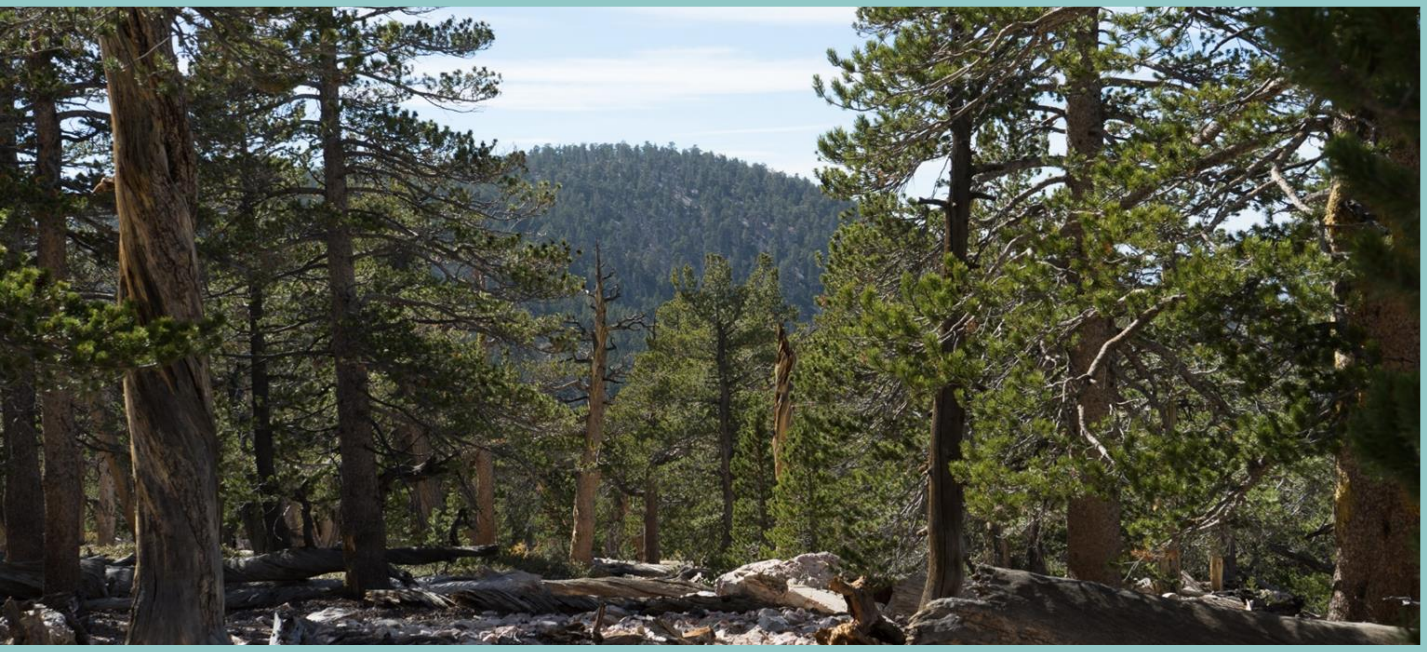
Beyond resistance:

building resilience and adaptation into management of montane forests across Southern California

