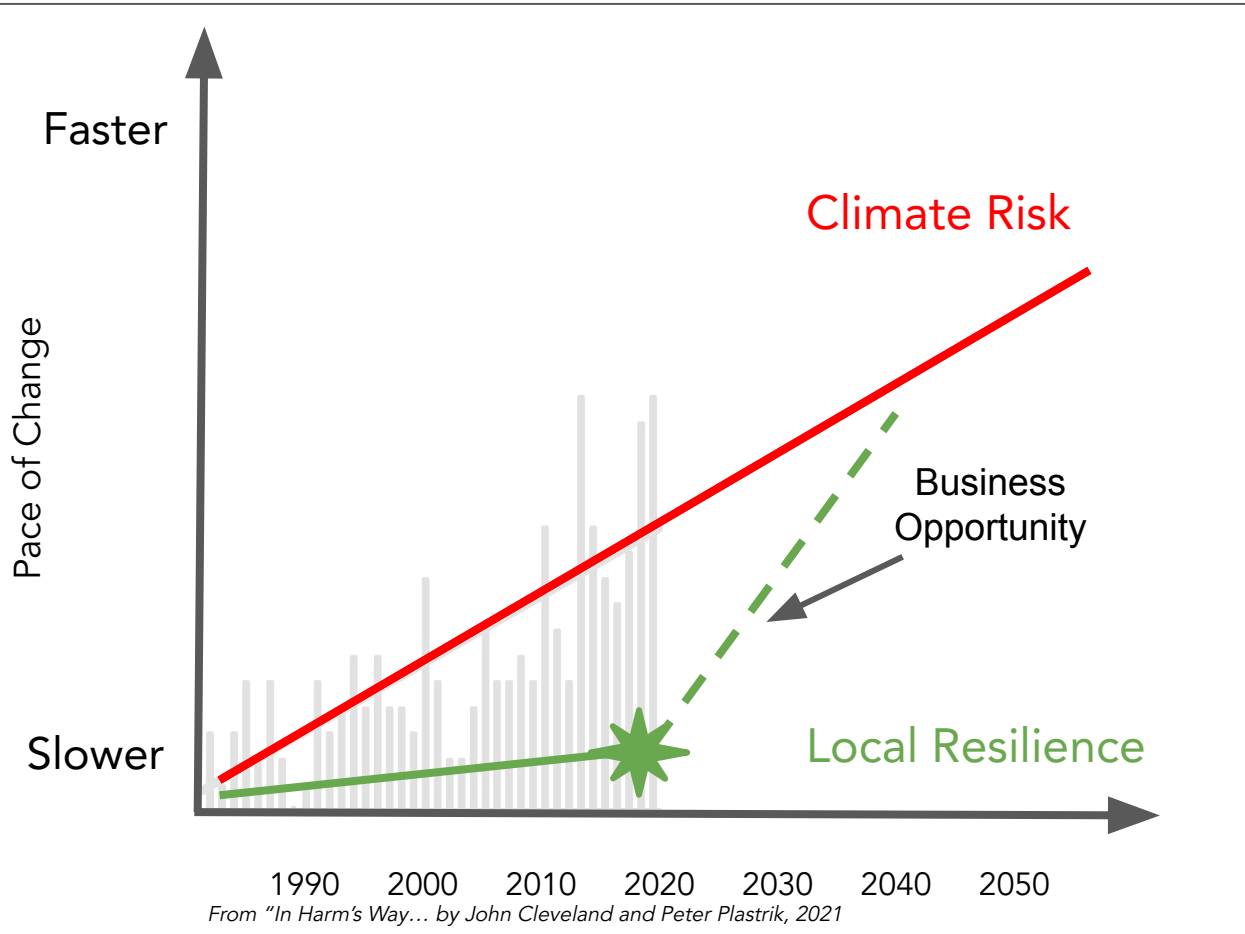# Building a Trained Workforce of Climate Service Providers for Societal Decision-making

Jim Fox, Aashka Patel, Matt Hutchins, Fernleaf

Karin Rogers, NEMAC

Growing gap between climate risk and the people to address it

From "In Harm's Way… by John Cleveland and Peter Plastrik, 2021

- To preserve a livable future, we need to get serious about climate mitigation

- Increasing risk highlights the need for rapid attention to equitable, resilient communities (adaptation)

