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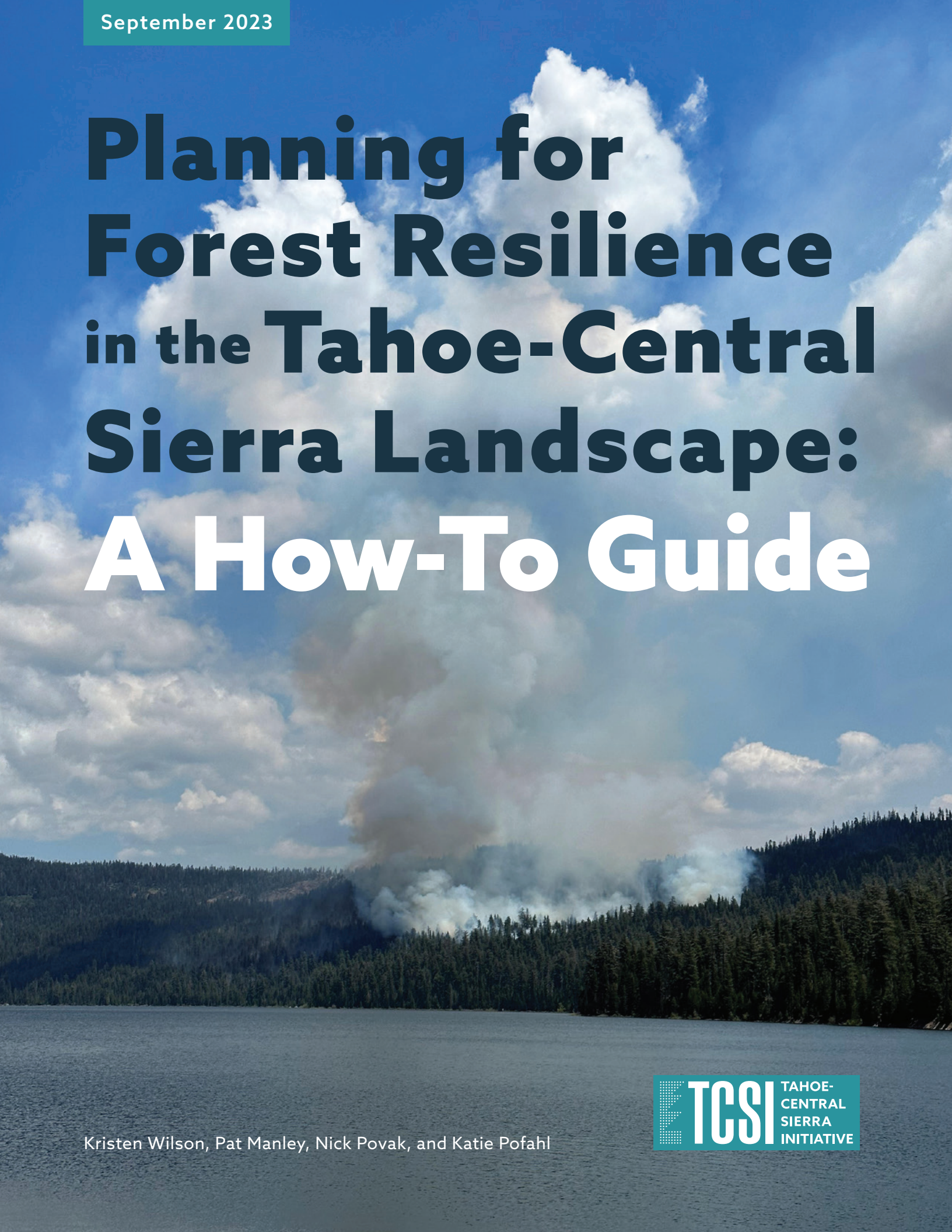
Planning for Forest Resilience in the Tahoe-Central Sierra Landscape: A How-To Guide



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TCSI TAHOE-CENTRAL SIERRA INITIATIVE