Sarah McCullough Hennessy, PhD



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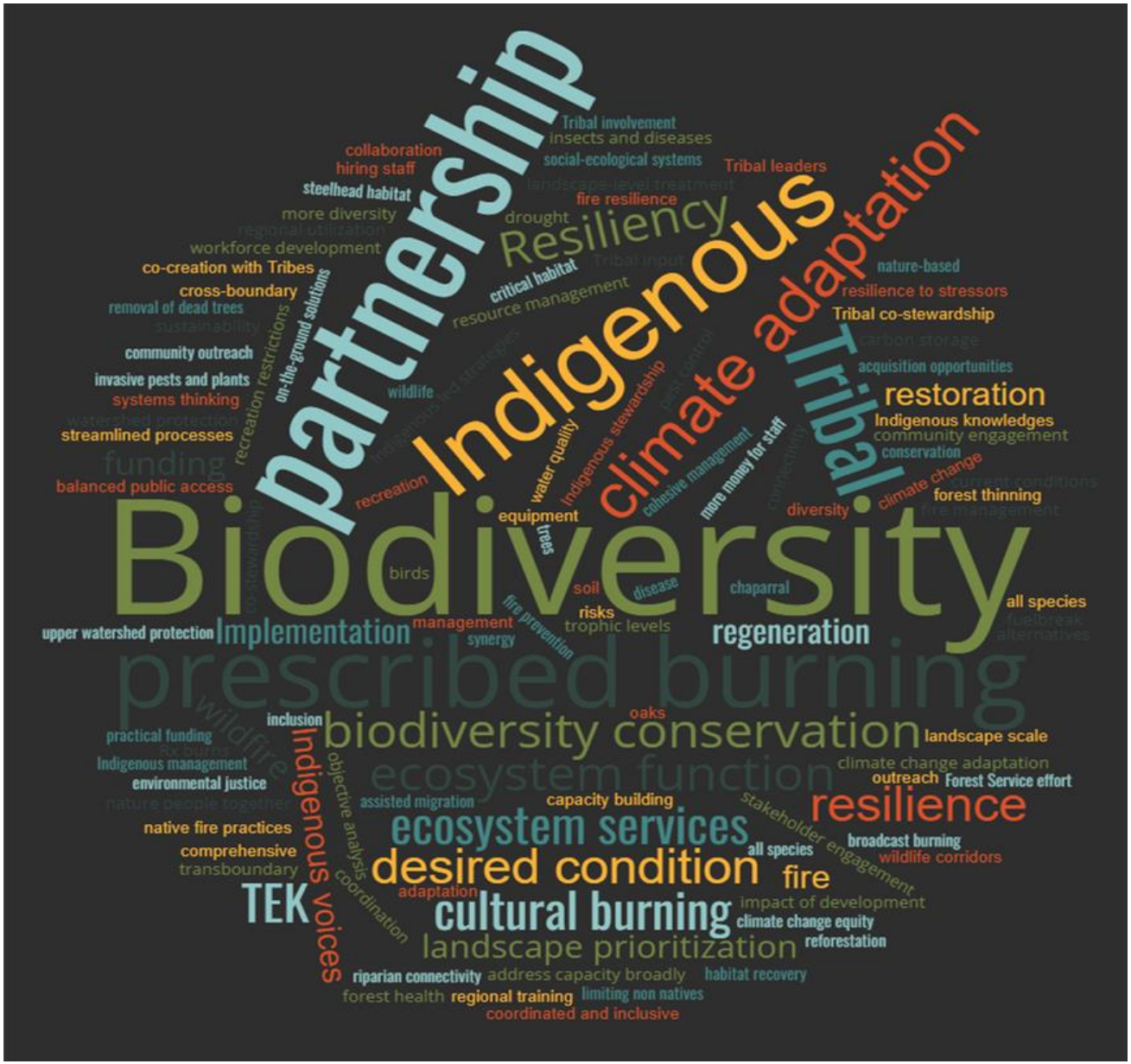
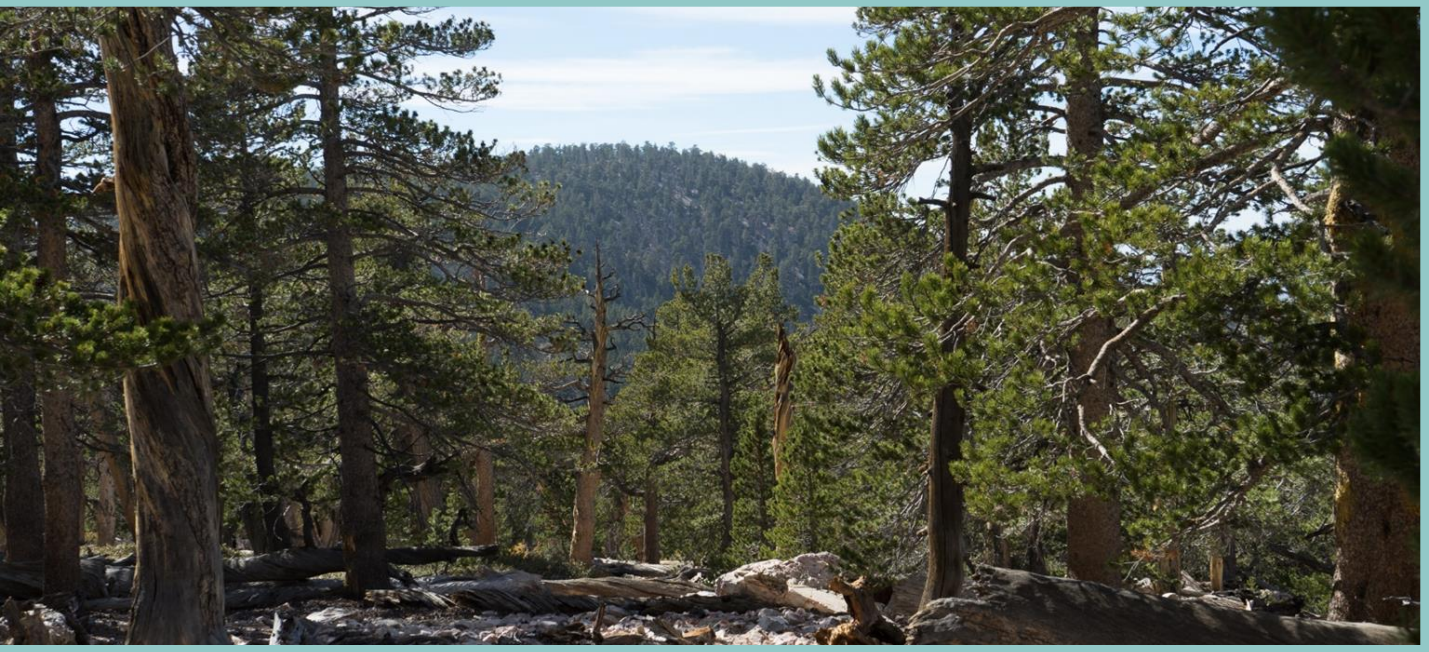

partnership
Indigenous
climate adaptation
Tribal
Biodiversity
prescribed burning
Resiliency
biodiversity conservation
ecosystem function
ecosystem services
desired condition
cultural burning
landscape prioritization
resilience
restoration
regeneration
Implementation
TEK
Indigenous voices
fire
Tribal involvement
insects and diseases
social-ecological systems
Tribal leaders
collaboration
hiring staff
steelhead habitat
fire resilience
more diversity
drought
workforce development
co-creation with Tribes
cross-boundary
removal of dead trees
sustainability
on-the-ground solutions
recreation restrictions
community outreach
invasive pests and plants
systems thinking
streamlined processes
funding
balanced public access
wildlife
recreation
critical habitat
resource management
water quality
Indigenous stewardship
cohesive management
more money for staff
nature-based
resilience to stressors
Tribal co-stewardship
acquisition opportunities
Indigenous knowledges
community engagement
conservation
climate change
forest thinning
diversity
equipment
trees
birds
soil
disease
chaparral
risks
trophic levels
management
synergy
fire prevention
all species
upper watershed protection
inclusion
oaks
practical funding
landscape scale
Indigenous management
environmental justice
climate change adaptation
outreach
Forest Service effort
assisted migration
capacity building
native fire practices
comprehensive
transboundary
broadcast burning
wildlife corridors
adaptation
impact of development
climate change equity
reforestation
coordination
riparian connectivity
address capacity broadly
habitat recovery
forest health
regional training
limiting non natives
coordinated and inclusive

