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MDPI

Sustained stakeholder engagement promotes use of co-produced climate-wise connectivity knowledge by a practitioner network

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S1. Semi-structured interview questions

At the project outset, we solicited information from Mayacamas to Berryessa Connectivity Network (M2B) stakeholders about their specific management needs, conservation priorities, and constraints. The following questions were distributed electronically, followed by a one-on-one, semi-structured telephone call or in-person conversation.

1. Background information about the interviewee
    a. How would you describe your position and role within your organization?
    b. What is your role with respect to connectivity conservation?
2. Background information about the organization
    a. How would you describe the goals and priorities of your organization?
    b. How would you describe the boundaries of the area overseen by your organization?
3. Corridor benefits and connectivity threats
    a. Which plant communities or animals that are unique to your area or that you have concerns about?
    b. What benefits do you think corridors would provide?
    c. Are there emerging changes in land use?
    d. Where is the most critical/sensitive habitat located within your organization's jurisdiction?
    e. Where is the most critical/sensitive corridor pinch point?
4. Climate adaptation concerns
    a. What impacts of climate change are you most concerned about?
    b. Are you relying on any climate change information?
    c. Do you have a preferred strategy for protecting open space given climate change?
5. Hydrology/watershed integrity
    a. How would you describe the role of hydrology and watershed integrity in your organization's jurisdiction?
    b. What are the threats to watershed or stream course integrity?
    c. What are the priorities of this network? What are the important attributes of watersheds or stream courses?
6. Additional information
    a. Is there any additional information or data that you feel may be helpful to us in understanding better ways to support and enhance habitat connectivity on the ground?

S2. Terminology developed and used by the Mayacamas to Berryessa Connectivity Network (M2B).

Connectivity

California Protected Areas Database Plus (CPAD+): A database of protected areas (>50 acres in size) comprised of lands owned in fee and protected for open space purposes from the California Protected Area Database (CPAD; calands.org) augmented with additional properties managed by participating stakeholders. In this report, the protected area database (CPAD+) is a combination of CPAD listings that are greater than 50 acres in size and additional properties of interest managed by participating stakeholders.

Habitat corridor: Designated patches or strips of habitat that allow wildlife to safely move between larger blocks of habitat. Highly permeable corridors consist of continuous habitat or landscape linkages connecting core areas that permit all species and other resources (e.g., water) to move easily between these wildland blocks. In this report, a habitat corridor specifically refers to an implementable project area identified by the stakeholders.

Large landscape patch: A large, contiguous extent of natural habitat that is used as a node for linkage or connectivity analysis. In this report, we define large patches as areas greater than 5000 acres in size that are continuous, unprotected, and undeveloped (e.g., no agriculture or roads) wildlands.

Least cost path (LCP): The predicted movement path between two locations that accounts for the influence of the landscape, which is represented as a resistance (cost) surface based on environmental factors (e.g., landscape integrity, climate, topography, or vegetation type). Thus, a least cost path represents the route between a source and destination with the fewest obstacles and least resistance to movement. In this report, a least cost path is a linear element that is the symbolic representation of the highest linkage potential (described below) between nodes across the landscape.

Linkage: A broad swath of land land that provides potential connectivity between larger habitat areas (e.g., protected areas, landscape patches)

Linkage potential: The potential for connectivity between natural habitat patches (e.g., protected areas and nodes) used to identify locations that facilitate the movement of multiple species and maintain ecological processes. In this report, the linkage potential is used to evaluate the quality of the landscape between protected area nodes and is represented as linkage potential surfaces.

Matrix: The physical setting and context of the landscape within which corridors and habitat patches are situated. In this report, the matrix is a component of the landscape, altered from its original state by human land use, which may vary in cover from human-dominated to semi-natural. Corridors and habitat patches are embedded in the matrix.

Naturalness: An index of ecological integrity that estimates the degree of human modification based on stressors such as land use, and land cover, as well as the presence of, use of, and distance from roads [1].

Nodes: Patches of contiguous habitat (i.e., protected areas) that are used as start and end points for linkage or connectivity analysis. In this report, the nodes are protected areas within the CPAD+ database, described above.