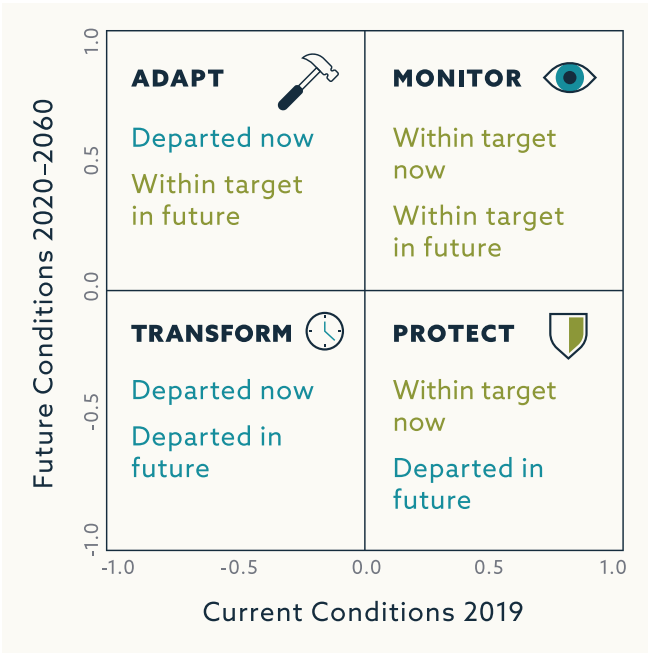
INTRODUCTION

The purpose of this how-to guide is to help stakeholders within the Tahoe Central Sierra Initiative (TCSI) landscape and stakeholders in the Sierra Nevada ecoregion use two science products designed to increase the pace and scale of thinning and prescribed fire work. The Framework for Resilience defines resilience based on social and ecological pillars that can be measured, mapped, and monitored. The Monitor-Protect-Adapt-Transform (MPAT) decision support system is a tool that combines spatial data on current and future projected conditions to guide where to prioritize forest treatments that will likely have an impact under climate change. Conditions are scored from -1 to 1 and juxtaposed on a graph with current conditions on the x-axis and future conditions on the y-axis. Scores for multiple pillars and metrics are synthesized in the decision support tool and locations that fall into adapt and protect management strategies are prioritized for treatment.

When combined, the Framework for Resilience and MPAT system can speed up planning of forest treatments and set a foundation for monitoring progress towards resilient forests and communities. The goal of increasing the pace and scale of forest treatments is to reduce the exposure of infrastructure to wildfire and to make our forests more resilient to wildfire and climate change.

Framework for Resilience

Monitor-Protect-Adapt-Transform



This guide is particularly aimed at new collaborative groups working to improve forest resilience and especially for U.S. Forest Service planners and any consultants leading the planning of forest thinning and prescribed fire projects. Users can view the results of MPAT priority areas online or download the results for use in ArcGIS Pro or another spatial data platform. After completing the planning steps in this How-To Guide, users will be ready to move into National Environmental Policy Act (NEPA) planning on National Forest land, Timber Harvest Plan development on private land, or to complete science-informed forest management on your own property.

This How-To Guide covers planning and monitoring of forest thinning and prescribed fire projects. The data is based on a snapshot in time, specifically 2019 for within the Tahoe Central Sierra Initiative area or 2021 for the Sierra Nevada ecoregion. Conditions are changing quickly with recent large wildfires, beetle outbreaks, droughts, and development. The state of California has committed to updating the vegetation data annually to ensure information is current for planning and monitoring efforts. Contact the California Wildfire and Forest Resilience Task Force for more information about updates.

Below is a step-by-step guide for forest planning using the Framework for Resilience and MPAT decision support tool. Note, this science-based foundation should be supplemented with local knowledge, as both perspectives are essential to include when planning forest restoration, adaptation, or fuels reduction treatments (Box 1). There is also a brief history on how the Framework and MPAT system evolved and led to the statewide Regional Resource Toolkits and Planscape tool.