SOUTHERN CALIFORNIA MONTANE FORESTS PROJECT

Regional Conservation Strategy



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SDSU San Diego State University | IEMM | CLIMATE SCIENCE ALLIANCE | FOREST SERVICE U.S. DEPARTMENT OF AGRICULTURE | Southwest Climate Adaptation Science Center | USGS science for a changing world

SOUTHERN CALIFORNIA'S MONTANE FORESTS

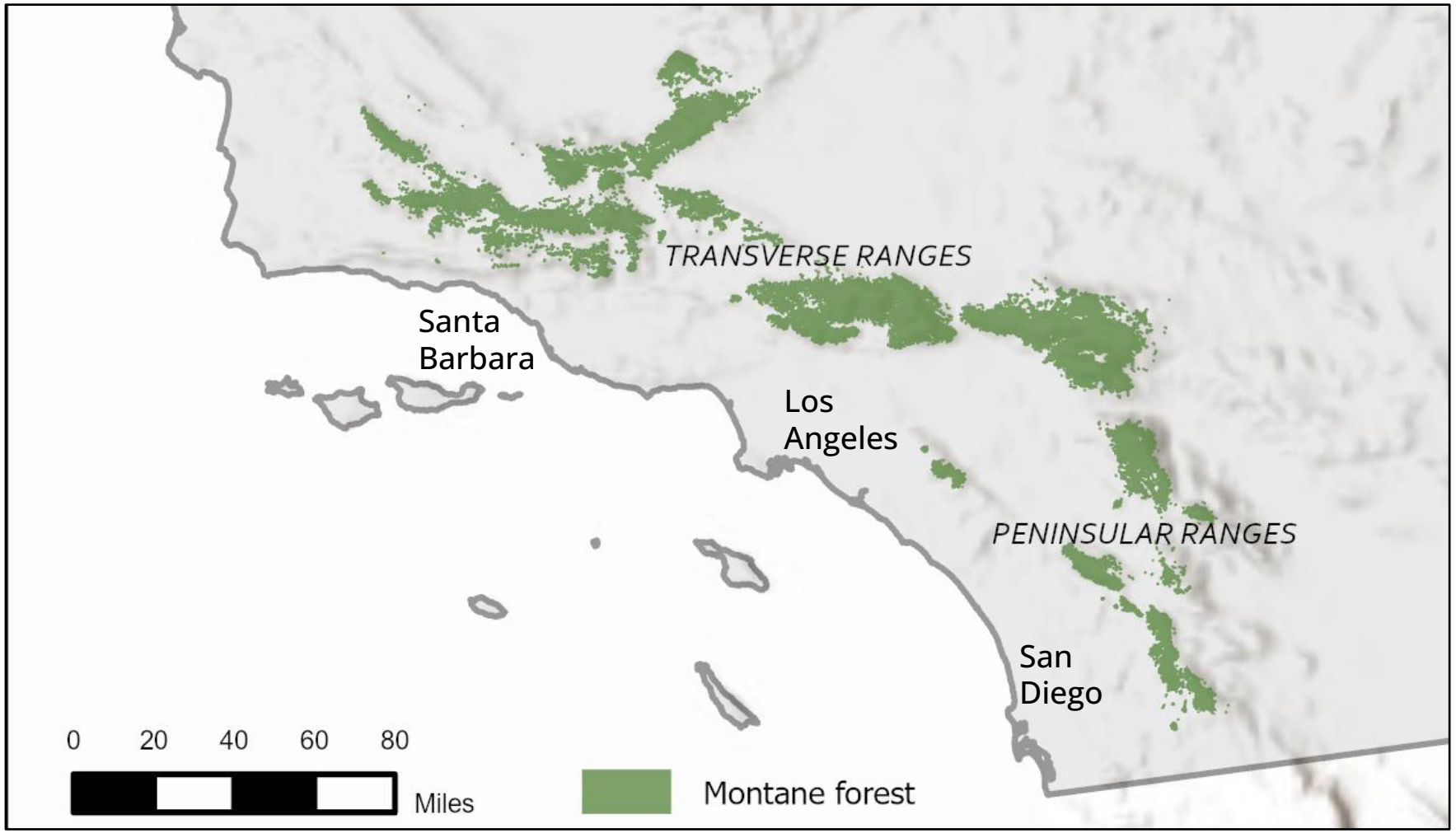


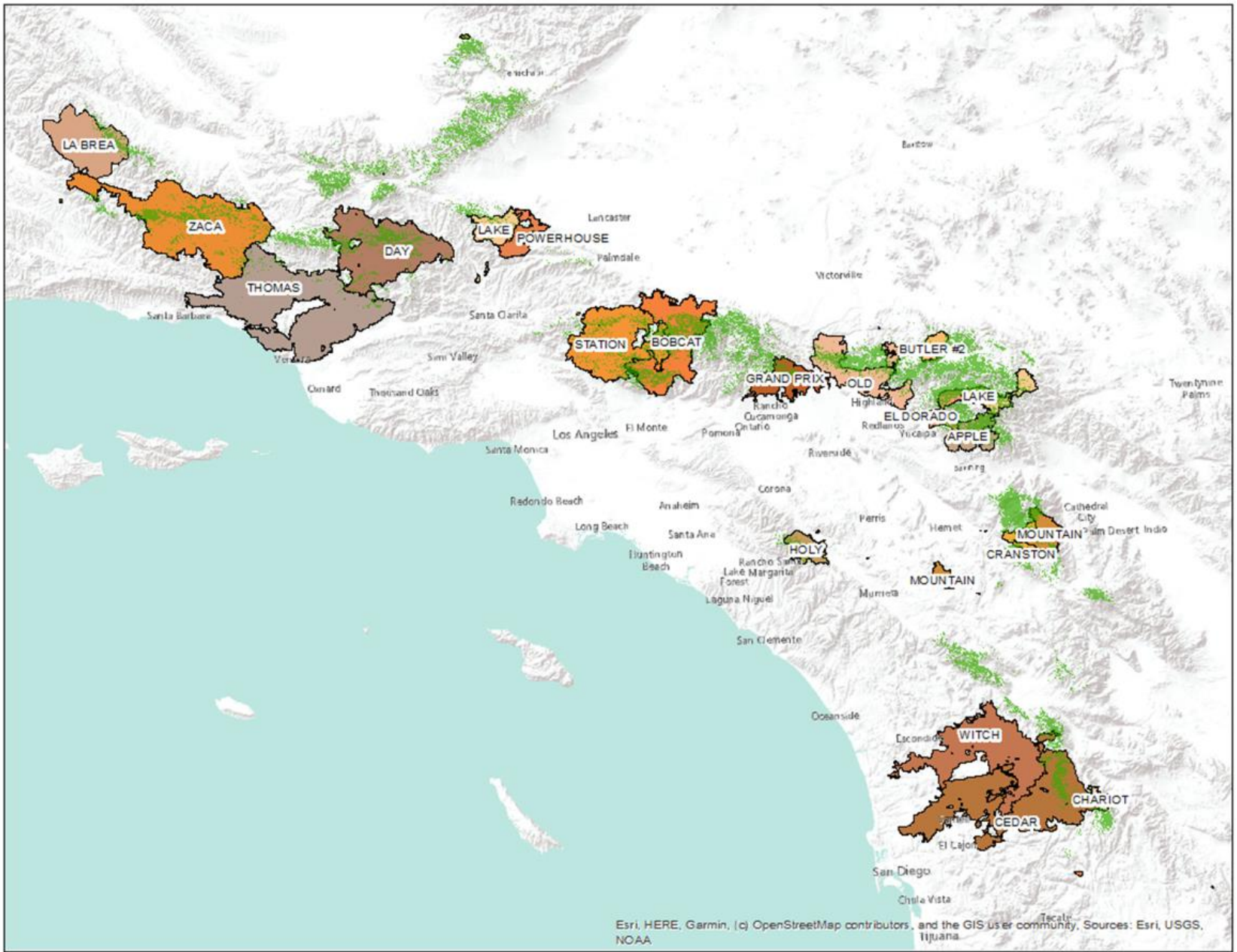
Photo: Megan Jennings

Stand of dense, dead white fir in 2004

BACKGROUND

Overly dense forests susceptible to drought, disease, insect mortality, and stand-replacing wildfires.

MAJOR FIRES SINCE 2003



PROJECT PARTNERS

This multi-jurisdictional project is a collaborative partnership among the Climate Science Alliance, U.S. Forest Service, Institute for Ecological Monitoring and Management at San Diego State University, and the Southwest Climate Adaptation Science Center.

Project Team

Advisory Team

A community of practice including resource and fire managers, policy makers, scientists, Tribal partners, and other stakeholders.

WORKSHOPS

- Technical Group Workshop
- Practitioners Workshop
- Tribal Partners Workshop
- Community Workshop

REVIEW

VULNERABILITIES & THREATS

Review of Threats

- Fire
- Climate change
- Pests
- Land-use change

Potential Conservation Goals / Targets

- Desired conditions

CHALLENGES & BARRIERS

