Developing and sustaining collaborative resilience in the face of change:

A review of the Collaborative Forest Landscape Restoration Program projects

August, 2020

CFRI - 2003

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Preface and acknowledgements

The Collaborative Forest Landscape Restoration Program (CFLRP) was an incubator for innovation and learning to improve forest management outcomes, advance applied research and multi-partner monitoring, and develop new collaborative governance structures. The initial 10-year performance period for the CFLRP has come to an end, and the Colorado Forest Restoration Institute (CFRI) and other Southwest Ecological Restoration Institutes are well-positioned to document lessons learned and transfer knowledge from the CFLRP to other collaborative forest restoration groups locally and across the nation.

The white paper published herein was developed in response to a request from contributors from the USDA Forest Service Washington Office Jessica Robertson (Integrated Restoration Coordinator) and Lindsay Buchanan (CFLRP Program Coordinator) to document lessons learned and assess the applicability of CFLRP collaborative planning, implementation, monitoring, and adaptive management processes to improve CFLRP and non-CFLRP programs and projects. In that vein, this white paper provides a synthesis of peer-review and gray literature on CFLRP projects and survey findings from two collaborative forest restoration cross-boundary workshops and a national CFLRP collaboration indicator survey to assess: 1) the factors that enabled and constrained collaboration; and 2) what factors contributed to the evolution, sustainability, and resilience of collaboratives through time.

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Executive Summary

The Collaborative Forest Landscape Restoration Program (CFLRP) was established to support collaborative, science-based restoration of priority forested landscapes. This report assesses the "C" in CFLRP. The author team synthesized peer-review and gray literature on CFLRP projects and findings from cross-boundary workshops and the National Forest Foundation's Collaboration Indicator Survey to assess the following research questions:

1. What are the factors that enabled and constrained collaboration across CFLRP project contexts and cases?; and
2. What contributes to the evolution, sustainability, and resilience of collaboratives through time?

The report identifies four emergent themes, and for each theme documented key findings and recommendations for collaborative forest restoration, which are summarized below.

Collaboration entails spanning different types of boundaries so people can more easily work together

- Policy makers should consider long-term investments in boundary spanning organizations and individuals to promote inclusivity, transparency, accountability, and use of best available scientific information.
- Investing in boundary spanning activities (e.g., field trips, joint fact-finding) can promote relationship-building, social learning, and knowledge exchange.
- Unit line officers and regional leadership can enable or constrain collaboration - collaboratives should seek support for collaboration from multiple levels of authority.
- The Forest Service, an agency of the U.S. Department of Agriculture (Forest Service), can cultivate collaboration by mandating collaboration training, including collaboration in performance metrics, using guidebooks on collaboration best practices, and/or establishing opportunities for promotions in place.
- To absorb inevitable agency and non-agency personnel transitions, collaboratives could: 1) document and periodically review operating principles, procedures, and agreement on restoration principles; 2) develop on-boarding documents and activities; 3) engage in the Forest Service hiring process to ensure new personnel embrace collaborative efforts; 4) and/or incorporate redundancy in positions or roles.

Aligning collaborative engagement opportunities with participants' expectations and capacity to engage requires constant attention and adaptive management

- Incremental, intermediate steps (e.g., focusing on "small wins", high-agreement issues, demonstration projects), and reporting minority opinions can help demonstrate progress, and build capacity for establishing dialogue to tackle more contentious, larger-scale objectives.
- Engaging participants early and often throughout decision-making processes can help collaboratives understand and inform the process, and identify actions that are plausible and desirable within Forest Service sideboards.
- Constantly (re)consider who should participate and when (e.g., operations staff in direction- and priority-setting) to better incorporate collaborative vision and recommendations into operations on the ground.
- Include Forest Service personnel in communication and dialogue, but not in collaborative decision-making to reduce conflict (e.g., FACA concerns) and increase time spent working towards restoration goals. Several public resources document how collaboratives can inform the NEPA process and navigate FACA concerns.

The degree of collaborative formality is dynamic and dependent on local context and history

- Collaborative formality is contingent upon the history of collaboration, internal capacities and expectations for engagement, and can change in response to internal or external factors.
- Some degree of formality may be required to define roles, procedures, and goals.
- It is important to consider trade-offs between highly formal and informal structures in the context of stakeholder expectations, capacities, and needs.
- Collaboratives and those who engage with, or support, collaboratives should consider and periodically re-evaluate collaborative structures and processes to: align personnel and funding capacities, expectations, and needs of existing and new members; consider the historical conditions that may inhibit what restoration options are feasible and desirable; and remain flexible and responsive to internal and external changes.

Changes in ecological and economic, social, or political conditions can disrupt progress and force a group to adjust

- External changes largely outside the control of collaboratives can provide windows of opportunity to garner support and reorganize, though they can also undermine collaborative progress and diminish adaptive capacity.
- Collaborative should: 1) document the major stressors they have been exposed to, or will likely experience in the future; 2) identify existing or future response and preparedness options to mitigate negative impacts and overcome barriers; and 3) determine ways to navigate opportunities when desirable changes occur.

The findings described herein highlight an overarching theme to consider for collaborative forest restoration: Change is a fundamental and recurring aspect of collaboration. Collaborative groups are continuously impacted, both positively and negatively, by changes within their group, external changes in social and ecological conditions, and a fluid institutional environment in terms of policy direction and resource availability. In this vein, the report identifies four recommendations to assist collaboratives in anticipating, navigating, and building collaborative resilience to change. First, turnover was the most commonly cited stressor that collaboratives experienced, and thus collaboratives should implement structures and/or practices to absorb inevitable changes in participants, confer institutional memory, and translate knowledge into practice. Second, collaboratives should assess and periodically evaluate their vulnerability and adaptive capacity to changes that have impacted their group using structured self-assessments grounded in vulnerability and adaptation science. Third, collaboratives should consider using scenario planning to explore the impacts of future biophysical and social changes, tradeoffs in decision-making, and opportunities for adaptation. Fourth, congress should consider expanding the CFLRP funding mechanism to develop and sustain collaborative capacity.

Given the continued emphasis on utilizing collaboration to realize national-level policy goals associated with forest restoration and wildfire risk management across landownerships and jurisdictions as envisioned by the Forest Service Shared Stewardship Strategy, it is necessary to understand the ways in which collaboration can be sustained over many years and be adaptable and resilient to stressors. Here, the report outlines a number of practical solutions to adapt to internal and external changes, as well as a number of frameworks and approaches for collaboratively assessing social vulnerability and adaptive capacity to current and future change. The intention is that collaborative participants and agency-partners find this report useful as they continue to engage in and grapple with collaborative forest restoration.

Introduction

The Forest Landscape Restoration Act (FLRA), passed under title IV of the Omnibus Public Land Management Act of 2009 (PL 111-11), established the Collaborative Forest Landscape Restoration Program (CFLRP). The purpose of the title was to "encourage the collaborative, science-based ecosystem restoration of priority forest landscapes"[1] through a competitive funding program administered by the Forest Service. In FY2010 and FY2012, an independent federal advisory committee selected 23 CFLRP projects based on the likelihood that proposed projects would meet the five primary objectives of the act: 1) support sustainable ecological, social, and economic systems; 2) leverage local resources with private and state-level resources; 3) reduce the cost of wildfire management, reintegrate natural fire processes, and reduce risk of uncharacteristic wildfire; 4) demonstrate how ecological restoration can benefit ecological and watershed health and reduce management costs; and 5) demonstrate the utility of biomass utilization to help reduce treatment cost, support local economies, and enhance forest health. CFLRP projects were so designated for a period of 10 years.

Having passed the CFLRP's initial 10-year performance period, the timing is ripe to take stock of the progress and outcomes of the CFLRP. The following report is part of a multi-partner synthesis effort to distill lessons learned and findings from CFLRP projects. The goal is to identify ways to inform and improve the CFLRP, and translate lessons learned to the Forest Service and external partners to improve collaborative restoration more broadly. The synthesis effort consists of two assessment levels and is coordinated by the Forest Service. The Level I assessment consists of a report to Congress to demonstrate the extent to which the CFLRP is fulfilling the purposes of the title. The Level II assessment is a deeper dive to identify broader lessons learned from the CFLRP in relation to several themes, including: 1) reducing the risk of uncharacteristic wildfire; 2) ecological outcomes; 3) science-based approach and multi-party monitoring; 4) collaborative approach; 5) leveraging resources; and 6) social and economic benefits.

The CFLRP developed mechanisms for evaluating project outcomes and accomplishments, and it attracted a host of social and natural science research activities. As such, a large, robust dataset exists for synthesis (e.g., spatial and non-spatial agency documentation, peer-reviewed literature, management and monitoring plans, annual project reporting). In the Level II assessment, the Forest Service leveraged these resources, coordinated "subject-expert" working groups for each theme, and hosted peer-learning activities to distill findings and lessons learned, as well as consider best practices for the next iteration of the CFLRP. The Southwest Ecological Restoration Institutes (SWERIs) are working in concert with the Forest Service to support these efforts by assisting in peer learning activities and outreach, conducting syntheses on related topics of interest, and serving on working groups as subject-experts.