BOX 1

Science Foundation Plus Local Knowledge

Everyone brings knowledge of their local forest that may not appear in the MPAT science-based spatial priority outputs. That does not imply that local knowledge or data should not be valued or be a priority for treatment. We encourage users to research and incorporate local knowledge, including cultural values, into planning efforts. These important resources can be integrated as priority areas alongside the science-based resilience priority areas for management. In fact, recent examples of forest planning projects using the Framework for Resilience within the Tahoe Central-Sierra Initiative area highlight this synergy of science-based and local knowledge-based prioritization of where to conduct forest thinning and prescribed burning.

HOW-TO USE THE FRAMEWORK FOR RESILIENCE AND MPAT DECISION SUPPORT SYSTEM

Planning Steps

Note that this is a chronological list, but planning is often iterative, and you may go back to earlier steps or repeat steps.

1. WHO: Identify the planning team.

A. Must include the land manager.

B. Identify a planning lead.

2. WHERE: Bound the planning area spatially using GIS.

A. This can be limited to your sphere of influence or include adjacent lands where fire may travel from and into your focal area.

3. WHAT: Identify which of the ten pillars of resilience from the Framework for Resilience to include.

A. You can incorporate all the pillars or only selected pillars if some are more important than others. Selecting specific pillars of resilience can be done using a ranking scheme or another method. See Box 2 for examples.

BOX 2

Case Study: North Yuba Landscape Resilience Project

To develop a NEPA plan for 275,000 acres in the central Sierra Nevada, the planning team hired Vibrant Planet, a consulting team. They used the pillars of resilience to define the goals of the project. Each planning team representative from individual organizations answered a survey questionnaire and then modified the results to rank the most important pillars. In the end the fire adapted communities, fire dynamics, forest resilience, water supply reliability, and biodiversity conservation were selected as the five pillars used in the planning.

The team incorporated data from current conditions for all the pillars except biodiversity along with other data and a restorative return-on-investment methodology to determine priority areas for treatment and project sequencing across this large project area. They considered including a climate change alternative based on current and future conditions but after running it through the return-on-investment method it returned similar priority areas and was not in the end an alternative considered in detail in the Environmental Impact Statement.

Other examples of groups that utilized the Framework for Resilience include the Yuba Forest Network and Middle Truckee Project.

4. HOW: Decide if you will base your planning on current and future modeled conditions under climate change or current conditions only.

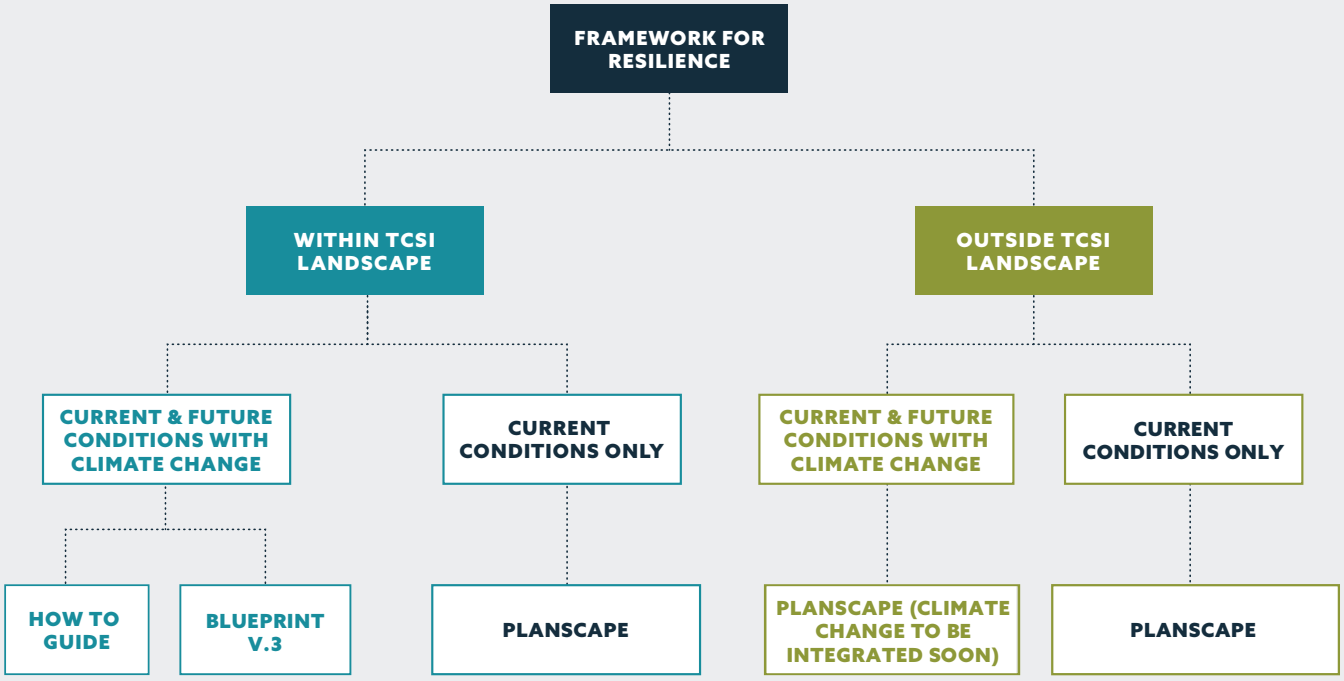
For more on this see Box 3.