Survey to Identify Challenges for Planning and Implementation

- Regulatory constraints
- Funding limitations
- Logistical issues
- Institutional challenges and community concerns

GATHER

Listening Sessions
Explore threats and adaptation strategies to overcome

Review potential adaptation strategies, discuss feasibility

Goals & Strategies
to mitigate threats and vulnerabilities and achieve desired conditions

Goals & Strategies
to overcome planning challenges and barriers to implementation

Listening Sessions
Explore challenges/barriers and solutions

Explore community needs/perspectives, discuss solutions brainstormed by practitioners

PLAN

STRATEGIC PLAN

- Goals
- Objectives and priorities
- Climate-smart adaptation strategies

Explore joint project and partnership opportunities to accomplish strategic plan goals

Funding group review

Review and provide feedback on draft strategic plan

Summary of actions for conservation strategy

Report out for decision makers, funders, program staff, and public outreach

To learn more about the Southern California Montane Forests Project, please visit: www.climatesciencealliance.org/southern-forests

Climate-Adapted Conservation Strategy for Southern California Montane Forests

DRAFT STRATEGY
JULY 2024

www.climatesciencealliance.org/southern-forests

SOUTHERN CALIFORNIA MONTANE FORESTS PROJECT

Regional Conservation Strategy

Three-pronged strategy:

1. Prioritize forest resilience projects at the landscape scale

Strategic prioritization framework incorporating refugia

2. Adapt for climate stressors at the project scale

Regionally tailored adaptation menu

3. Consider context in reforestation

Post fire restoration framework


Angeles Crest Highway, Los Angeles County

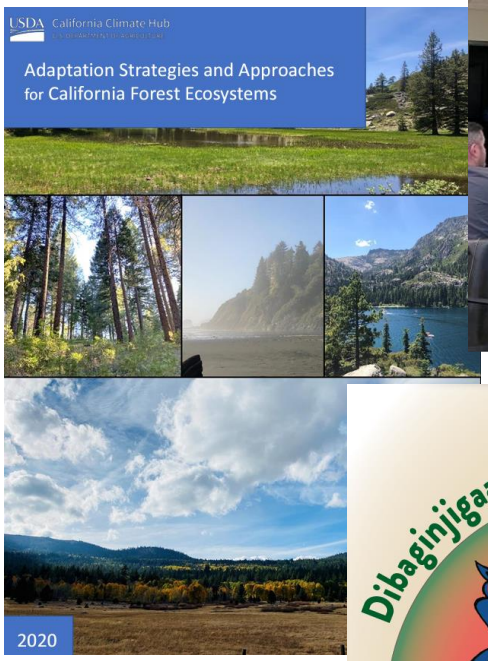
SOUTHERN CALIFORNIA MONTANE FORESTS PROJECT

Regional Conservation Strategy

Three-pronged strategy:

1. **Prioritize forest resilience projects at the landscape scale**
   - Strategic prioritization framework incorporating refugia
2. **Adapt for climate stressors at the project scale**
   - Regionally tailored adaptation menu
3. **Consider context in reforestation**
   - Post fire restoration framework