The report herein is intended to support the Level II assessment on the collaborative approach theme. The CFLRP explicitly required projects to be developed and implemented collaboratively. However, 'collaboration' was not specifically defined in the FLRA or CFLRP requirements, nor did the CFLRP provide specific guidelines by which collaborative groups convened and engaged in collaborative restoration throughout the life of the CFLRP project. This has resulted in a multitude of collaborative structures, processes, and practices that were implemented in diverse social and ecological contexts across the country. Also, while a number of social science research projects have addressed collaboration in CFLRP projects, very few longitudinal assessments track collaboration in the CFLRP through time. Thus, the research questions that are addressed in this synthesis are:

1. What are the factors that enabled and constrained collaboration across CFLRP project contexts and cases?; and
2. What contributes to the evolution, sustainability, and resilience of collaboratives through time?

The intended audience for this report is place-based collaborative groups, non-governmental organizations and their networks, Forest Service personnel, and non-federal partners.

1 Pub. L. No. 111-11, tit. IV, 123 Stat. 991 (2009)

Methodological Approach

The author team conducted a review of peer-reviewed and gray literature on CFLRP projects related to collaboration. This report defines collaboration as a process in which stakeholders work with each other and the Forest Service on restoration-related activities. Resources were compiled predominantly from the CFLRP Resource Library[2], while several other dissertations and relevant materials not included in the CFLRP Resource Library were retrieved from a Google Scholar and Web of Science search. In all, the author team developed a database of peer-reviewed and gray literature (n=43) related to the collaboration theme. This was supplemented with two additional sources: 1) results from a worksheet completed by participants (n=35) and notes from breakout groups (n=10) at the 2020 SWERI Cross-Boundary Landscape Restoration Workshop (Figure 1)[3] and the Idaho Forest Restoration Partners workshop (n=10)[4]; and 2) a subset of questions from the National Forest Foundation's (NFF) 2020 CFLRP Collaboration Indicator survey[5] (henceforth collaboration survey), which assessed the successes and challenges of each of the 23 CFLRP projects' collaborative efforts (n=105). Both the worksheet and collaboration survey asked participants to document the internal and external changes that they were exposed to, positive and negative impacts of these changes, responses, and barriers to response. The collaboration survey included other questions pertinent to this analysis, including: 1) the level of collaborative engagement in the environmental analysis and decision-making phases pursuant to the National Environmental Policy Act (NEPA); 2) whether the Regional Office supported and coordinated CFLRP project work; and 3) the name, duration, and role of third-party facilitators and organizations that provided technical analysis capacity.

Each of these resources were uploaded to, coded, and analyzed in Atlas.ti, a qualitative data analysis software package following a grounded theory approach (Glaser and Strauss 1967; Bryant and Charmaz 2007; Corbin and Strauss 2008). Text-based resources were read in their entirety, wherein codes (i.e., a word or phrase that summarizes meaning in a text segment) were applied to text segments related to the collaboration topic. The codes were inductively generated, and were focused on the structures, processes, and practices of collaboration, the factors that enabled or constrained collaborative function and performance, and lessons learned for collaborative restoration. Videos and webinars from the CFLRP Resource Library (n=15) were analyzed separately and supplemented the findings.

Figure 1: Participants from over 50 organizations discuss successful strategies for collaboration at the 2020 SWERI Cross-Boundary Landscape Restoration Workshop.

2 https://www.fs.fed.us/restoration/CFLRP/resource-library.php
3 https://sweri.eri.nau.edu/cross-boundary-landscape-restoration-workshop/
4 http://idahoforestpartners.org/reference-library.html
5 https://www.nationalforests.org/collaboration-resources/learning-topics/collaborative-forest-landscape-restoration-program-cflrp/cflrp-monitoring

Spanning Boundaries: Key Findings and Recommendations

- Policy makers should consider long-term investments in boundary spanning organizations and individuals (e.g., community champions, facilitators) to promote inclusivity, transparency, accountability, and use of best available scientific information.
- Investing in boundary spanning activities (e.g., field trips, joint fact-finding) can promote relationship-building, social learning, and knowledge exchange.
- Unit line officers and regional leadership can enable or constrain collaboration—collaboratives should seek support for collaboration from multiple levels of authority.
- The Forest Service can cultivate collaboration by mandating collaboration training, including collaboration in performance metrics, using guidebooks on collaboration best practices, and/or establishing opportunities for promotions in place.
- To absorb inevitable agency and non-agency personnel transitions, collaboratives could: 1) document and periodically review operating principles, procedures, and agreement on restoration principles; 2) develop on-boarding documents and activities; 3) engage in the Forest Service hiring process to ensure new personnel embrace collaborative efforts; 4) and/or incorporate redundancy in positions or roles.
- The development of boundary objects and a robust transition strategy can articulate shared visions among collaborative members and across entities to ensure practices and procedures endure personnel change.

Findings

The findings are summarized into four emergent themes: 1) collaboration entails spanning different types of boundaries so people can more easily work together; 2) Aligning collaborative engagement opportunities with participants' expectations and capacity to engage requires constant attention and adaptive management; 3) degree of collaborative formality is dynamic and dependent on local context and history; and 4) changes in ecological and economic, social, or political conditions can disrupt progress and force a group to adjust.

This report describes each theme, in turn, below. Key findings and recommendations from each theme are summarized in boxes and using bold-face, italic font and bulleted lists for easy reference. The report also includes links to relevant tools, websites, and articles in footnotes throughout.

Spanning Boundaries

Collaboration entails spanning different types of boundaries so people can more easily work together. Collaboration is a process by which individuals or organizations with different perspectives and resources come together to achieve outcomes they would not be able to attain by working alone. The CFLRP was unique in that it dedicated sustained funding and a requirement to collaborate from planning to implementation and monitoring. The 10-year duration of projects meant that collaborators needed to create and sustain a space through which this 'coming together' could endure through time, and persist throughout changes in participants and personnel, policies, resources, and other unforeseen circumstances. A theme emerging from the synthesis is that creating and sustaining this space required participants to work across geographic, administrative, social, political, and cultural boundaries.

Boundary spanning activities allow collaborative participants to work through differences and attain mutually-beneficial outcomes. These activities include and, in turn, support:

- collaboratively producing and applying shared knowledge;
- pooling, sharing, and leveraging resources (e.g., human, social, financial, and political capital) to build collaborative capacity;
- developing and sustaining relationships and trust among participants who may otherwise be at odds with one another; and
- investing in the capacities needed for participants to self-organize and self-govern (i.e., where people voluntary organize around common rules and procedures, and a common function to solve shared problems)[6] (Cash et al. 2006; Berkes 2009; Robinson and Wallington 2012; Cheng et al. 2015; Edelenbos and van Meerkerk 2015; McAllister and Taylor 2015; Bergemann et al. 2019; Colavito 2019; Ryan and Urgenson 2019; Jensen-Ryan and German 2019)

Based on the review of the CFLRP literature, the author team identified a number of factors that enabled and constrained boundary-spanning, including key individuals and organizations (e.g., community champions, facilitators, coordinators, research groups), activities, and objects (See Appendix 1 for a detailed list of the roles and examples of boundary spanning activities in supporting collaboration).

Community champions: Community champions were opinion leaders and trust-brokers that made sure community interests and perspectives were represented, helped get community buy-in, and maintained collaborative momentum by maintaining all participants' attention on, and accountability to, the CFLRP project (Cheng and Sturtevant 2012; Egan and Dubay 2013; Antuma et al. 2014).

Professional third-party facilitators and/or coordinators: According to the collaboration survey responses, the majority of CFLRP projects (60%) have used third-party facilitators over the life of the project. Some projects used facilitators throughout the project tenure, for part of it, and/or have cycled through several facilitators (National Forest Foundation 2020). Facilitators were instrumental in: 1) reducing conflict and establishing zones of agreement; 2) (re)defining goals, missions, and objectives; 3) ensuring diverse perspectives were heard; 4) ensuring tasks were completed as promised; 5) supporting public engagement activities; and 6) conducting evaluations of the collaborative process (Bartlett 2012; Cheng and Sturtevant 2012; Moote 2013; Antuma et al. 2014; DuPraw 2014; Bergemann 2017; Schultz et al. 2017; Walpole et al. 2017; USFS 2018). Meanwhile, coordinators held multiple roles, such as: 1) planning meetings; 2) coordinating field trips; 3) monitoring support; and 4) outreach and communication, among others (e.g., Knapp 2010; Antuma et al. 2014; Bergemann 2017; Schultz et al. 2017; Urgenson et al. 2017; USFS 2018).