- But, ultimately, the question is "Who is paying for these new climate services?"
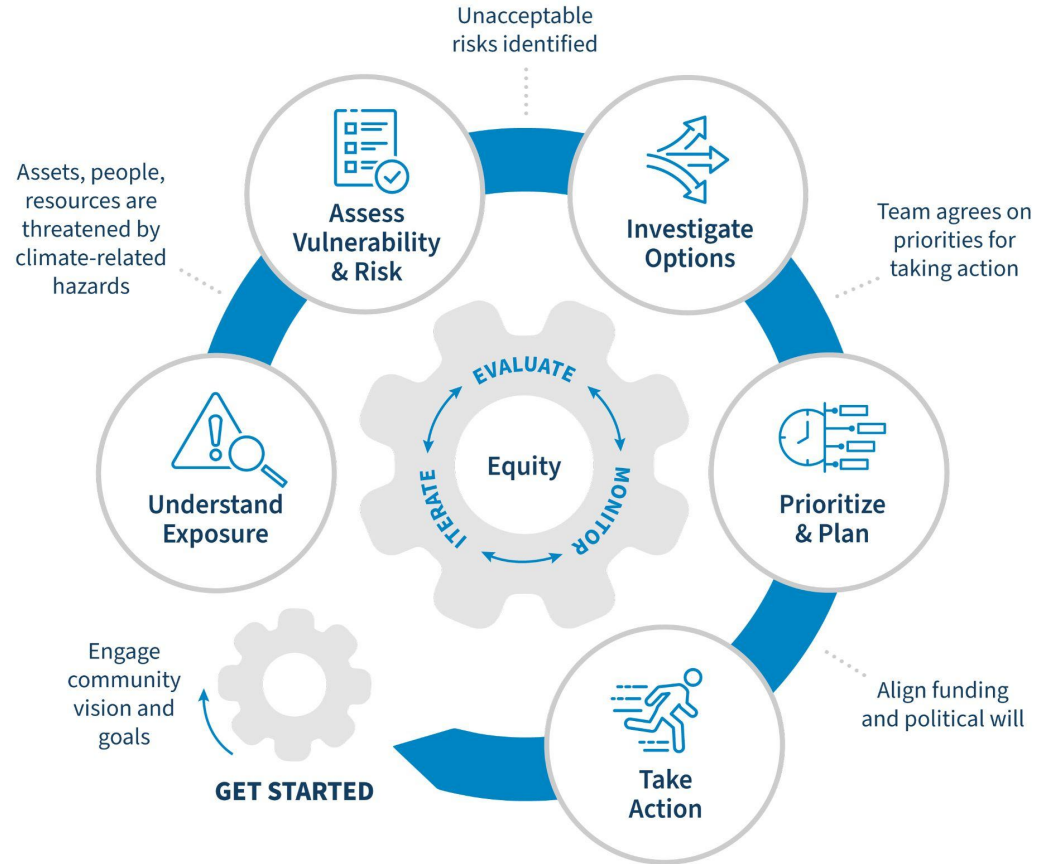
2

Implementing the Steps to Resilience

A PRACTITIONER'S GUIDE

VERSION 1

What is the Practitioner's Guide?

- Audience: climate service practitioners working with communities to implement the **Steps to Resilience**
- Provides guidance through objectives in each step
- Includes resources in the form of worksheets, templates, and job aides

Unacceptable risks identified

Assets, people, resources are threatened by climate-related hazards

Team agrees on priorities for taking action

Assess Vulnerability & Risk

Investigate Options

Understand Exposure

Prioritize & Plan

EVALUATE

MONITOR

ITERATE

Equity

Engage community vision and goals

Align funding and political will

GET STARTED

Take Action

Integration of climate information and tools

Step 1: Tools for hazards and stressors

Hazards and climate stressors

Document past and existing climate-related hazards (see **Table 4** for examples). Hazards may be identified from community experiences and using trusted sources of information. Example climate-related hazards include flooding, wildfire, and heat waves. The practitioner will need to provide a list of hazards and possible data sources to the planning team for review and feedback. Hazards can overwhelm, damage, or destroy the protective value of natural features, causing cascading impacts on the dependent communities (13).