CREATING AN ADAPTATION MENU



Dibaginjigaadeg Anishinaabe Ezhitwaad

Caring for those who take care of us

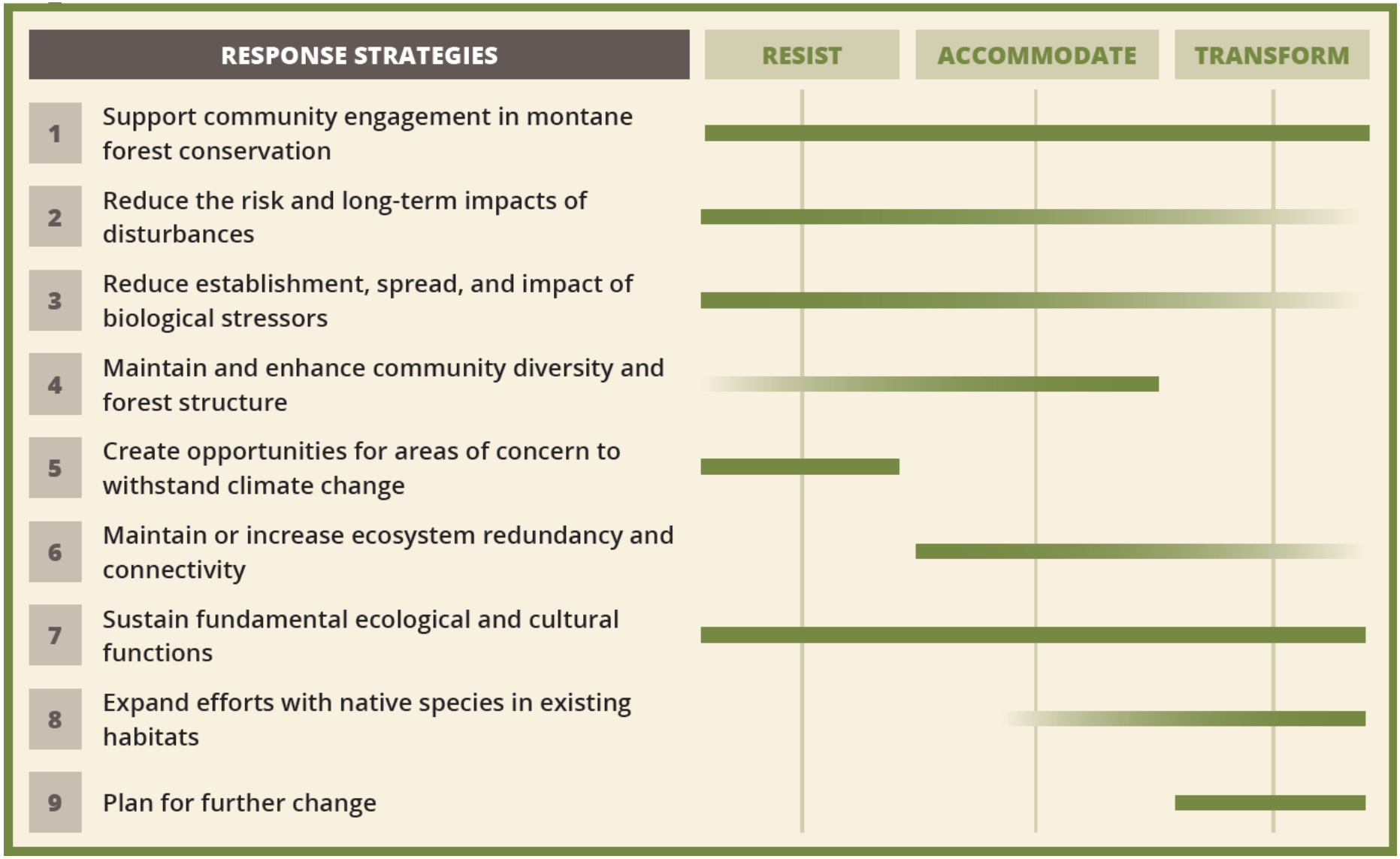
A Tribal Climate Adaptation Menu

Adaptation Menu

RESPONSE STRATEGIES	
1	Support community engagement in montane forest conservation
2	Reduce the risk and long-term impacts of disturbances
3	Reduce establishment, spread, and impact of biological stressors
4	Maintain and enhance community diversity and forest structure
5	Create opportunities for areas of concern to withstand climate change
6	Maintain or increase ecosystem redundancy and connectivity
7	Sustain fundamental ecological and cultural functions
8	Expand efforts with native species in existing habitats
9	Plan for further change

Adapted from Janowiak et al. 2022

Adaptation Menu



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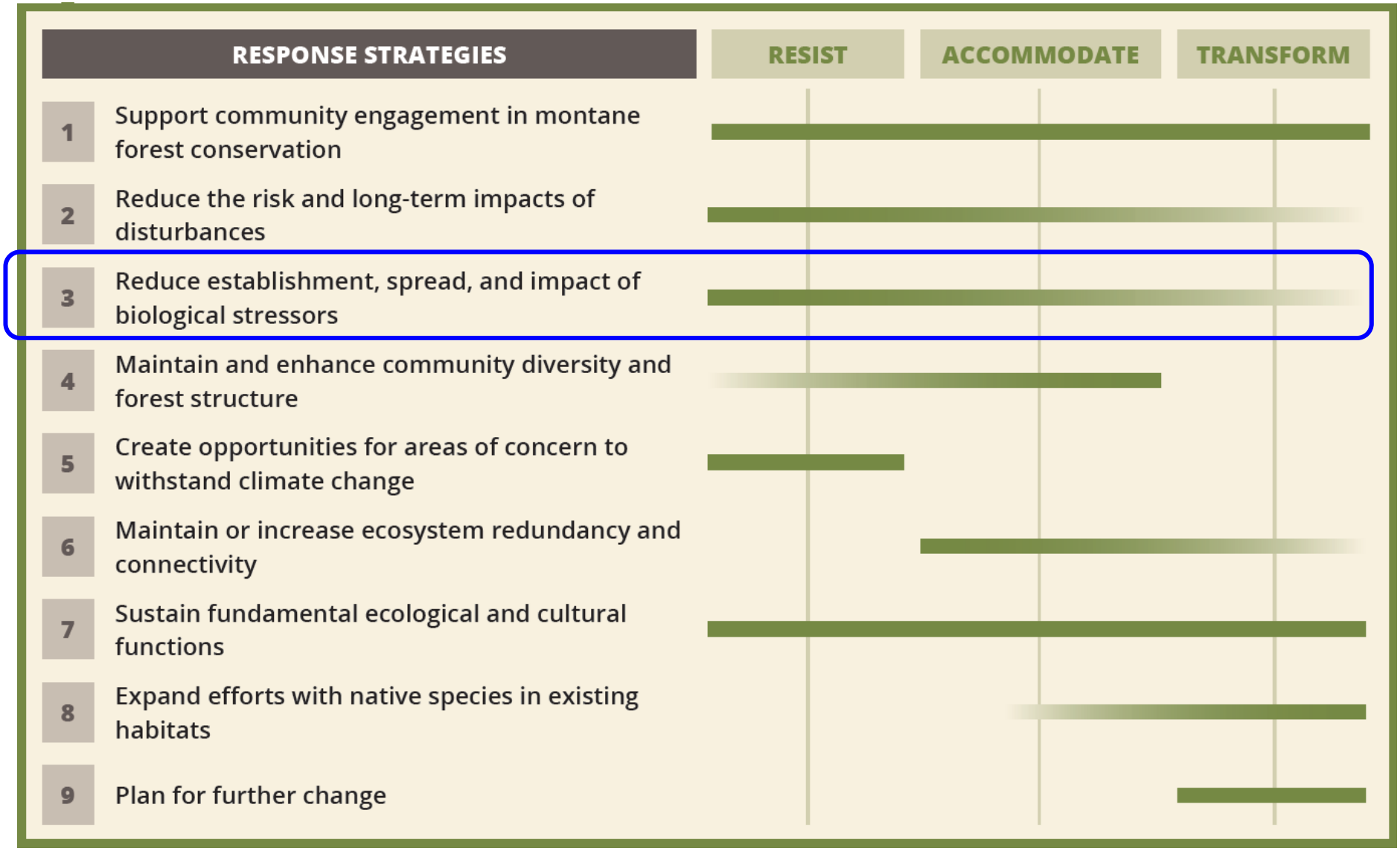
Adaptation Menu



Adapted from Janowiak et al. 2022

Montane Forest Adaptation Menu

All Strategies | RESIST | ACCOMMODATE | TRANSFORM

Strategy 1
Support community engagement in the montane forest conservation

Strategy 2
Reduce the risk and long-term impacts of severe disturbances

Strategy 3
Reduce establishment, spread, and impact of stressors

Strategy 4
Maintain and enhance community diversity and forest structural heterogeneity

Strategy 5
Maintain or create opportunities for sites or communities of concern to withstand climate change

Strategy 6
Maintain or increase ecosystem redundancy and connectivity across the landscape