Invest in opportunities for relationship-building, knowledge exchange, and learning: Individuals and organizations supported cross-boundary work through relationship-building and knowledge exchange activities, such as: 1) joint fact-finding missions[7]; 2) peer-learning webinars, workshops, and site visits[8]; 3) field trips[9]; 4) pub talks; and 5) podcasts. The majority of collaboratives (~70% of survey respondents) reported the use of third-party organizations to augment science and technical analysis capacity (National Forest Foundation 2020). These entities supported biophysical and socio-economic monitoring, adaptive management,

6 In contrast to centralized, hierarchical government, self-organization is not centralized. Self-organization and self-governance occurs when individuals and organizations voluntarily organize to establish and agree on common rules and procedures; develop a common understanding of the problem at hand and serve a common function or goal; and integrate and learn from diverse knowledges, experiences, and information (i.e., learning by doing) to solve a shared, or common, problem (Ostrom et al. 1999; Folke et al. 2005; Folke 2006; Hahn and Nykvist 2017; Nederhand et al. 2019).

7 Joint fact finding is a set of procedures wherein multiple stakeholders come together to "to compile and pool relevant information and to "translate" it into a form that can be used by decision makers and others to create the foundation for broad-based consensus" (McCreary et al. 2001, p. 329). In short, the role of joint fact-finding missions is to bring together diverse perspectives and research for knowledge exchange.

8 Peer-learning activities facilitate sharing of ideas, successes and challenges, and exchange of knowledge across CFLRP projects. Each CFLRP project operated under a similar policy context, which supported this knowledge exchange.

9 Field trips, pub talks, and others provided a forum for building trust and relationships in informal settings and for facilitating knowledge exchange among collaborative groups, Forest Service, and the broader community.

resource-specific specialization/expertise, landscape evaluations, and planning, to name a few (Bartlett 2012; Antuma et al. 2014; DuPraw 2014; Cheng et al. 2015, 2019; Butler et al. 2015; Blue Mountain Forest Partners 2017; Schultz et al. 2017; Walpole et al. 2017; Thompson III et al. 2018; USFS 2018; Bergemann et al. 2019; Butler and Esch 2019; Butler and Schultz 2019; Christenson and Butler 2019; Colavito 2019; McIntyre 2019; National Forest Foundation 2020). These activities supported social learning and knowledge exchange in several ways, for example:

- field trips illustrated how restoration principles translated to operations on the ground and allowed the collaborative group to provide feedback on restoration treatments;
- joint fact-finding missions tailored research to local contexts and scales to support decisions; and
- peer learning workshops helped share successes and challenges of collaborative restoration across CFLRP projects and promoted relationship-building.

In sum, policy-makers relying on collaboratives to advance on-the-ground forest restoration should consider investing in boundary spanning individuals, organizations, and activities. Investing in boundary spanning can: ensure local and diverse perspectives are included at the table; allow participants to collectively work through differences and develop mutually beneficial outcomes; develop accountability for completion of tasks and programs of work; facilitate use of the best available science for learning and adaptive management; and promote relationship-building and knowledge exchange.

Role of local Forest Service unit line officer and Regional Office in shaping the collaborative space: Although national level policies, such as the FLRA, can provide the opportunity for collaborative spaces to emerge, actual collaborative functioning relied on the willingness and ability of local Forest Service unit line officers to steer intra-unit attitudes, values, team dynamics, and personnel and financial resources to support collaboration (Sabatier et al. 1995; Butler 2013; Moseley and Charnley 2014; Cheng et al. 2015). Line officers, thus, can either legitimize the collaborative process or become a significant barrier to collaborative performance (Wondolleck and Yaffee 2000; Butler 2013; Bergemann et al. 2019; Butler and Schultz 2019). In a similar vein, Regional Office decisions can either support or inhibit collaborative work (See Appendix 2). For instance, prioritization of collaboration at the regional level can help steer unit- and district-level commitments to collaboration. The region can also provide resources to support trust-building activities, flexible financing options, and offer technical expertise and specialization when needed. Alternatively, mis-alignment between regional-level priorities and CFLRP project principles, limited support for—or conflicting guidance on—implementation and contracting, and diminished engagement with the CFLRP project through time reportedly inhibited collaborative performance (National Forest Foundation 2020). ***Collaboratives need to garner support for collaborative engagement and restoration from multiple levels of authority and influence. Also, the Forest Service should cultivate and incentivize collaboration at all levels, which could be achieved by:***

- including collaborative engagement as part of managers' performance metrics;
- finding mechanisms to include collaborative participants in the interview process for new candidates on the national forest;
- mandating collaboration training for line officers who engage with collaboratives; and/or
- developing guidebooks or tools that inform line officers of effective ways to get involved in collaborative restoration. (Bixler and Kittler 2015; National Forest Foundation 2016; Butler and Schultz 2019; Christenson and Butler 2019; Ryan and Urgenson 2019). An example of this is the Partnership Capacity Assessment[10] Tool, which was developed to help Forest Service personnel evaluate and enhance their capacity to engage with collaborative groups .

10 https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/fseprd493263.pdf

Turnover of Forest Service personnel and collaboration participants: Across CFLRP projects, an oft-cited factor negatively affecting collaboration is the turnover of participants (Wondolleck and Yaffee 2000; Schultz et al. 2017; National Forest Foundation 2020; McIntyre and Schultz 2020). This is neither unique to CFLRP projects nor to the Forest Service. Loss of participants can: 1) slow collaborative progress; 2) diminish trust and relationships; and 3) result in the loss of institutional memory, leadership, direction or focus, commitment, and local knowledge and understanding of social and ecological contexts (Wondolleck and Yaffee 2000; Antuma et al. 2014; Cheng et al. 2015; Schultz et al. 2017; Mottek Lucas et al. 2017; DiBari and Randall 2018; USFS 2018; Butler and Schultz 2019; McIntyre 2019; National Forest Foundation 2020). Turnover can also present opportunities to reorganize - new participants can reinvigorate and legitimize collaboration, facilitate boundary-spanning, encourage risk-taking, and consider new ways of doing things (National Forest Foundation 2016, 2020).

Transition strategy: ***It is important to have a strategy to deal with personnel transitions so that collaborative performance and function is not impacted.*** Stern and Coleman (2019, 2014) have argued that developing agreed-upon rules and procedures that articulate shared values, goals, roles, expectations for engagement and negotiation, and commitments (i.e., procedural, or systems-based trust) can help absorb turnover and maintain and build other forms of trust (e.g., rational or affinitive) as new personnel come onboard (See Appendix 3 for examples of how collaboratives can build or repair trust). As new personnel come on board there is constant negotiation about how knowledge will be shared and used, who is responsible for what, and what capacities individuals and groups bring to bear (DuPraw 2014; Orth and Cheng 2019). Thus, periodically reviewing and evaluating operating principles and reviewing ground rules for negotiation at meetings is critical (National Forest Foundation 2020).

Additionally, some CFLRP projects adjusted to participant turnover by developing:

- "hand-over memos"[11];
- onboarding workshops, meetings, or field trips;
- a buddy system where senior personnel worked with new staff;
- redundancy in positions or roles as new personnel come on board; and
- a process wherein collaborative participants were involved in the interview process for new Forest Service personnel to identify candidates who embrace collaborative restoration (Wondolleck and Yaffee 2000; Antuma et al. 2014; DuPraw 2014; National Forest Foundation 2016; Schultz et al. 2017; USFS 2018; Butler and Schultz 2019; Cheng et al. 2019; Christenson and Butler 2019).

Still, a number of barriers remain to responding to turnover. For example, the Forest Service culture of "move out to move up," detailing, and limited capacity to fill vacancies hinders collaboration. ***An organizational shift that offers incentives and promotional potential to stay on the forest could help maintain institutional knowledge, understanding of local social and ecological contexts, and foster collaboration*** (Gray et al. 2001; Schultz et al. 2017; National Forest Foundation 2020). Also, collaboration survey respondents reported that they did not have enough notification prior to agency departures, they lacked a 'deep bench' of participants from which to recruit, and it was difficult to recruit and retain participants who have their own jobs or other commitments and are not paid to collaborate (National Forest Foundation 2020). Appendix 4 provides more detail on the positive and negative impacts of turnover, and Appendix 5 highlights a number of responses and barriers to responding to turnover.