BOX 3

Reasons to Include Climate Change in Planning

The science is clear that as our climate warms, forests composition and structure can change following disturbances. Suitable climate envelopes for conifer regeneration are shifting uphill. However, it can be difficult for land managers and residents to adjust to this new reality. It is difficult to switch mindsets from a resistance mindset, where our primary goal is to return forested areas to forest following a disturbance, to a resilience mindset that recognizes the dynamic change underway in our forests. Incorporating climate change projections into planning will allow us to direct our resources to projects that will likely be successful now and in the next forty years. By protecting or resisting change and adapting forests to the changing climate, we anticipate that we can improve forest resilience.

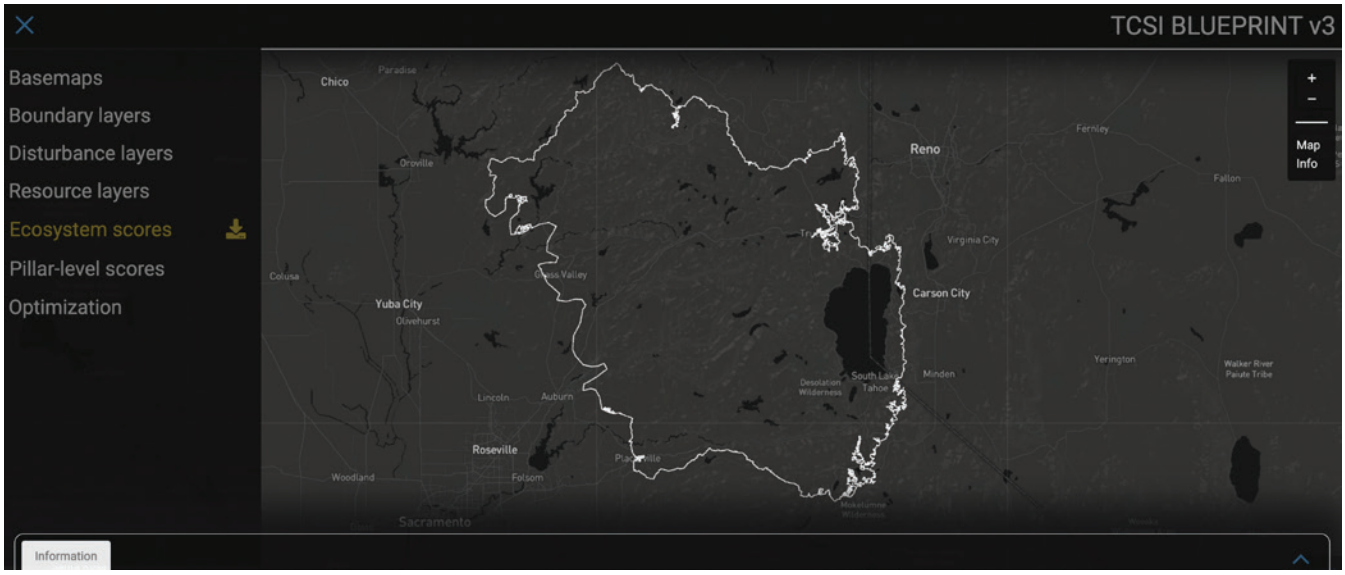
Select the Planning Tool That is Right for You



