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Briefing Paper: Challenges and Opportunities for Integrating Ecological Connectivity into U.S Forest Service Planning and Management

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Ecological connectivity is fundamental for effective biodiversity conservation in an era of climate change and expanding human development. In recognition of this fact, the U.S. Forest Service included explicit requirements for maintaining or restoring ecological connectivity in its 2012 Planning Rule (2012 Rule).[1] Now that nearly a decade has passed since the rule was promulgated—and both state and federal agencies are increasingly prioritizing ecological connectivity conservation—it is timely to assess how the Forest Service has implemented the connectivity mandate. In order to evaluate lessons learned and capture best practices, the Center for Large Landscape Conservation conducted research on challenges and opportunities for integrating ecological connectivity into U.S Forest Service planning and management. The following findings and recommendations—which address 1) science, 2) planning, 3) management, 4) partnerships and 5) regional coordination— are drawn from 45 key-informant interviews with individuals from across levels of the agency and partner organizations, and an analysis of 17 draft and final forest plans revised under the 2012 Rule. The full analysis with additional detail will be available in early 2022.

Key Findings

1. Science: The availability, awareness, and uptake of useable connectivity science varies significantly across the NFS. Connectivity science has been developed and used primarily in the following plan revision contexts: where there is a Regional or Forest-level "champion" and support from line officers; where there are wide-ranging at-risk species; and where there is a history of science-management partnerships. However, these conditions are not the norm. There is often a lack of sufficient funding and staff capacity to invest in connectivity science, and a lack of awareness or availability of existing connectivity science that is relevant, accurate, and reliable (i.e., the Best Available Scientific Information). As a result, the existing body of relevant connectivity science remains limited, and what resources are available remain underutilized in planning and management. However, numerous interviewees highlighted opportunities for leveraging advances in monitoring and remote sensing to develop broad-scale connectivity

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[1] The 2012 Rule defines connectivity as the "ecological conditions that exist at several spatial and temporal scales that provide landscape linkages that permit the exchange of flow, sediments, and nutrients; the daily and seasonal movements of animals within home ranges; the dispersal and genetic interchange between populations; and the long-distance range shifts of species, such as in response to climate change." (36 C.F.R. § 219.9). See also Haber, J., & Nelson, P. (2015). Planning for Connectivity. *A guide to connecting and conserving wildlife within and beyond America's national forests.* https://defenders.org/sites/default/files/publications/planning-for-connectivity.pdf.

science products that can inform planning across NFS units and adjacent jurisdictions, and ensure connectivity science—and plan components—are adaptable to changing conditions over time[2].

2. Planning: Planning direction for connectivity tends to be vague and aspirational, rather than specific and actionable. Many of the national forests that effectively overcame the above barriers to integrating connectivity science into their planning efforts developed robust connectivity plan components. Exemplary connectivity plan elements include spatially explicit Special Management Areas, Key Linkage Areas, Riparian Habitat Conservation Areas, and

Figure 1. Number of Connectivity Plan Components by Plan Component Type
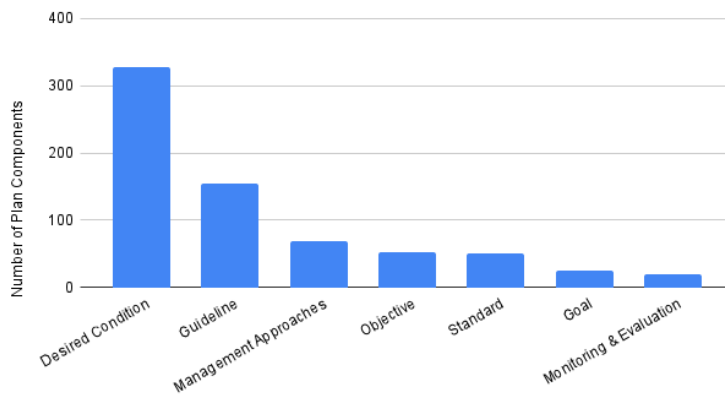
Conservation Watershed Networks. However, most connectivity-related plan components were aspirational desired conditions, rather than actionable or enforceable objectives, standards, or guidelines (Figure 1). Moreover, only 21% of connectivity plan components analyzed included clear goals or specific direction related to a defined geographic location, habitat, time frame, or species.

Barriers that prevent Forest Service staff from developing robust connectivity plan components include: a reluctance by agency staff to commit to specific direction given the potential for changing conditions; lack of knowledge or examples of how to craft effective connectivity plan components; lack of commitment and interest from line officers due to competing priorities; and lack of capacity for coordinating connectivity efforts across adjacent NFS units and with neighboring land owners (federal, state, tribal, and private).

3. Management: Maintaining and restoring connectivity requires both planning and management. While *planning* for ecological connectivity is critical, *managing* for connectivity is equally important. Interviewees highlighted numerous opportunities for integrating connectivity considerations into Forest Service programs and activities beyond the NFMA planning process, including:

- Shared Stewardship (e.g., specific emphasis on protecting and enhancing wildlife corridors in the Colorado Shared Stewardship Memorandum of Understanding)[3]
- Vegetation management and mitigation (e.g., USFS-led Northern Arizona Landscape Connectivity Alliance)[4]

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[2] Zeller, K. A., Lewsion, R., Fletcher, R. J., Tulbure, M. G., & Jennings, M. K. 2020. Understanding the importance of dynamic landscape connectivity. *Land*, *9*(9), 303.