"Boundary objects": Boundary objects are objects or structures that exist within and between entities (e.g., the Forest Service and collaborative group) that facilitate knowledge sharing and understanding on practices and procedures. Example boundary objects employed in CFLRP projects included:

11 https://www.fs.usda.gov/detailfull/prc/tools-techniques/collaboration/?cid=STELPRDB5155747&width=full

- guidelines for restoration treatments and/or agreements that document responsibilities and expectations (e.g., memoranda of understanding, general technical reports);
- monitoring and adaptive management protocols; and
- models, databases, or maps (Antuma et al. 2014; Cheng et al. 2015; Clearwater Basin Collaborative 2015; Stern and Coleman 2015; Urgenson et al. 2017)

Appendix 6 includes example boundary objects with links to where they can be found. Boundary objects can provide institutional memory and translate knowledge into practice (Cheng et al. 2015). Boundary objects that are co-produced[12], re-evaluated, and updated as conditions change, and that explicitly identify how the agency will implement recommendations are more likely to be relevant over time and with turnover (Cheng et al. 2015; Urgenson et al. 2017). In sum, ***developing boundary objects and a robust transition strategy can articulate shared visions and processes of the collaborative group, facilitate a common understanding between the collaborative group and Forest Service, and ensure that practices and procedures endure personnel change.***

Aligning Opportunities with Capacity

Aligning collaborative engagement opportunities with participants' expectations and capacity to engage requires constant attention and adaptive management. Within a collaborative space, an array of collaborative engagement types and decision-making phases can occur. Because 'collaboration' is not specifically defined in the FLRA or CFLRP requirements, every participant (including Forest Service line officers and staff) has different expectations for what it entails relative to forest landscape restoration decision-making. Furthermore, expectations of some stakeholders about the types and timing of collaborative engagement may exceed the capacity of other stakeholders to deliver on those

Aligning Opportunities with Capacity: Key Findings and Recommendations

Collaboratives should consider the following to help work towards shared agreement, learn about and inform decision-making within regulatory and institutional guidelines, and move from one phase to the next:

- Incremental, intermediate steps (e.g., focusing on "small wins", high-agreement issues, demonstration projects), focusing on undesired outcomes, and reporting minority opinions can help demonstrate progress, and build capacity for establishing dialogue to tackle more contentious, larger-scale objectives.
- Engaging participants early and often throughout decision-making processes can help collaboratives understand and inform the process, and identify actions that are plausible and desirable within Forest Service sideboards.
- Constantly (re)consider who should participate and when (e.g., operations staff in direction- and priority-setting) to better incorporate collaborative vision and recommendations into operations on the ground.
- Include Forest Service personnel in communication and dialogue, but not in collaborative decision-making to reduce conflict (e.g., FACA concerns) and increase time spent working towards restoration goals. Several public resources document how collaboratives can inform the NEPA process and navigate FACA concerns.

12 Co-production refers to an iterative and collaborative process where multiple perspectives, expertise, and actors come together to develop knowledge relevant to a particular context or issue. Some general principles of co-production are that it is situated within a context, issue, or place; involves multiple actors and perspectives; has a clearly define goal; and is iterative and interactive (Norström et al. 2020)

expectations. The attention CFLRP projects have paid to tailoring and adapting collaborative engagement types and timing to participants' expectations and capacities is often time-consuming, but also critical to long-term collaborative progress.

Many CFLRP projects determined the need to develop consensus-based decision-making through open, transparent dialogue as an expected type of collaborative engagement. However, developing consensus is challenging and slow, particularly in complex natural resource management contexts (Urgenson et al. 2017). To mediate this challenge, several CFLRP projects:

- strove to attain, and celebrate, "small" wins or successes early in the collaborative process, wherein groups focused first on areas of general agreement;
- implemented a pilot or demonstration project;
- developed "issue-based" recommendations that identify shared visions on specific management topics; or
- focused on identifying undesired outcomes instead of desired outcomes.

These incremental, intermediate steps can help build the capacity for dialogue and agreement on more contentious issues or setting restoration objectives at larger scales (Cheng and Sturtevant 2012; Antuma et al. 2014; DuPraw 2014; Schultz et al. 2017; Walpole et al. 2017; Urgenson et al. 2017; Christenson and Butler 2019; Toman et al. 2019). In instances where consensus could not be reached, some CFLRP projects developed majority and minority reports that were both delivered to the Forest Service, which helped ensure all voices were heard (Monroe 2015; Urgenson et al. 2017; Christenson and Butler 2019; Ryan and Urgenson 2019).

With regards to the timing and level of collaborative engagement in decision-making processes, CFLRP projects and reviews pointed to the ***importance of interactions between stakeholders and the Forest Service early, often, and throughout the environmental analysis and decision-making (EADM) process*** pursuant to the National Environmental Policy Act (NEPA) and other planning requirements (Wondolleck and Yaffee 2000; Schultz et al. 2012, 2017; Butler 2013; Cheng et al. 2015; National Forest Foundation 2016; Mottek Lucas et al. 2017; USFS 2018; Bergemann et al. 2019; Butler and Esch 2019; Christenson and Butler 2019; McIntyre 2019). This was also echoed in findings from regional partner roundtables on EADM (DiBari and Randall 2018). When treatments are based on "shelf-stock" NEPA with limited to no collaborative input, Forest Service managers have limited flexibility to accommodate requested changes to management actions (Cheng et al. 2015; Bergemann et al. 2019; Butler and Esch 2019). Alternatively, when stakeholders participate in developing the evidence basis for why forest restoration is needed, it can often: 1) increase trust; 2) potentially reduce conflict and litigation; and 3) streamline the NEPA process (Schultz et al. 2012; Esch and Vosick 2016; Bergemann et al. 2019) (Appendix 7). CFLRP projects have provided opportunities for collaborative involvement in many phases of the NEPA process. Over 60% of respondents from the collaboration survey reported that their collaborative was involved in assessing ecological conditions, defining the purpose and need, scoping, defining design criteria, defining alternatives, defining monitoring and mitigation strategies, and reviewing and commenting on drafts. Fewer respondents noted that they were involved in the objections, litigation, or analysis of environmental effects phases.

Legal requirements, mandates, and associated timelines of the Forest Service's procedures are often not made explicit to collaboration participants, which can result in participants having limited or erroneous understanding of these processes (e.g., Antuma et al. 2014; Mottek Lucas 2015; Esch and Vosick 2016). Multiple, frequently used lines of communication among Forest Service personnel and collaborative groups in the EADM process can:

- clearly define the Forest Service's available decision space;
- identify when and how the Forest Service is accountable to the collaborative;
- demonstrate to stakeholders why actions are taken (or why they are not);

- help stakeholders better understand how and when to inform the process; and
- help cross-walk from planning to implementation.

Thus, ***including collaborative participants in the EADM process can identify feasible and mutually-desirable actions within Forest Service sideboards*** (Cheng and Sturtevant 2012; National Forest Foundation 2016; Monroe and Butler 2016; Bergemann 2017; DiBari and Randall 2018; Christenson and Butler 2019).

There is a need to closely consider who should be included and when in the collaborative process to better integrate planning and implementation. In the Forest Service, planning, research and assessment, and implementation of land management activities are separate functions that are often carried out by different individuals or teams. These various teams themselves are made up of multiple entities engaged in a lengthy process; navigating and understanding these processes can be cumbersome, especially for collaboratives that aren't typically directly involved. A disconnect between planning and implementation can be a challenge for collaborative engagement and management as projects move from one phase to the next (Gray et al. 2001; Knapp 2010; Freeman and Goldman 2016). For example, Cheng et al. (2015) noted that when the Colorado Front Range Restoration Initiative failed to include field-level staff during the initial transition from direction-setting to implementation, the collaborative provided little incentive for, or understanding among, these staff to carry out the collaborative's goals. When restoration principles are implemented by Forest Service staff who have not been involved in collaborative restoration direction– and priority–setting, consequences can include:

- discontent with results on the ground when implemented actions don't reflect the collaborative's vision;
- diminishment of social capital developed during the direction-setting phase ; and
- tasks not being completed on time (National Forest Foundation 2016; Stern and Coleman 2019).

NEPA Resources for Collaboratives

There are many available resources that collaboratives can use to understand the NEPA process and that provide guidelines for how to collaborate with federal agencies during the NEPA process. For example:

- NFF hosts a learning topics page dedicated to providing tools, webinars, and a roadmap for collaboration before, during, and after NEPA.

  See: *https://www.nationalforests.org/collaboration-resources/learning-topics/collaboration-the-national-environmental-policy-act*

- The Payette Forest Coalition developed a NEPA Business Process that outlines expectations and responsibilities of the Responsible Official, Interdisciplinary Team, and the collaborative (Schmidt and DiBari, 2013)

  See: *http://www.spatialinterest.info/administrativedocuments.html*

- Brown (2015) provided information to collaboratives about the administrative and judicial review process of the Forest Service and opportunities, or insertion points, for engagement in these processes.