Climate stressors are conditions, events, or trends related to climate variability and change that can exacerbate hazards. For example, rising sea levels can exacerbate the effects of coastal flooding. While coastal flooding may be a current issue, how this could change in the future as a result of sea level rise is also something to consider for long-range planning.

The practitioner can work with the planning team to use the following resources:

▤ **Resource 1.1d | Hazards & Stressors Research Guide** provides guidance for using tools and information.

▤ **Resource 1.1e | Evaluate Hazards and Stressors** provides a space to record your answers to the questions posed in **Resource 1.1d**.
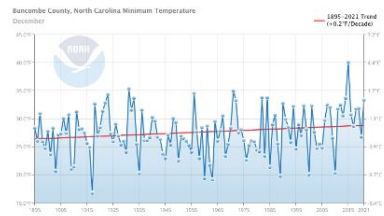

Climate Maps and Climate Graphs provide a variety of metrics for historical trends and future projections, using two emissions pathway scenarios (RCP 4.5 and RCP 8.5). The maps and charts are also downloadable images, which can be used and cited for your report. Extreme Events allows you to choose a reporting station within (or nearby) your area of interest and explore historical occurrences of extreme temperature and precipitation events. If the area is coastal, the High Tide Flooding option can be used to understand the occurrence of high tide floods in a specific area.
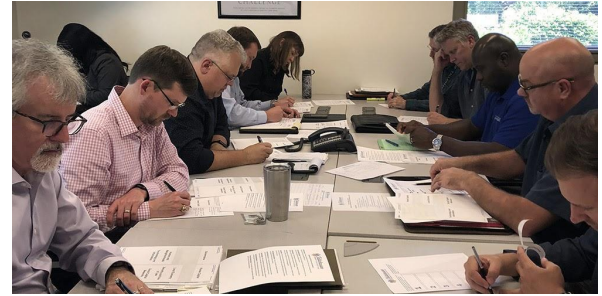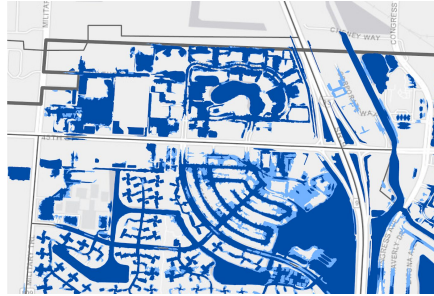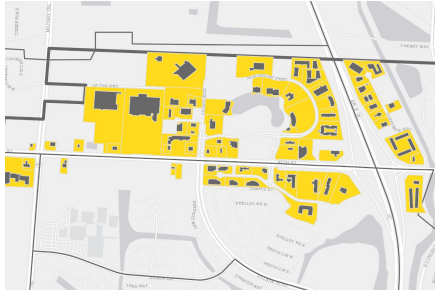
Climate at a Glance (NOAA)

Climate at a Glance allows near-real-time analysis of monthly temperature and precipitation data across the contiguous United States. Users can request data for select cities, states, regions, and the nation as a whole to compare current conditions with the historical record. Data is available for the period 1895 to the present.
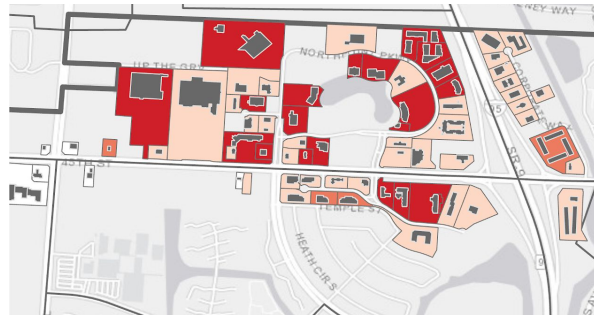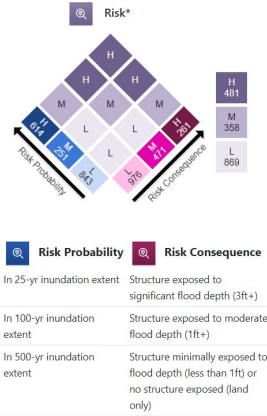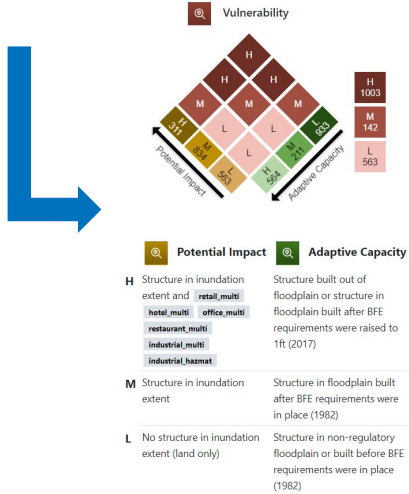
The tool is ideal for studies of climate variability and change. The tool's graphing functions allow users to determine whether,