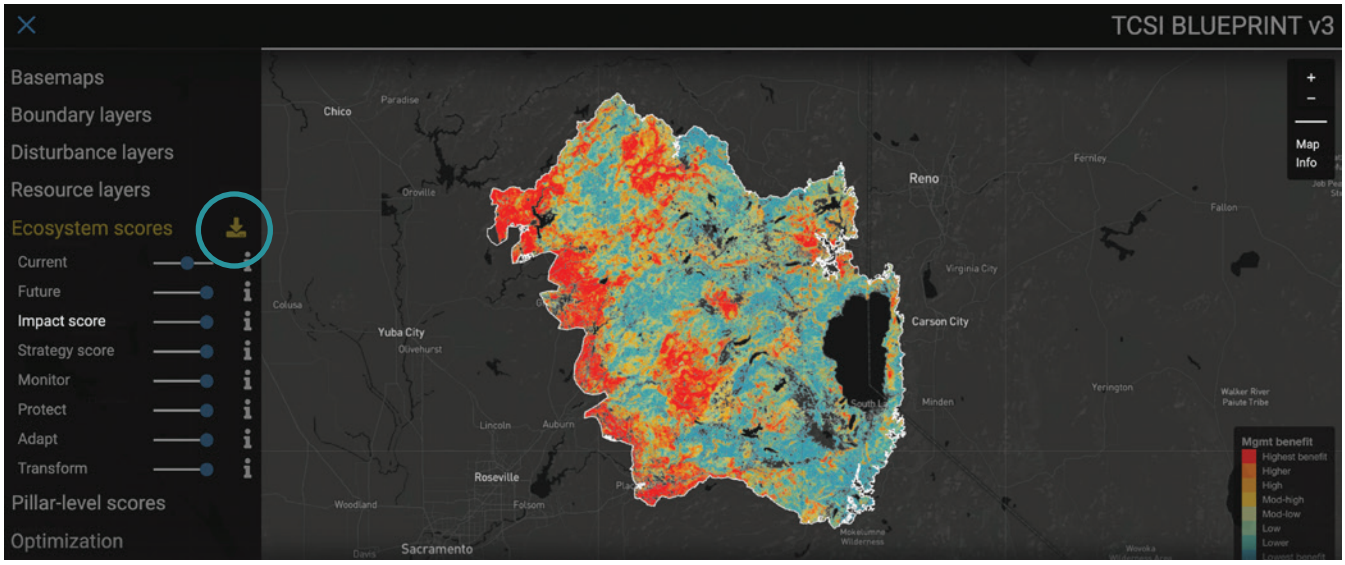
A. Current (2019 or 2021) and future (2020–2060) conditions. If you are working in the TCSI area, decide if you want to use TCSI's defined desired conditions for each metric, or Planscape's relative values compared to the rest of the ecoregion. TCSI based the desired conditions on science and expert opinion. In Planscape the values are relative to the region not based on a target for what constitutes resilience. The metrics are slightly different in the two approaches (See Table 1 at the end). The future conditions modeling under climate change modeling is also different. TCSI relied on LANDIS-II while Planscape incorporates a climate analogue approach. Both are useful, but different approaches.

i. The planning area is within TCSI and you want use TCSI's desired conditions for the metrics.