[3] Memorandum of Understanding Between the State of Colorado and the U.S. Department of Agriculture. https://www.fs.usda.gov/sites/default/files/MOU-CO-USDA.pdf.

[4] Contact R3 Regional Wildlife Ecologist Leslie Hays for more information.

- Land and Water Conservation Fund acquisitions and easements via the Federal Lands Acquisitions program and the Forest Legacy Fund (e.g., Florida Wildlife Corridor)[5]
- Legacy Roads and Trails and Infrastructure Act investments (e.g., improving aquatic organism passage and constructing wildlife crossings)[6]
- Travel Management Planning (e.g., integrating connectivity considerations into motorized recreation and road decommissioning decisions)
- Range management (e.g., modifications to make fencing more permeable to wildlife)
- Landscape-scale National Environmental Policy Act effects analysis and programmatic environmental assessments[7]

4. Partnerships: Collaboration is essential for achieving connectivity goals. Given that maintaining and restoring ecological connectivity requires an "all-lands" approach, collaborating with federal, state, tribal, and local partners is essential. Interviewees said that working closely with state and tribal natural resource and transportation agencies is especially important, particularly given the raft of new connectivity policies states have issued and passed in recent years[8]. There are also pressing opportunities for coordination with federal agencies within the Department of the Interior (DOI), such as the Bureau of Land Management (BLM), which is preparing guidance regarding designations for habitat connectivity areas. Agency and external partners also highlighted the importance of non-governmental partners who can co-develop connectivity science products, facilitate and convene interagency collaboration, and engage in community outreach and education around the need for and benefits of ecological connectivity.

5. Regional Coordination: Regional Offices and Bioregional Planning Centers can be critical hubs for ecological connectivity science, planning, and management. Regional Offices are well-positioned to develop and disseminate broad-scale connectivity science, foster partner collaboration, and promote coordination across agency branches, programs, and units. This would then allow for the development of consistent plan components and programmatic direction for integrating connectivity considerations into management activities. Assessing, planning for, and managing connectivity at the regional or bioregional level would improve efficiency and consistency, leading to more successful implementation of the biodiversity provisions of the 2012 Rule. However, direction from leadership and investments in staff capacity are necessary to catalyze and sustain regional coordination efforts.

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[5] North Florida Land Trust. "Ocala-to-Osceola Wildlife Corridor." https://www.nflt.org/ocala-to-osceola-wildlife-corridor/.

[6] Oregon Department of Fish and Wildlife. The Oregon Conservation Strategy. "Strategy Spotlight: U.S. 97 Wildlife Crossing." https://oregonconservationstrategy.org/success-story/us-97-wildlife-crossing/.

[7] Pacific Northwest Region Aquatic Restoration Project EA. https://www.fs.usda.gov/nfs/11558/www/nepa/108207_FSPLT3_4448686.pdf.

[8] Conservation Corridor. "State-by-state connectivity policies in the U.S." June 8, 2021. https://conservationcorridor.org/digests/2021/06/state-by-state-connectivity-policies-in-the-us/.

Conclusion and Recommendations

In order to effectively implement the connectivity requirements of the 2012 Rule and integrate connectivity considerations into programs and management activities, Forest Service should a) establish ecological connectivity as a priority for science, planning, and management, and b) leverage and build capacity to improve coordination within the agency and with external partners in order to achieve connectivity goals. The following are specific actions the agency can take to more successfully advance the maintenance and restoration of connectivity over the near- and mid-term.

Near-term

- Issue guidance or formal communications establishing connectivity conservation as national priority for forest planning and management.
- Designate connectivity leads for each Regional Office, as well as the Washington Office.
- Allocate funding for the collaborative development of regional connectivity science products and support NFS and Research staff engagement in interagency connectivity working groups.
- Direct Ecosystem Management Coordination staff to work with partners to develop a connectivity plan component library, a "Data Sources and Tools" module, and ecological connectivity training modules and webinars for forest planners and resource specialists
- Coordinate with BLM Wildlife Program staff on connectivity efforts on federal lands in the West.

Mid-term

- Work with partners to convene an interagency workshop to explore best practices, innovations, and opportunities for coordination around connectivity planning and management with the Natural Resource Conservation Service and DOI agencies.
- Integrate connectivity criteria into Federal Lands Acquisition processes, and ensure the program is sufficiently funded to support implementation.
- Work with the Federal Highway Administration to create more transportation liaison positions to mitigate the impacts of roads on ecological connectivity.
- Build capacity in Regional Offices to develop useable connectivity science and operational frameworks for connectivity conservation in collaboration with Research staff and partners.
- Develop data standards, Best Available Scientific Information review processes, and accessible spatial databases to support connectivity data sharing and partner coordination[9].
- Consider Regional plan amendments or directives to address connectivity needs at the landscape and transboundary scale.

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[9] Or leverage existing databases such as databasin.org.