Assets + Threats + Stakeholder Input

Vulnerability and Risk

Vulnerability

	H 1003
	M 142
	L 563

Potential Impact — **Adaptive Capacity**

	Potential Impact	Adaptive Capacity
H	Structure in inundation extent and retail_multi hotel_multi office_multi restaurant_multi industrial_multi industrial_hazmat	Structure built out of floodplain or structure in floodplain built after BFE requirements were raised to 1ft (2017)
M	Structure in inundation extent	Structure in floodplain built after BFE requirements were in place (1982)
L	No structure in inundation extent (land only)	Structure in non-regulatory floodplain or built before BFE requirements were in place (1982)

Risk*

	H 481
	M 358
	L 869

Risk Probability — **Risk Consequence**

	Risk Probability	Risk Consequence
H	In 25-yr inundation extent	Structure exposed to significant flood depth (3ft+)
M	In 100-yr inundation extent	Structure exposed to moderate flood depth (1ft+)
L	In 500-yr inundation extent	Structure minimally exposed to flood depth (less than 1ft) or no structure exposed (land only)

* Risk values denote the scope of the risk, but are not probabilistic loss estimates.

Step 2: Assess Vulnerability & Risk

Exercises and templates

Meeting Agendas, Facilitation Tips, Presentations

Step 4: Prioritization Sheet

Annotated Meeting Agenda: Step 1 Meeting

Meeting objective:

Provide an overview of what has been achieved thus far in Step 1. Should provide an overview of hazards and stressors, community asset themes, and any data gaps at this point. The practitioner should review the potential impacts matrix and leave time for questions/discussion.

In attendance:

Step 3 Facilitation Recommendations

WHO	Recommendations for the practitioner in Step 3.
WHAT	These are recommendations around recording options and facilitating the brainstorming exercise.

The following are some facilitation recommendations for the practitioner when working with the planning team to record options:

- Encourage the planning team to compile as much information as possible for each option.
- It may be helpful to record options in a workshop setting alongside or after the panning team has been introduced to Step 3 and after the initial research and brainstorming step.
- Depending on the group size, it may be helpful for the planning team to break out into smaller groups to allow for discussion and sharing or perspectives. Groups can focus on certain topic areas (such as by hazard, resilience objective, or type of option).
- If working in smaller teams, have each team working on their own copy of Resource 3.60 based on their area of focus. Then plan to compile each team's work into one master record of options.
- If working in smaller teams, identify one notetaker for each team that is recording input from the group.
- As facilitator, try to ensure that team member voices are being heard and that groups are not being dominated by a single perspective. Also, try to encourage teams to move on if they are getting stuck but to flag where further discussion or work may be needed.
- Have the planning team keep in mind that this is an iterative process and that it may take multiple work sessions to identify all options. Encourage teams to continue working on the options in work sessions after/between the main workshops.

Slides link:

Resource 1.4b | Step

1. [5 minutes] Call to
2. [15 minutes] Revie
3. [30 minutes] Revie
4. [15 minutes] Open
5. [5 minutes] Wrap

Criteria for Evaluation:

List the criteria developed by the team here.

Reduction of vulnerability and risk	Ability to implement

Evaluate Strategies:

Update criteria and add rows as-needed.

Strong impediment to meeting criteria	Criteria partially met or addressable impediment	Meets criteria with no impediment or concern

ID	Strategy	CRITERIA			Tier # (see note below for next step)
		Is there political will?	Is funding available (now or future)?	Is there staff capacity?	