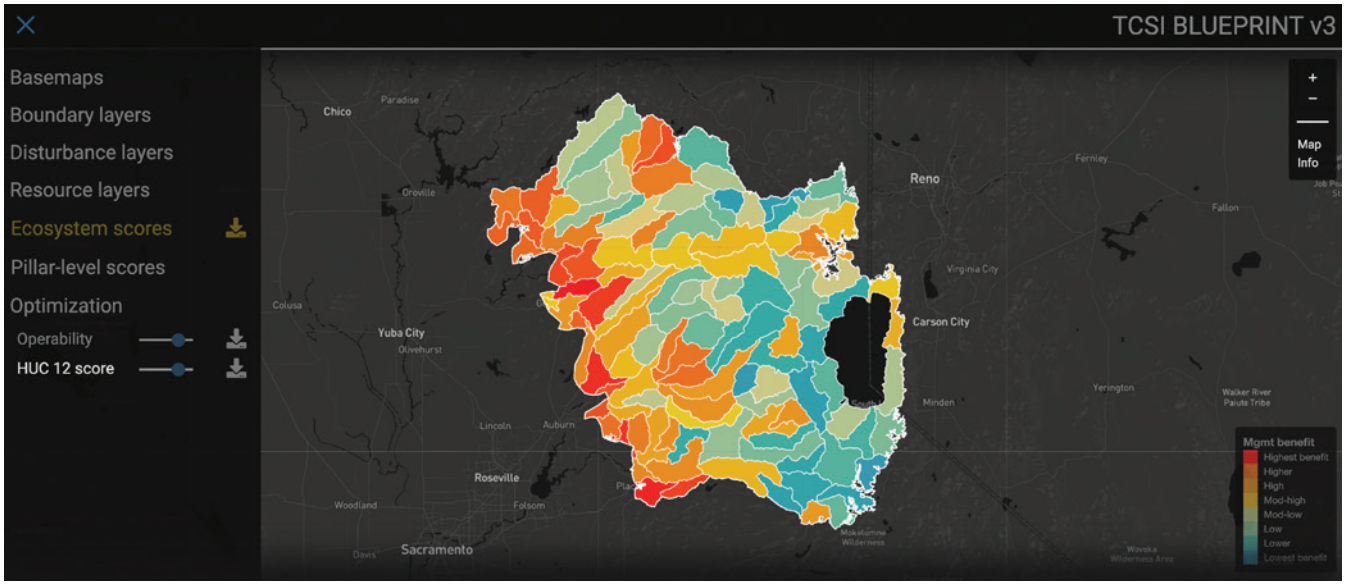
1. Target conditions for the pillars of resilience were defined for this area based on science and stakeholder input.
2. Future conditions under climate change are based on the LANDIS model.
3. Go to the blueprint tool on the TCSI Blueprint webpage. Download the spatial data for all or the selected pillars to be viewed and overlaid in GIS. Note, you will need to download data at the TCSI scale and then subset to your planning area.



4. For all five pillars available (forest resilience, fire dynamics, fire-adapted communities, carbon sequestration): Click on the Ecosystem Scores label. Then select the Impact Score, which identifies priority areas to protect (where current conditions are within target but future conditions are likely to not be) and adapt (where current conditions are outside of target but could be within target in the future). Places identified as monitor or transform are a lower priority. See MPAT webinar for a complete description of the four management strategies. Download the Ecosystem Scores by clicking on the icon to the right of the text. The Impact Score is the output to use to prioritize treatment locations.