  See: *https://www.nationalforests.org/assets/files/Admin_Legal-Review-Opportunities-for-Collabs_SJ-Brown-and-ERI-2015.pdf*

Many collaboratives haven't historically been directly involved in the implementation phase of a project. However, there are opportunities to facilitate collaborative learning about the process and steps involved in implementation. For example, in 2017 the Ecological Restoration Institute hosted face-to-face workshops with local- to national-level Forest Service personnel, representatives from industry, and Four Forests Restoration Initiative staff to: consider the issues and concerns with implementing landscape-scale restoration projects in ecosystems with traditionally low-value wood, and identify pathways for innovation and modernization in implementation (Vosick and Colavito 2020)[13].

A tension often cited in case studies is that Forest Service employees must maintain authority over decisions that are made on public lands, while adhering to legally defined, yet somewhat opaque procedures for collaboration, vis-à-vis the Federal Advisory Committee Act (FACA) (Schultz et al. 2012; Butler 2013). Butler (2013) found that in cases where Forest Service personnel had a strong role in attempting to structure decision-making in the collaborative for fear of FACA violations, social capital, trust, and dialogue among the group was diminished, and the time spent working on restoration goals was reduced. Alternatively, ***when Forest Service personnel were not included in collaborative decision-making, but were heavily involved in communication and dialogue, conflict was reduced and the agency personnel and stakeholders spent more time working together to identify appropriate and desirable ecological restoration goals*** (Butler 2013).

Lack of clarity under FACA requirements for collaboration has resulted in different interpretations among line officers and other decision-makers regarding how and to what extent they should be involved in the collaborative process (Butler 2013; Christenson and Butler 2019). Collaboration has been practiced and touted by Forest Service leadership since the early 1990s, and guidance to clarify FACA standards vis-à-vis collaboration have been issued by the Forest Service, other federal agencies, and subject matter experts over the years[14]. Yet, FACA remains a source of confusion and conflict for all parties across CFLRP projects.

Collaborative Formality

The degree of collaborative formality is dynamic, and dependent on local context and history. CFLRP projects varied in their degree of formality, from highly to loosely structured processes. Highly structured processes included group charters, membership and decision rules, and memoranda of understanding. Other groups subscribed to very loose organizing principles, and eschewed formal documents and rules (Monroe and Butler 2016; Butler and Esch 2019). ***This range of collaborative formality appears to be associated with the history of conflict, cooperation, and trust between parties, and sets the stage for subsequent collaborative dynamics.*** For example, while some collaborative groups with historically high levels of agreement may not need to rely on formal processes for deliberation and decision-making, others who do not have this foundation may need formal structures and processes (Antuma et al. 2014; Monroe 2015; Monroe and Butler 2016; USFS 2018; Bergemann et al. 2019; Butler and Esch 2019; Ryan and Urgenson 2019; Stern and Coleman 2019).

Donahue (2004) and others (Monroe 2015; Ryan and Urgenson 2019) point out that at least ***some degree of formality may be needed to initially identify participants, procedures, and goals of the collaborative, which should be reconsidered as the collaborative evolves.*** A consequence of a high degree of formalization is that formal collaboratives require a significant amount of resources (e.g., personnel, finances, time) to coordinate and facilitate the group, while informal groups have much less overhead. In collaborative groups with limited staff and organizational capacity, Bonnel and Koontz (2007) found that some collaborative groups ended up spending an inordinate amount of resources on organizing at the expense of addressing resource

13 2020 Modernizing 4FRI Implementation: Progress after two years workshop—https://sweri.eri.nau.edu/4fri-modernization-workshop/; See also related conference proceedings—https://sweri.eri.nau.edu/accelerated-restoration/

14 See for example the National Forest Foundation's Toolbox of Resources on FACA and collaboration, including a series of peer learning sessions related to the subject: https://www.nationalforests.org/collaboration-resources/tools-search/results?q=FACA&type=&topic=

management issues. Therefore, ***it is important to consider internal capacities as well as expectations for the timing and amount of collaborative engagement when structuring collaboratives*** (Bartlett 2012; National Forest Foundation 2016).

Collaborative Formality: Key Findings and Recommendations

Collaboratives should consider the following to help work towards shared agreement, learn about and inform decision-making within regulatory and institutional guidelines, and move from one phase to the next:

- Collaborative formality is contingent upon the history of collaboration, internal capacities and expectations for engagement, and can change in response to internal or external factors.
- Some degree of formality may be required to define roles, procedures, and goals.
- It is important to consider trade-offs between highly formal and informal structures in the context of stakeholder expectations, capacities, and needs.
- Collaboratives and those who engage with, or support, collaboratives should consider and periodically re-evaluate collaborative structures and processes to: align personnel and funding capacities, expectations, and needs of existing and new members; consider the historical conditions that may inhibit what restoration options are feasible and desirable; and remain flexible and responsive to internal and external changes.

Additionally, ***structure and formality of collaboratives change over time as social, ecological, economic, and policy conditions change*** (Lauber and Decker 2011; Chaffin et al. 2014; Monroe and Butler 2016; Cosens et al. 2018; USFS 2018). The specific ways in which collaboratives adapt to changes are reflective of local context, collaborative history, and current conditions. For example, CFLRP projects reorganized their existing collaborative structures and processes, or created entirely new collaborative organizations in response to the FLRA requirements for landscape-scale restoration and collaboration from planning through implementation and multi-party monitoring. Furthermore, CFLRP projects were arguably subject to additional scrutiny and attention from collaborative participants and interest groups external to the collaborative due to the unique collaborative mandate of the pilot program. This led several collaboratives to reorganize throughout the life of the project to respond to concerns about inclusivity, participation in decision-making processes, and fiscal accountability and transparency (Monroe and Butler 2016).

In sum, the degree of formality in collaboratives is dependent on the context and history of collaboration or conflict, internal capacities (e.g. personnel and funding), and collaborative expectations for engagement. Also, structures and processes can change in response to internal or external stressors affecting the group. These factors (i.e., local context and history, internal capacities, expectations, and external or internal stressors) are important to consider for both emerging and "mature" collaboratives, as well as funding agencies, parent organizations, and Forest Service personnel who support or engage with collaboratives. For example:

- emerging collaboratives should consider these factors as they initially develop their structure and decision-making processes;
- collaboratives should periodically re-evaluate their collaborative structure and process to determine whether changes are needed as a consequence of changes in membership, capacities, goals, or external changes;

- Participants, line officers, and funding and parent organizations should take the time to understand these factors in CLFRP projects, which can help them: 1) understand how past events shape what options for restoration are available and desirable; 2) provide more meaningful expectations for collaborative engagement based on personnel resources, capacity, and needs; and 3) develop the responsiveness and flexibility to adjust to changes external to and largely outside the control of the group.

External Changes can Disrupt Progress

Changes in ecological and economic, social, or political conditions can disrupt progress and force a group to adjust. Larger-scale or unanticipated changes in ecological, economic, social, or political circumstances can provide opportunities to garner collective action (Mottek Lucas 2015; Schultz et al. 2017; Mottek Lucas et al. 2017; Toman et al. 2019). For example, biophysical disturbances are often catalysts for establishing a collaborative around a common purpose, as they provide justification for restoration efforts, and can result in additional funding and support to mitigate negative impacts from disturbance events (Appendix 4).

Yet, these same changes can undermine a collaborative group's function and performance and decrease the adaptive capacity[15] of collaborative groups to respond (Emerson and Gerlak 2014; Cheng et al. 2015; Schultz et al. 2017; Butler and Schultz 2019). Conflicting priorities, legal challenges, or policy changes associated with contentious resource management issues (e.g., listing of an endangered species, or a lawsuit barring forest management activity like the Mexican-spotted owl injunction in the southwest that started in the fall of 2019[16]) can challenge collaborative forest restoration. Changes in the timing and among of funding (e.g., congressional appropriations to individual forests or funding allocations from Regional Office), might also affect the pace and scale of collaborative restoration (Schultz et al. 2017; Mottek Lucas et al. 2017; USFS 2018). Limited industry capacity and loss of long-term stewardship contracts have also reduced the ability of collaborative groups to meet their restoration goals, which has increased conflict and frustration between the collaborative, surrounding community, and the Forest Service (Antuma et al. 2014; Esch and Vosick 2016; Schultz et al. 2017; McIntyre 2019). Fallout from the 2008 recession has contributed to the decline of timber industry operating and processing capacity, and affected collaborative membership and participation among industry organizations that have provided support for collaboration (Bergemann 2017; Mottek Lucas et al. 2017). Unanticipated ecological disturbance—such as a wildfire in or surrounding the project area—can challenge agency capacity and slow momentum (Schultz et al. 2017; McIntyre and Schultz 2020), or a poorly managed fire or escaped broadcast burn can quickly erode social capital and community buy-in for prescribed burning (Antuma et al. 2014; National Forest Foundation 2020). Disturbance can also take

External Changes can Disrupt Progress: Key Findings and Recommendations

- External changes largely outside the control of collaboratives can provide windows of opportunity to garner support and reorganize, though they can also undermine collaborative progress and diminish adaptive capacity.
- Collaborative should: 1) document the major stressors they have been exposed to, or will likely experience in the future; 2) identify existing or future response and preparedness options to mitigate negative impacts and overcome barriers; and 3) determine ways to navigate opportunities when desirable changes occur.