In Practice Guidance

- 4-6 objectives per step
- 50 supporting resources in total

Step Objective

### 3.4 Identify acceptable options for your community

Identify and list the options that team members agree could address their primary concerns. and by identifying new and innovative ideas for how to achieve the resilience objectives identified earlier. These options can be inventoried in 🔲 Resource 3.4a | Exercise: Options Inventory . The evaluation and prioritization of options will come in Step 4. Brainstorming of options can include strategies as well as more specific actions and projects, which are defined below:

Strategy: strategies fit within resilience objectives and further describe the way in which the resilience objectives are going to be achieved. While a strategy describes how a resilience objective may be achieved, it may not have a specific geographic scale or timeframe for implementation. Most options published in resilience plans are strategies.

Actions and projects: actions and projects fit within a strategy and describe how a strategy will be carried out. Actions and projects have clear roles and responsibilities, l, timeframes, and geographic scale.

Step 3: Investigate Options
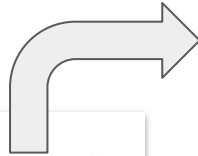
Implementation Example
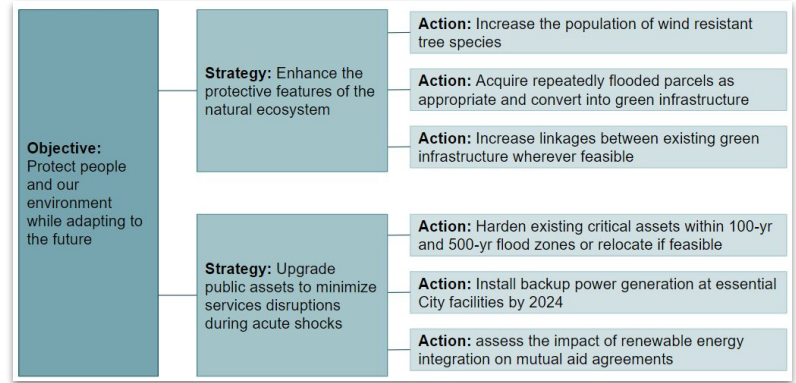
Worksheet Template

GOVERNANCE CAPACITY BUILDING				
Option ID	Option	Key Challenge #	Resilience Objective #	Strategy or Action?
EOP-001	*Acquire Repeatedly flooded parcels as appropriate and convert into green infrastructure*		1	*action*
EOP-002	*Enhance the protective features of the natural ecosystem*		1	*strategy*
EOP-003	*Upgrade public assets to minimize services disruptions during acute shocks*		1	*strategy*

8
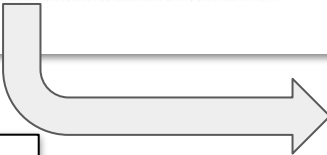
Implementation examples

NATURE-BASED SOLUTIONS CONSIDERATION:

Species and ecosystems vary in their sensitivity to climatic shifts, as well as their adaptive capacity to accommodate or cope with change. Depending on the type, pace, and scale of climatic impacts, many species and ecosystems will themselves require specific adaptation measures to maintain or enhance their capacity to deliver benefits and services.

In natural systems, sensitivity refers to the extent to which species or natural systems would be affected by or respond to changing direct or indirect climatic impacts. Factors such as physiological characteristics, plasticity, and evolutionary potential can increase or decrease a species' sensitivity. Information on ecosystem thresholds or tipping points can be a useful indicator to understand their ability to withstand climate impacts.

Adaptive capacity in ecological systems depends on the diversity and flexibility across traits (e.g., metabolic rates, reproductive strategies), organizational levels (e.g., genetic species, populations), and interactions with suitable habitats (e.g., habitat diversity, connectivity) while for species adaptive capacity is influenced by attributes such as genetic diversity, dispersal capacity, mode of reproduction, and physiological tolerance. A range of

Populations and community assets with both high sensitivity and low adaptive capacity have the highest vulnerability. The map at left (**Figure 8**) shows a three-class vulnerability assessment using the rulesets described above.
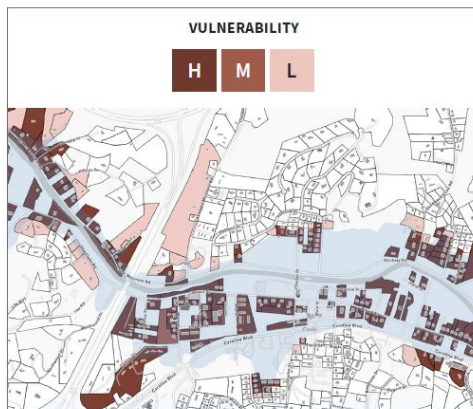
Figure 8. Example spatial analysis output generated for vulnerability. Source: Fernleaf.