Strategy 7
Sustain fundamental ecological functions

Strategy 8
Expand efforts with native species in existing habitats

Strategy 9
Plan for further change

Click on a Strategy box to view approaches on the right side

Explore Tactics by Management Topic

Explore Tactics by Project Activity

Laguna Meadow, San Diego County

Approach 3.2 Reduce the spread, impact, and establishment of stressors

- **3.2.2 For many species, targeted removal before seed production is key to reducing abundance and likelihood for seed spread**

Approach 3.2 Reduce the spread, impact, and establishment of stressors

- **3.2.3 If the understory is currently invaded, hot high intensity broadcast burns could be used to reduce nonnative propagules.**

Approach 3.2 Reduce the spread, impact, and establishment of stressors

- **3.2.5 Post-disturbance monitoring should prioritize areas that previously retained intact native cover before disturbance.**

Approach 3.2 Reduce the spread, impact, and establishment of stressors

Tactic 3.2.1
Before planned disturbances: implement weed reduction activities within project areas prior to undertaking ground-disturbing activities.
Related Management Topics
Related Project Activities:
Restoration/Reforestation

Tactic 3.2.2
Understanding the biology and phenology of nonnative species can help with effective management.
Related Management Topics
Related Project Activities:
Restoration/Reforestation

Tactic 3.2.3
If understory is currently invaded: high intensity broadcast burns could be used to reduce nonnative propagules.
Related Management Topics
Related Project Activities:
Restoration/Reforestation
Prescribed Fire

Tactic 3.2.4
If currently no nonnatives present at the site: emphasize precautions to reduce nonnative introduction (clean equipment, minimize surface disturbance, etc).
Related Management Topics
Related Project Activities:
Restoration/Reforestation

Tactic 3.2.5
After disturbance events: conduct invasive species monitoring a control treatments.
Related Management Topics
Related Project Activities:
Forest Thinning
Prescribed Fire

- 3.2.7 **In areas where invasives are managed with annual treatment, strengthen funding and capacity to ensure uninterrupted annual treatments.**

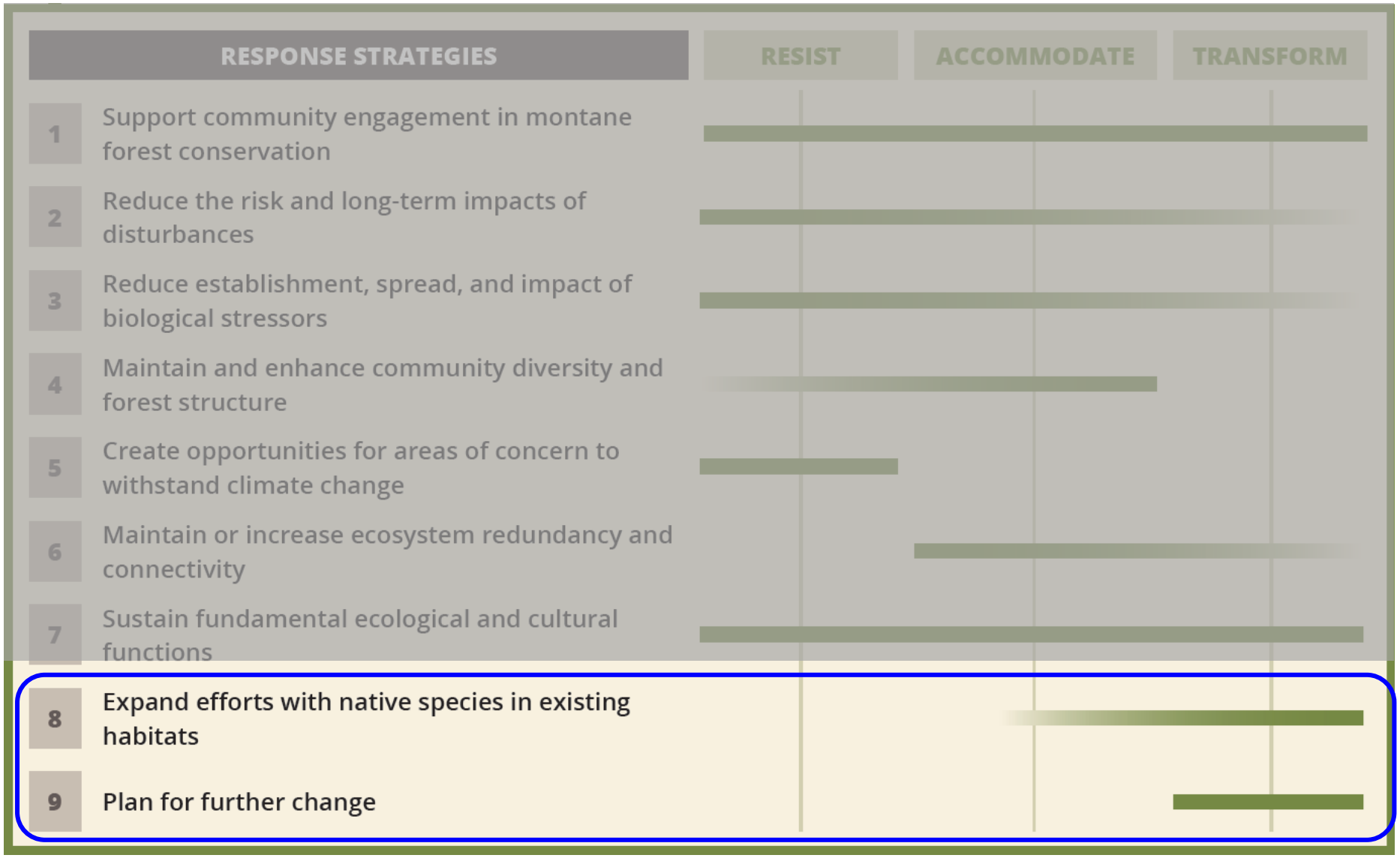
Tactic 3.2.8
Include perennial understory species in restoration projects to resist new invasive establishment.
Related Management Topics
Related Project Activities:
Restoration/Reforestation