Permeability: The degree to which regional landscapes, encompassing a variety of natural, semi-natural, and developed land cover types, are conducive to wildlife movement and sustain ecological processes. In this report, we use two indices of landscape permeability: (1) Naturalness, as described above, and (2) a combined model derived using three indices of habitat fragmentation: median patch size effect, mean parcel size effect, and road effect [2].

Resistance surface: A data layer used in connectivity modeling to approximate the difficulty of movement between locations while considering the influence of the landscape (e.g., landscape integrity, temperature, topography, or vegetation type), where a high value is considered highly resistant to movement or resource flow.

Riparian connectivity: A measure of connectivity based on enduring physiographic features of ruggedness, topography, and landforms presumed to be important for terrestrial, aquatic, and

riparian resource flow that is used to inform linkage potential, least cost paths, corridors, and pathways. Locations with a high value facilitate terrestrial, aquatic, and riparian resource flow.
Terrestrial connectivity: A measure of terrestrial connectivity based on the physical arrangements of habitat patches, disturbance, or environmental elements presumed to be important for terrestrial wildlife movement that is used to inform linkage potential, least cost paths, corridors, and pathways. Locations with a high value facilitate terrestrial wildlife movement.

Climate

Average summer monthly maximum temperature (JJA Tmax; June, July, August): The average summer maximum temperature in the three warmest months of the year (June – August), which is a prime determinant of heat wave extremes, and an important contributor to potential evapotranspiration and aridity.
Average winter monthly minimum temperature (DJF Tmin; December, January, February): The average minimum temperature over the three coldest months of the year (December – February), which is a prime determinant of frost and freeze frequency, and chilling hours for winter dormant plants.
Future climate: In general, a future climate refers to climate conditions generated by the global circulation model. In this project, we use future climate to describe the projected temperature surface at 30-m resolution derived from the 30-year average of temperatures for 2040 – 2069 generated by the CNRM-CM5 model using representative concentration pathway 8.5 [3].
Net cooling benefit: A quantification of the availability of relatively cooler temperatures within a designated area. We calculated the net cooling benefit for each linkage by calculating the absolute difference between the minimum temperature values for each adjoining protected area.
Recent climate: In this project we use future climate to describe the 30-year average of temperatures from 1981 – 2010 based on 800 m PRISM data spatially downscaled to 30 m using the gradient-inverse distance squared approach [3].

References

1. Theobald, D.M. A general model to quantify ecological integrity for landscape assessments and US application. *Landsc. Ecol.* **2013**, *28*, 1859–1874, doi:10.1007/s10980-013-9941-6.
2. Gray, M.; Wilmers, C.C.; Reed, S.E.; Merenlender, A.M. Landscape feature-based permeability models relate to puma occurrence. *Landsc. Urban Plan.* **2016**, *147*, 50–58, doi:10.1016/j.landurbplan.2015.11.009.
3. Flint, L.E.; Flint, A.L.; Thorne, J.H.; Boynton, R. Fine-scale hydrologic modeling for regional landscape applications: The California Basin Characterization Model development and performance. *Ecol. Process.* **2013**, *2*, 1–21, doi:10.1186/2192-1709-2-25.

S3. Mayacamas to Berryessa Connectivity Network (M2B) Outreach Brochure

The M2B Network collaboratively created a brochure to use in outreach activities with landowners. The brochure was a tri-fold, letter-sized document with six panels on the front and back that provided a brief introduction to the M2B project, summarized corridors and their benefits, and identified seven ways landowners can keep their lands "wildlife friendly".