Sensitivity and adaptive capacity are combined to look at vulnerability. Properties that are highly vulnerable have low adaptive capacity and high sensitivity.

Table 13. Example traffic light evaluation of strategies. Source: Fernleaf.

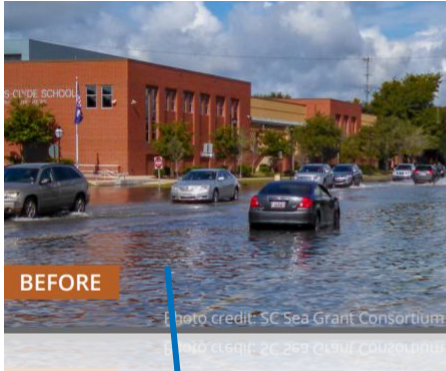Step 2: Vulnerability Assessment Example

Step 4: Prioritization Example

Charleston, SC

- Cooper River
- Interstate 26
- Arthur Ravenel Bridge
- Port of Charleston
- Example shown
- Charleston Harbor
- Downtown Charleston

Quantifying benefits beyond $BCA

Tidal Check valve Peninsula flooding reduction:
- 50% of Churches
- 20% of Public Housing
- 10% of Critical Facilities
- More robust mobility connection to Port and Downtown

But Tidal Check Valve will fail with rising seas. What next?

BEFORE

Photo credit: SC Sea Grant Consortium

AFTER

Charleston, SC Peninsula Example Dynamic Adaptive Policy Pathway
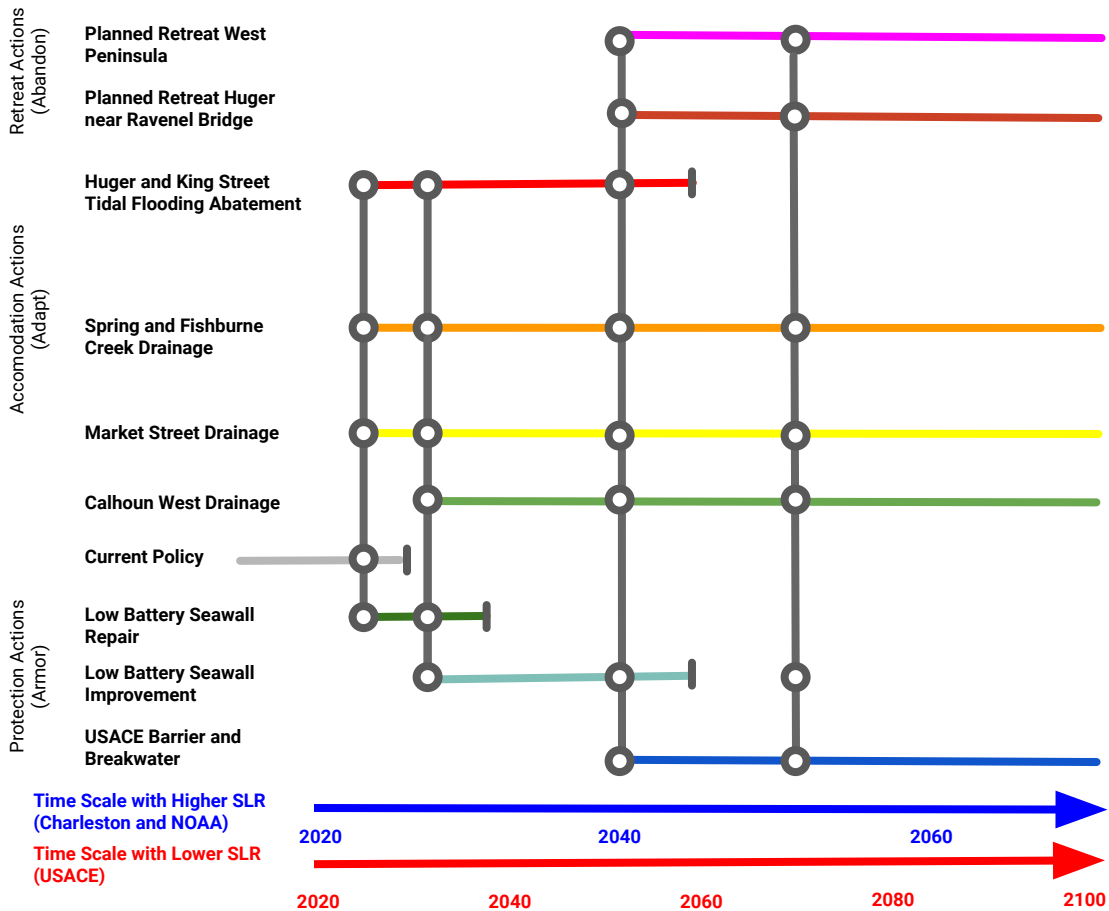
Climate Service Practitioners
- Academia
- Non-profit & Private Sectors
- State, Local, and Tribal Government
- Federal Government