Apple Fire, San Bernardino County

Transformation

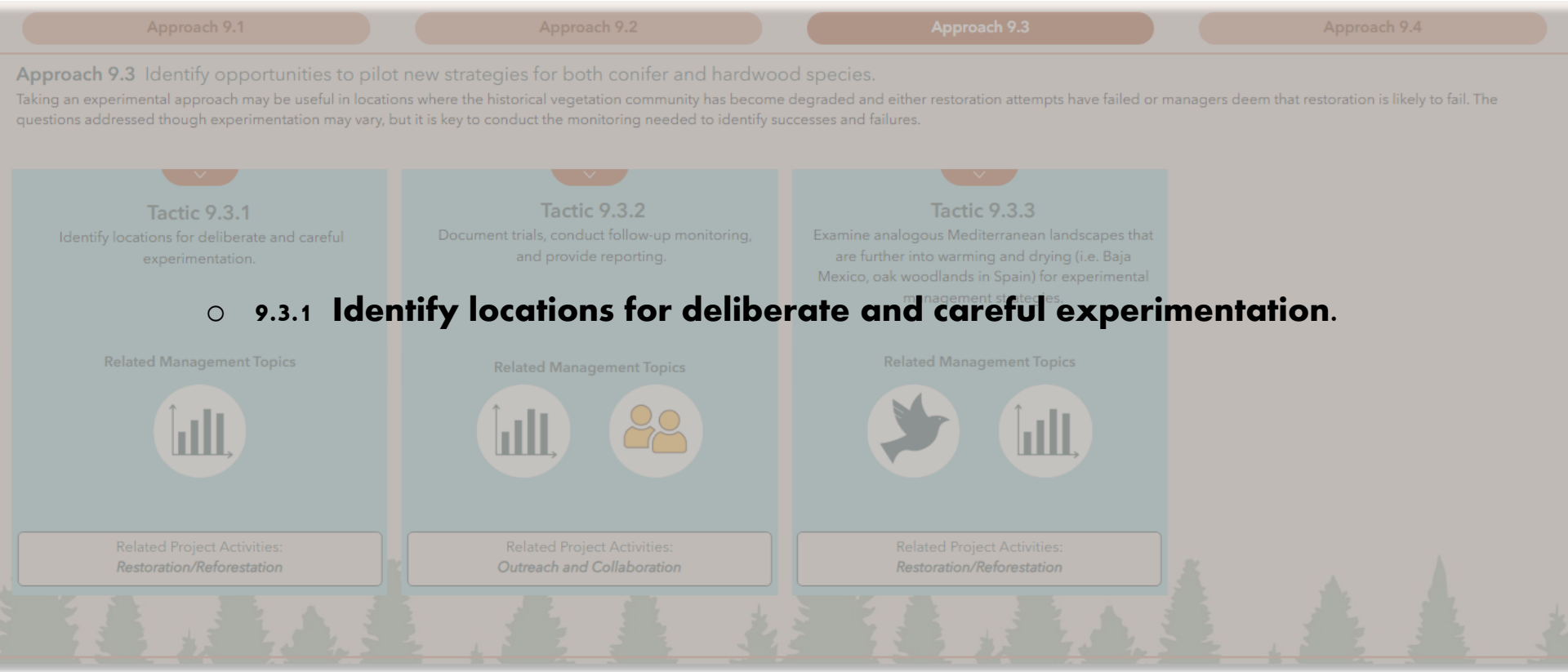
Communities transform through their response to disturbance and self-reorganization

Ready to transform?



Adapted from Janowiak et al. 2022

Approach 9.3 Identify opportunities to pilot new strategies



- 9.3.1 **Identify locations for deliberate and careful experimentation.**

Approach 9.3 Identify opportunities to pilot new strategies

Approach 9.1 | Approach 9.2 | Approach 9.3 | Approach 9.4

Approach 9.3 Identify opportunities to pilot new strategies for both conifer and hardwood species.

Taking an experimental approach may be useful in locations where the historical vegetation community has become degraded and either restoration attempts have failed or managers deem that restoration is likely to fail. The questions addressed though experimentation may vary, but it is key to conduct the monitoring needed to identify successes and failures.

- **9.3.2 Document trials, conduct follow-up monitoring, and provide reporting.**

Tactic 9.3.1
Identify locations for deliberate and careful experimentation.

Tactic 9.3.2
Document trials, conduct follow-up monitoring, and provide reporting.

Tactic 9.3.3
Examine analogous Mediterranean landscapes that are further into warming and drying (i.e. Baja Mexico, oak woodlands in Spain) for experimental management strategies.

Related Management Topics

Related Project Activities:
Restoration/Reforestation

Approach 9.3 Identify opportunities to pilot new strategies

- **9.3.3 Examine analogous Mediterranean landscapes that are further into warming and drying for experimental management strategies (i.e. Baja Mexico, oak woodlands in Spain)**

SOUTHERN CALIFORNIA MONTANE FORESTS PROJECT

A Climate-Informed Conservation Strategy

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