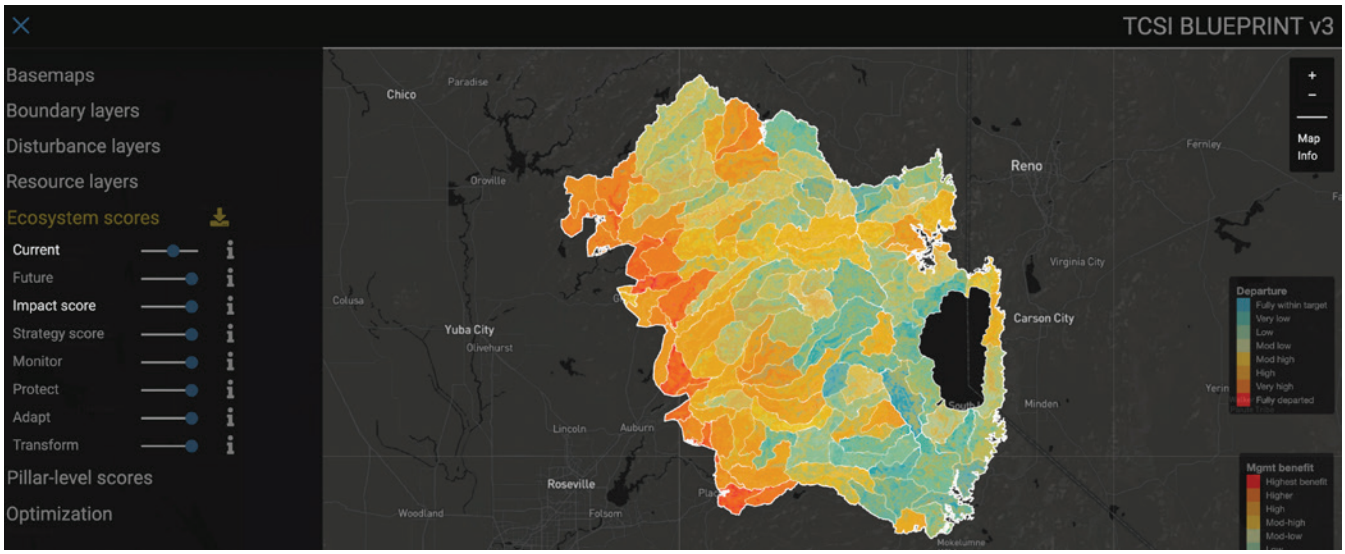


You can also select the HUC12 watershed ranking of watershed with the highest protect and adapt scores, under the Optimization tab.



5. For individual pillars: Select pillar-level score to pull out individual pillars of interest. Shown below is the Fire Dynamics pillar and current conditions. The impact score is the combination of current and future conditions and the emphasis on protect and adapt management strategies. These areas are projected to be places where investments in treatments are likely to be effective in the future under climate change.

If you need to combine a few select pillars, download the data for each pillar and then manually combine them in GIS.



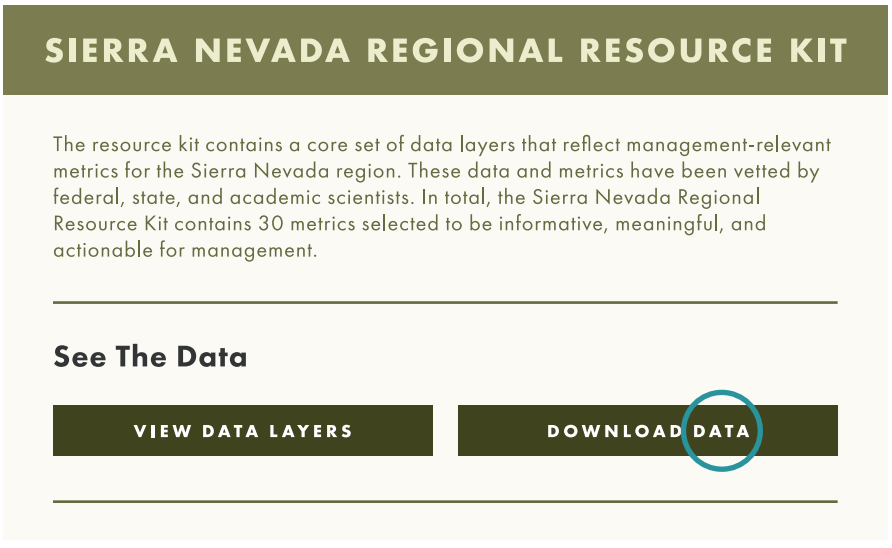
ii. The planning area is within TCSI and you want use Planscape which shows metrics values relative to the rest of the Sierra Nevada ecoregion.

   1. Go to the Planscape tool.

iii. The planning area is outside TCSI.