Skills/Backgrounds
- Planning
- Facilitation
- Spatial analysis
- Data science
- Earth system science
- Engineering
- Management
- Project management
- Community engagement
- Hazard mitigation

Communities
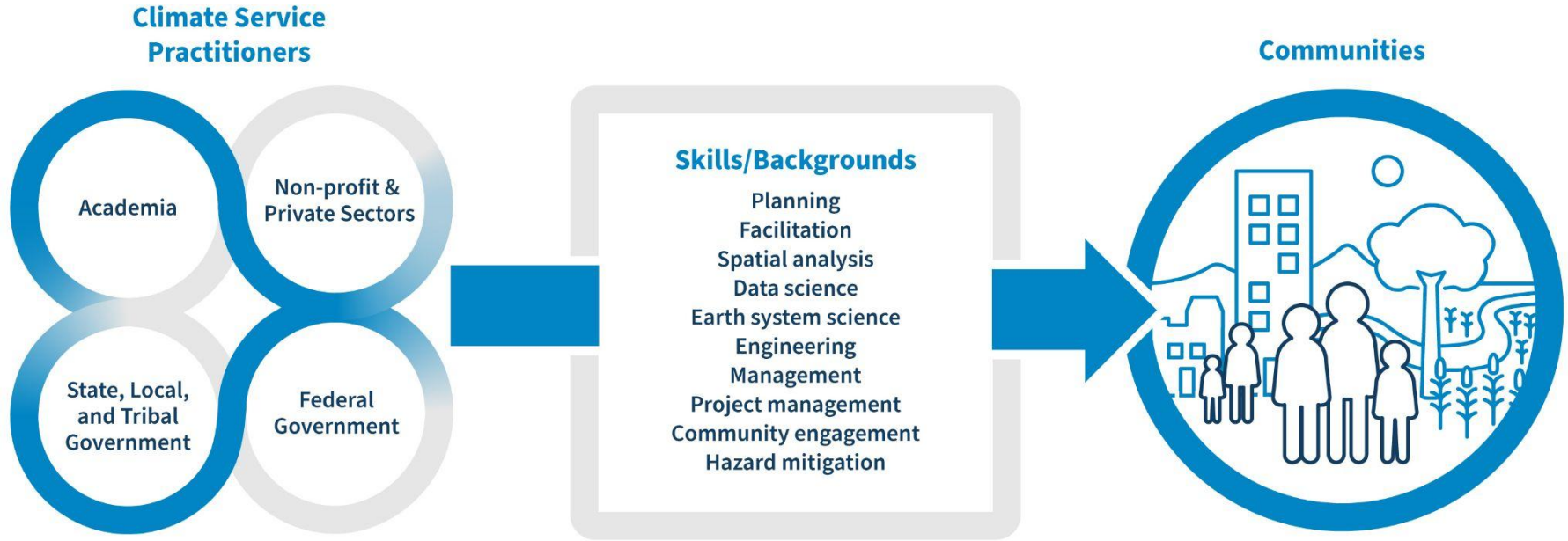
Trained Practitioners, supported by their own strong network, can meet the shortfall to build resilience in our nation.

Questions?

jfox@fernleaf.us