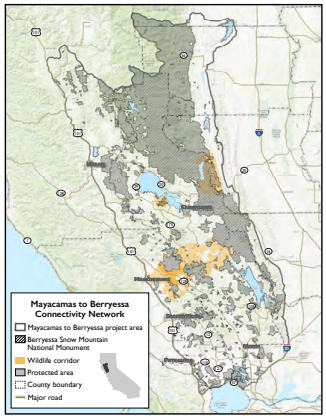
The creation of the brochure involved defining the content and messaging at two in-person convenings and through online communication. Researchers and managers proposed content, and stakeholders provided feedback about concepts expected to resonate with landowners and highlighted potentially sensitive topics. Knowledge interplay between researchers and stakeholders was critical in the creation of the brochure. For example, some words and topics considered "scientifically neutral" by researchers were highlighted as having a second, potentially sensitive meaning by stakeholders, and were subsequently revised (or eliminated. Stakeholders demonstrated ownership of the final product by independently printing the brochure and distributing it at their

142 local offices and as a supplementary component of regular outreach materials mailed to their
143 networks.

144 *Front of Brochure*

CONNECTED LANDS ARE RESILIENT LANDS

The **Mayacamas to Berryessa Landscape Connectivity Network** is a partnership of public and private land managers across **10 counties** advancing the stewardship of habitat corridors vital to the health of Northern California's inner Coast Ranges.



The network has identified a set of wildlife corridors key to landscape resilience:

Shiloh Ridge to Mark West Springs
Pepperwood to Modini Mayacamas
Heart of Mayacamas to Berryessa
Clear Lake to Mount Konocti
Alexander Valley
Indian Valley Areas of Environmental Concern

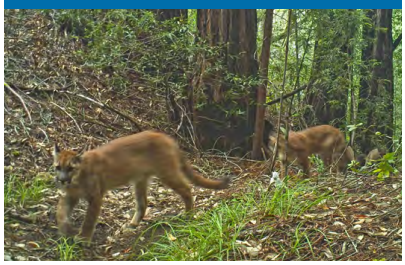
Mayacamas to Berryessa Landscape Connectivity Network partners:

Pepperwood PRESERVE
CA LCP
Berkeley UNIVERSITY OF CALIFORNIA
Land Trust OF NAPA COUNTY
SONOMA LAND TRUST
AG + OPEN SPACE
acr conservation in action

Learn more about wildlife corridors and this project at www.pepperwoodpreserve.org

WHY WILDLIFE CORRIDORS?

How connected landscapes benefit our community and what you can do to help



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147 *Back of Brochure*

Wildlife corridors keep our landscape healthy

A **wildlife corridor** is a continuous swath of natural & agricultural lands.

These corridors are critical to maintain the quality of our water, forests, and wildlife in a rapidly changing environment.

BENEFITS OF CORRIDORS

Clean and abundant water
Connected creek corridors protect our streams and groundwater.

Reduced wildfire risk
Well-managed forests have less fuel to carry and spread flames.

Climate change resilience
Plants and animals can move through corridors to cooler places.

Room to roam
Connected landscapes maintain healthy flows of plants, animals, and resources.

We can work together to save and restore natural connections across our landscape. Protecting wildlife today keeps nature thriving and ensures future generations can enjoy the iconic natural beauty of this place we call home.

7 WAYS YOU CAN KEEP YOUR LANDS WILDLIFE FRIENDLY

1. **Keep pets indoors or contained**
Cats and dogs are natural predators and can devastate wildlife populations. Keep pets leashed or fenced when they're outside.

2. **Dim lights at night**
Artificial light at night disrupts ecosystems. Timers and motion sensors on outdoor lights prevent confusion of wildlife—and save energy.

3. **Secure livestock**
Provide security in the form of paddocks and guardian animals to help minimize livestock and wildlife conflicts.

4. **Stash your food and trash**
Avoid attracting wildlife to your property by securing trash containers and keeping animal food indoors.

5. **Road safety for people & wildlife**
To reduce collisions, honk and flash high beams at animals on the road. Consider wildlife crossing strategies at roadkill hotspots.

6. **Friendly fencing**
Remove unused fencing, and make sure your fences are highly visible with space at the bottom to let wildlife pass through.

7. **Reduce wildfire risk**
Maintain fire- and drought-tolerant native plants in forests and landscaping, and reduce potential wildfire fuels on your property.

Motion-activated wildlife cameras are a fun, non-invasive way to learn who is visiting your property!

DID YOU KNOW?

The two-million-acre landscape spanning the Mayacamas to Berryessa mountain ranges of Northern California is one of the most biologically diverse areas in the world!