15 Adaptive capacity is defined as "the ability of a system to evolve in order to accommodate environmental hazards or policy change and to expand the range of variability with which it can cope" (Adger 2006, p. 270)

16 See https://www.fs.usda.gov/detail/gila/home/?cid=FSEPRD666433 for updates on court rulings related to the injunction

resources away from collaborative groups and shift priorities, or even lead to conflicting priorities, which can delay implementation and undermine collaborative performance (Cheng et al. 2015; Schultz et al. 2017; Bergemann et al. 2019; National Forest Foundation 2020) (Appendix 8).

Collaborative groups have demonstrated flexibility to respond to ecological disturbances. For example, in response to the 2012 Barry Point Fire in Oregon and California—which burned up approximately four years of identified restoration projects and a NEPA-ready green timber program—the Lakeview Stewardship Group agreed on a post-fire salvage logging project and successfully made amendments to the CFLRP project agreement related to funding allocation, planning/project areas, timelines, and outputs (Spaeth 2014). Strategic planning that identifies alternative options when unexpected disturbances occur may streamline this process and reduce impacts to wildfire and other biophysical disturbances (National Forest Foundation 2016, 2020). Other collaboratives drafted letters of support to ensure that collaborative priorities were aligned with actions identified in categorical exclusions following insect disturbance, or developed a joint fact-finding process to document impacts of salvage logging on wildlife to inform future management decisions. To respond to legal or policy changes, collaboratives submitted letters of support for projects, filed an amicus brief, and/or sought legal support from an outside agency (National Forest Foundation 2020). Still, a number of barriers constrain the ways in which collaboratives respond to changes in social and ecological conditions that are largely outside of their control. See Appendix 5 for examples of how collaborative groups have responded to turnover, biophysical disturbances, and legal or policy changes, and the remaining barriers that inhibited their response capacity.

As such, collaborative groups should invest time and resources to:

- identify the types of changes they have been exposed to;
- develop preparedness and response actions to mitigate negative impacts of external change and overcome barriers to the extent possible; and
- identify courses of action for navigating desirable changes when they occur.

Lessons Learned for Collaborative Restoration Moving Forward

The CFLRP was a learning laboratory for landscape-scale, collaborative forest restoration. Through analysis of CFLRP projects and the broader collaborative management literature, the author team identified several themes that enabled, constrained, and/or were important to consider for collaborative forest restoration. Together, ***these findings highlight an overarching theme to consider for collaborative restoration moving forward: change is a fundamental and recurring aspect of collaboration.*** Collaborative groups are continuously impacted, both positively and negatively, by changes within their group, external changes in social and ecological conditions, and a fluid institutional environment in terms of policy direction and resource availability (e.g., personnel and funding). These changes, in turn, have the potential to expose collaborative groups to a number of vulnerabilities, as well as opportunities that must be considered and navigated. In this section, the report distills findings and lessons learned from this synthesis, with an aim to provide a forward-looking diagnostic framework for identifying, anticipating, and navigating change, and for building collaborative resilience in the face of change. The report does this in the context of the Forest Service "Shared Stewardship Strategy"[17] (henceforth Shared Stewardship) and finish with policy recommendations for the CFLRP specifically and collaborative forest restoration more broadly.

17 https://www.fs.usda.gov/managing-land/shared-stewardship

Developing Adaptive Capacity

Collaborative groups must develop the adaptive capacity to be resilient to prospective changes from different directions. Collaboration in forest landscape restoration, or any other natural resource problem area, is nested within, and impacted by internal (e.g., group membership; financial resources, social capital) and external (e.g., social, political, economic conditions; biophysical conditions; legal requirements and agency priorities) factors. These factors change over time and interact to affect the outcomes, outputs, and performance of local collaboratives (Ostrom 2009; Emerson et al. 2012; Moseley and Charnley 2014) (Figure 2). ***A lingering question from the many academic studies and agency reviews of the CFLRP is the extent to which CFLRP projects are resilient to internal and external changes.***

Resilience is "the capacity of a social-ecological system to absorb a spectrum of shocks or perturbations and to sustain and develop its fundamental function, structure, identity, and feedbacks through either recovery or reorganization in a new context" (Chapin III et al. 2009, p. 24). Adopting a collaborative resilience framework starts with the acknowledgement that change is a fundamental aspect of any system. In order to mitigate the vulnerability of collaboratives to unwanted change and identify opportunities to take advantage of desired changes, collaboratives must enhance their adaptive capacity to anticipate and strategically respond.

Collaborative resilience is dependent upon the combination and interaction among biophysical and social components. From a biophysical standpoint, resilience depends on the type, severity, duration, and cumulative impacts of the disruption(s). With regards to the social component, collaborative resilience depends on a number of attributes of adaptive capacity, including:

- anticipating potential disruptions and preparedness planning
- developing institutional flexibility, diversity, and redundancy;
- instituting structures and practices that facilitate trust-building, social learning, and knowledge exchange across actors and organizations at multiple levels of authority and influence;
- access to and mobilization of human, financial, political, and institutional resources; and
- the ability to take risks and innovate while maintaining transparency and accountability (Holling and Gunderson 2002; Berkes et al. 2003; Folke et al. 2005; Nelson et al. 2007; Kofinas 2009; Goldstein 2012; Cheng and Sturtevant 2012; Cisneros 2019).

Adaptive capacity of collaboratives is especially pertinent in light of Shared Stewardship and its emphasis on expanding forest management roles, responsibilities, and accountabilities across land ownerships and jurisdictions. The durability and adaptability of these new or evolving collaborative arrangements is often a secondary consideration once formal political agreements are signed (e.g., Memoranda of Understanding). The report identifies several recommendations to help collaborative groups build resilience to internal and external changes based on findings from the synthesis and the collective applied research. These include: 1) implement structures and/or practices to absorb inevitable changes in participants, confer institutional memory, and translate knowledge into practice; 2) conduct and periodically revisit vulnerability and adaptive capacity assessments; 3) use scenario planning to explore future changes, tradeoffs in decision-making, and opportunities for adaptation; and 4) expand the CFLRP funding mechanism to develop and sustain collaborative capacity (Table 1).

Figure 2: Social-ecological system framework highlighting external and internal processes that affect the function, outcomes, and performance of collaborative groups.