   1. Target conditions are relative to the rest of the ecoregion based on 2019 vegetation data.
   2. Future conditions under climate change based on climate analogue method.
   3. Go to the Planscape tool.

iv. **Current (2021) conditions only—Go to Regional Resource Toolkits and Planscape.**



i. Download the spatial data for all or the selected pillars to be viewed and overlaid in GIS. Alternatively, you can view the pillar data on Planscape and plan projects.

ii. Create maps of the normalized values for the pillar metrics that the planning team decided to include.

iii. Use the normalized values and overlay them in a GIS system by adding the normalized values. Note, if only one metric is selected there is no need for an overlay.

iv. A higher number indicates a higher priority in terms of addressing multiple pillars.

v. If you have a set budget or want to iterate possible budgets you can use a treatment cost and the total normalized values to limit the priority area. To do this requires that you have treatment cost data. For example, you have $100,000 for a project and the cost is $1,000/acre to thin out small trees and reduce fire hazard in your area. You can identify the top 100 acres ($100,000/($1,000/acre)=100 acres) based on the highest normalized values.

Support

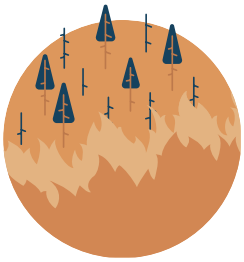
Continued learning:

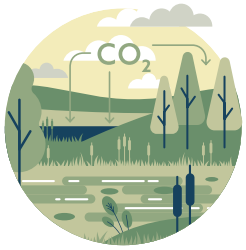
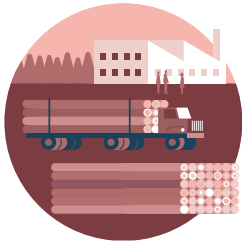
- Regional Resource Toolkits (Current Conditions)
  Peter Stine: pstine@climateandwildfire.org
  Pat Manley: Patricia.Manley@usda.gov

- TCSI Blueprint (Current and Future Conditions, TCSI area only, available now)
  Erin Ernst: erin.ernst@tahoe.ca.gov

- Planscape (Current and Future Conditions, coming 2023)
  www.planscape.org/contact

Table 1. **Comparison of the Tahoe Central Sierra Initiative (TCSI) and Regional Resource Toolkit (RRTK) metrics.**

	Pillars of Resilience	Elements / Metrics	TCSI Current	RRTK Current	TCSI Future
	**Forest Resilience**	**FOREST STRUCTURE**			
		Tree density and basal area	X	X	X
		Structural heterogeneity	X		
		Large tree density	X	X	X
		Maximum SDI		X	
		FOREST COMPOSITION			
		Seral stage	X	X	X
		Compositional heterogeneity	X		X
		Tree:shrub cover ratio		X	
		DISTURBANCE			
		Disturbance frequency	X	X	X
	**Fire Dynamics**	**FIRE SEVERITY**			
		Probability of high severity fire	X	X	X
		High (H) severity fire patch size	X		X
		Annual burn probability		X	
		FUNCTIONAL FIRE			
		Influence of low (L) and moderate (M) severity fire	X		X
		Frequency of fire	X		X
	**Fire-Adapted Communities**	**FIRE HAZARD**			
		Risk of M and H severity fire	X		X
		Structure exposure score		X	
		Damage potential		X	
	**Biodiversity Conservation**	**FOCAL SPECIES**			
		California spotted owl habitat	X	X	X
		Pacific fisher habitat		X	
		Black oak stands		X	
		SPECIES DIVERSITY			
		Species richness and connectivity	X	X	X
		COMMUNITY INTEGRITY			
		Habitat connectivity		X	

	Pillars of Resilience	Elements / Metrics	TCSI Current	RRTK Current	TCSI Future
	**Carbon Sequestration**	**STABILITY**			
		Potential carbon loss	X	X	X
		STORAGE			
		Total carbon	X	X	
	Air Quality	**PARTICULATE MATTER**			
		Potential smoke, M severity		X	
		Potential smoke, H severity		X	
	**Social & Cultural Well-being**	**ENVIRONMENTAL JUSTICE**			
		Housing burden		X	
		Unemployment		X	
		Low income		X	
	**Water Security**	**QUANTITY**			
		AET/precipitation	X	X	
		Average runoff	X	X	
	**Wetland Integrity**	**HYDROLOGIC FUNCTION**			
		Meadow sensitivity index		X	
	**Economic Diversity**	**WOOD PRODUCT INDUSTRY**			
		Biomass stumpage costs	X		
		Costs of potential treatments		X	
		Available standing biomass		X	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