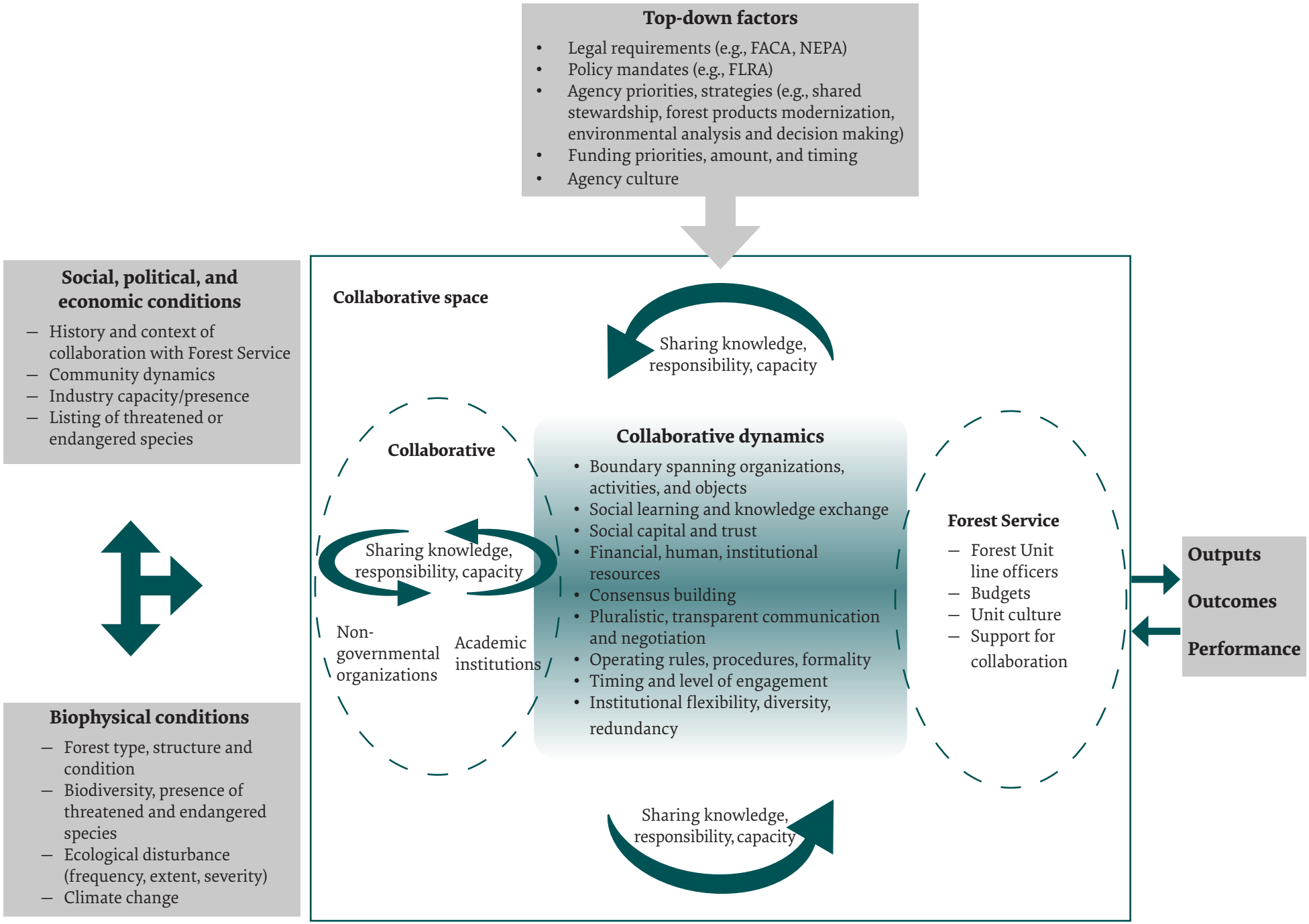

Table 1: Recommendations for collaboratives to build and sustain resilience

Recommendation	Practical solutions/Example approaches
Implement structures and practices to absorb change in participants, confer institutional memory, and translate knowledge into practice	• Co-develop and revisit rules and procedures to provide structure and accountability • Co-develop and revisit boundary objects (e.g., written agreements that guide restoration treatments and monitoring), on-boarding material or activities (e.g., workshops, buddy system), and build redundancy in positions or roles • Develop incentives for collaboration (e.g., include collaboration as part of performance evaluations, inter- and intra-organizational collaboration training)

Conduct and periodically revisit vulnerability and adaptive capacity assessments (See Appendix 9)	• Place-based vulnerability assessments work with communities and practitioners to determine the underlying causes of vulnerability and rely on past events as analogs for future impacts and plausible, desirable response options. These assessments ask:
	  * What changes has the collaborative experienced?
	  * How have these changes impacted collaborative performance?
	  * What have collaboratives done to prepare for or respond to these changes?
	  * What remaining barriers need to be overcome that inhibit response?
	• Structured self-assessments could be carried out by the collaborative and with Forest Service personnel (See Appendix 9 for an example assessment worksheet).
	• Vulnerability is time- and context-specific and should be periodically re-evaluated perhaps through annual reporting mechanisms which could support inter- and intra-collaborative learning and strategic allocation of limited resources.

Use scenario planning to explore future changes, tradeoffs in decision-making, and opportunities for adaptation	• Scenario planning can help collaborative participants explore the impacts of potential future biophysical and social changes on collaborative function and performance. • Scenario investment planning, a tool emphasized in the Forest Service Shared Stewardship Strategy, can help clarify the tradeoffs involved in various restoration strategies. • Scenario planning provides a space to collaboratively test assumptions, explore response options, and identify desirable outcomes and measures of success and resilience. • Northern Institute of Applied Climate Science and partners have led the development and deployment the Climate Change Response Framework and menus of adaptation options in forests and fire-adapted ecosystems, which are useful tools for identifying climate-smart management actions to adapt to climate change and variability • Simulation modeling can supplement scenario planning to evaluate the impacts of management alternatives and climate change scenarios on desired outcomes.
Expand CFLRP funding mechanism to develop and sustain collaborative capacity	• Support activities related to planning, social learning, conflict management, and relationship-building • Support for facilitators, coordinators, and technical/scientific experts can help develop and maintain accountability among collaborative members and support the suggested assessments recommended herein • Extend funding's focus on "mature" collaboratives to nascent collaboratives in marginalized areas where capacity is low • Develop funding mechanisms to better support multi-jurisdictional restoration efforts

Recommendation 1: Implement structures and/or practices to absorb inevitable changes in participants, confer institutional memory, and translate knowledge into practice

Creating and sustaining a space for collaboration required individuals to span boundaries to provide critical capacities, knowledge, and responsibilities (Figure 2). Yet, turnover in collaborative participants and agency personnel is inevitable. One strategy to promote stability through change is for collaborative groups to invest time and attention to co-develop systems-based, or procedural, trust by establishing and adapting rules and procedures to provide structure and accountability (Stern and Coleman 2019).

Though the degree of formality may vary widely between collaboratives, establishing basic rules and procedures for decision-making processes can confer institutional memory as people come and go (Table 1). Yet, it is important that rules and procedures remain flexible to account for changes or disturbances. Periodically revisiting and reaffirming the relevance, effectiveness, and mutual agreement on such rules and procedures serves as a reminder for both long-standing and new participants of how interdependent collaborative members are, despite their different viewpoints (Zellner et al. 2012), and may help institutionalize collaboration under Shared Stewardship despite participant turnover and external change.

Collaboratives should consider co-developing boundary objects and onboarding material, hosting onboarding activities, and ensuring redundancy or overlap in roles or positions to support new personnel. Boundary objects and onboarding material need to be periodically updated to remain relevant (Cheng et al. 2015; Stern and Coleman 2015; USFS 2018; Butler and Schultz 2019; Christenson and Butler 2019) (Table 1). In this vein, when turnover occurs, it is important to take stock of which capacities or knowledges are lost, and what is needed to fill the gaps that they left, with the understanding that people and organizations required to meet current and future goals and needs may have different capacities, knowledges, and responsibilities as those that left. In other words, turnover can also present an opportunity for renewal and reorganization.

One challenge to collaborative resilience under Shared Stewardship is that its implementation rests not only on Forest Service line officers, but various state and local governments, and non-governmental and community-based entities and individuals. Findings from this synthesis suggest that different entities will interpret how to implement Shared Stewardship differently based on their organizational and community cultures, budgetary and staffing constraints, and individual attitudes and perceptions (Sabatier et al. 1995; Butler 2013; Moseley and Charnley 2014; Cheng et al. 2015). This underscores the need to align incentives for collaboration across organizations, perhaps by including them as part of managers' performance, offering collaboration training involving all organizations' key participants, and joint program-of-work reviews as collaborative learning and accountability opportunities (Table 1).

Recommendation 2: Conduct vulnerability and adaptive capacity assessments of collaboratives

Increases in the frequency, size, and severity of forest disturbances can diminish the adaptive capacity of collaboratives. Large-scale wildfire or insect and disease outbreaks can affect planning units and reallocate priorities and resources. Further, changes in dynamic socio-economic conditions (e.g., demographic transitions, forest products markets and industry capacity dynamics, recreation use trends) and internal conditions can affect the vulnerability of collaborative groups and may diminish collaborative progress and performance (Figure 2). While this synthesis provided several examples of the ways in which collaboratives were impacted by, and responded to, internal and external changes, vulnerability is unique to local social and ecological contexts. Therefore, collaboratives should consider conducting vulnerability and adaptive capacity assessments to internal and external changes (Table 1) (See Appendix 9 for a worksheet to assess collaborative resilience and adaptive capacity).

Vulnerability is defined as the "state of susceptibility to harm from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt" (Adger, 2007: 268). As the definition implies, vulnerability consists of three inter-dependent components: 1) exposure to a stressor (e.g., wildfire); 2) sensitivity to harm; and 3) adaptive capacity, or the ability to prepare for or respond to change. Socio-cultural, political, and institutional barriers can limit response capacity (Adger et al. 2009; Jantarasami et al. 2010; Moser and Ekstrom 2010; Bierbaum et al. 2013; Biesbroek et al. 2013). There are a number of frameworks and approaches to assess social vulnerability and adaptive capacity of collaboratives to multiple social and environmental stressors across scales (e.g., Turner et al. 2003; Smit and Wandel 2006), and some adapted specifically to public lands and collaborative management contexts (Gupta et al. 2010; Fischer et al. 2013; McNeeley et al. 2017).[18] One such approach is place-based, qualitative vulnerability assessments. These assessments acknowledge that vulnerability is place-, context-, and time-dependent (Smit and Wandel 2006; O'Brien et al. 2007), and thus rely on close consultation with collaboratives and/or resource managers to:

- document the underlying causes of vulnerability and adaptive capacity; and
- identify past impacts, responses, and barriers that inhibited response as analogs for future impacts, feasible and desirable response options, and remaining needs (Smit and Wandel 2006; Ford et al. 2010).[19]

Place-based vulnerability assessments are commonly conducted using participant observation, focus groups, or in-depth interviews, which can help document the context-specific factors that contribute to vulnerability that might be otherwise overlooked using quantitative approaches. Further, and particularly relevant to the CFLRP and CFLRP projects, conducting place-based vulnerability assessments with collaboratives and Forest Service resource managers may help articulate how Forest Service decision-making exacerbates or attenuates local vulnerabilities, while also providing a better understanding among collaboratives of the regulatory and institutional context in which the Forest Service operates (Beeton and McNeeley 2020)[20]. Vulnerability assessments present an opportunity to develop desirable and plausible actions that are within the regulatory and legal bounds of Forest Service management.

Collaboratives can be impacted by external and internal changes at any time; changes have the potential to expose collaboratives to new and potentially compounding vulnerabilities. Thus, collaboratives should periodically monitor and evaluate their vulnerabilities and adaptive capacities over time (Table 1). CFLRP projects are required to submit annual reports describing outputs, outcomes, and performance, which may provide an opportunity to implement a standardized self-assessment protocol to evaluate the adaptive capacity of CFLRP projects annually (Appendix 9). This could:

- provide yet another social learning opportunity for collaboratives to identify where capacities exist, where they don't, and support adaptive management;
- provide a mechanism for peer learning across CFLRP projects; and
- help funding agencies and parent organizations more efficiently allocate limited resources where needed.

Beyond the CFLRP context, regular periodic assessments of collaborative progress relative to Shared Stewardship agreements and programs of work may help institutionalize adaptive capacity for the long term across multiple levels of authority and agency.

18 See Fischer et al. (2013) https://doi.org/10.5849/jof.12-091 and McNeeley et al. (2017) https://doi.org/10.1016/j.crm.2017.01.005 for different approaches to social vulnerability assessment in public lands management contexts.

19 See Ford et al. (2010) http://doi.wiley.com/10.1002/wcc.48 for a review of case study and analog approaches in vulnerability research

20 Beeton and McNeeley (2020) – a technical assessment of social vulnerability to climate change and agency decision-making https://cnhp.colostate.edu/wp-content/uploads/download/documents/misc/COBLM-SLV-SVA_Technical-Assessment_Report-Final.pdf

Recommendation 3: Use scenario planning to explore future changes, tradeoffs in decision-making, and opportunities for adaptation

Identifying current changes to which collaboratives are exposed and using structured self-assessments to document impacts, response options, and remaining needs is critical (See recommendation 2). Yet, it is also important to explore the impacts of potential and uncertain future biophysical, social, political, and economic changes to collaborative function and performance (Table 1). In dealing with highly complex and uncertain spaces, such as the forest landscape restoration management arena, collaboratives can use scenario thinking and strategic scenario planning. Scenarios are simply descriptions or narratives of plausible, future states. They depict how internal or external forces and factors might interact and change in the future, and the ways in which these changes may provide both challenges and opportunities for organizations or communities. Strategic scenario planning can be used by collaboratives to:

- identify future plausible, but divergent biophysical, socio-political, and/or economic scenarios
- explore the impacts of those scenarios on multiple and often conflicting management objectives;
- explore tradeoffs and outcomes in alternative restoration activities to strategically prioritize investments; and
- assess whether current management actions, objectives, and desired conditions can be achieved or need to be revised in light of future conditions (Rose and Star 2013) (Table 1).[21]

Scenario planning has been used in CFLRP projects specifically, and in the Shared Stewardship Strategy and public lands management contexts more broadly. In 2018, as the initial 10-year performance period mandated by CFLRP authorizing legislation ended, there was uncertainty about funding multi-party monitoring and maintenance treatments on CFLRP projects. Regional and national-level leadership developed a process to support scenario planning that would consider plausible future funding scenarios for monitoring and restoration work. A template was developed and CFLRP projects completed and submitted these scenario plans in their FY 2018 Annual Report.[22] Additionally, the Forest Service and its partners developed the Scenario Investment Planning Platform[23] to clarify tradeoffs and set priorities for investment under Shared Stewardship. Case studies from the Scenario Investment Planning Platform offer lessons learned in clarifying and focusing priorities for collaborative restoration work (Table 1).

Scenario Planning for Climate Change

Climate projections indicate that warmer and drier conditions will increase the extent, severity, and duration of insect outbreaks and wildfires in the future (Vose et al. 2018), and the pace and scale of change in some areas will cause transformations to novel systems with no historical analog (Williams and Jackson 2007; Hobbs et al. 2009, 2014; Schoennagel et al. 2014, 2017). In many cases, the direction and magnitude of change is highly uncertain, as are the likely changes to, and interactions among, social and ecological systems. Climate change is a risk multiplier, i.e., changes in climate will further challenge resource management decision-making and may exacerbate existing vulnerabilities. As such, it is imperative to explore plausible future climate scenarios and the impacts to resources of management concern, management objectives, and actions.

In this vein, the Department of the Interior (DOI) and Forest Service have developed and deployed climate change scenario planning in public lands management contexts (e.g., Symstad et al. 2014;

21 Rose and Star – Using Scenarios to explore climate change: A handbook for practitioners: http://climate.calcommons.org/sites/default/files/CCScenarios-Handbook%20FINAL%20080113.pdf

22 L. Buchanan, Personal communication

23 Scenario Investment Planning Platform - https://sipp-usfs.opendata.arcgis.com/

Schuurman et al. 2019).[24] The Northern Institute of Applied Climate Science (NIACS) Climate Change Response Framework project has also developed climate change tools and approaches[25], including an adaptation workbook and menus of adaptation strategies and approaches for forests.[26] Additionally, Southwest FireCLIME partnered with NIACS to develop a menu of adaptation options for fire-adapted ecosystems.[27] Both of these resources are intended to help natural resource managers explore future impacts and vulnerabilities, assess whether current desired conditions and actions are tenable under future change, and identify desirable and feasible adaptations from a menu of options (Table 1). Recently, scientists and managers from the DOI and Forest Service coordinated a two-day climate change and adaptation workshop for the Colorado Front Range national forests (Pike-San Isabel and Arapaho-Roosevelt), which developed a hybrid approach comprised of the NIACS Forest Adaptation Resources framework and a climate scenario planning framework spearheaded by the DOI North Central Climate Adaptation Science Center. The intent of this effort is to develop a general technical report to inform future project- and forest-level planning for climate change.[28] In addition, the Climate Change Response Framework includes a number of demonstration projects where land managers integrate and monitor climate-smart practices.[29] Demonstration projects could serve as yet another social learning opportunity to develop mutual agreement and understanding on collaborative restoration efforts.

Scenario planning can be supplemented with quantitative simulation modeling. For instance, simulation models could be used to assess the effects of various management alternatives (e.g., forest treatment strategies) and climate scenarios on fire risk reduction or desired ecosystem structure (Stoddard et al. 2015; Symstad et al. 2017; Halofsky et al. 2017; Loehman et al. 2018).[30] The Scenario Investment Planning Platform uses simulation modeling to assess tradeoffs in management alternatives across jurisdictional boundaries. These tools are useful to explore whether collaborative restoration management actions will result in desirable outcomes, and prioritize restoration investments (Table 1).

Scenario Planning Processes

Scenario planning can take many forms, from responding to a set of structured questions during annual reporting, to participatory workshops. Thus, the individuals or organizations that need to be involved in the process can vary, depending on the scope, scale, and intent of the process. In the case of climate change scenario planning workshops, these are structured, highly collaborative and participatory workshops that typically last 1-3 days. These workshops are intended to provide a space for participants to test assumptions and critically and creatively explore options to anticipate and respond to future change. Thus, a broad range of diverse partners, including climate scientists, ecologists, agency program managers and specialists, and collaborative members should be brought together, and professional facilitation may be warranted. Regardless of the scenario planning process format, it is important to note that collaborative resilience can take many different forms depending on different group values, goals, and perspectives (Nelson et al. 2007; Crane 2010). As such, a scenario planning process should provide space for participants to collaboratively explore what outcomes are feasible and desirable, i.e., what does success mean to collaboratives, what are the measures of success, and to what and for whom is resilience considered (Table 1).

24 Schuurman et al. (2019) https://irma.nps.gov/Datastore/DownloadFile/632857
25 Swanston et al. (2016), NRS-GTR-87-2: https://www.fs.usda.gov/treesearch/pubs/52760
26 Menus of adaptation strategies and approaches: https://forestadaptation.org/adapt/adaptation-strategies
27 Adaptation Tools – Resources for managing fire and forests in the context of climate change: https://swfireclime.org/fire-climate-adaptation-tools/
28 https://www.fs.usda.gov/inside-fs/delivering-mission/sustain/climate-change-vulnerability-and-adaptation-options-two
29 Climate change response framework adaptation demonstration projects: https://forestadaptation.org/adapt/demonstration-projects
30 Loehman et al. 2018 http://www.mdpi.com/1999-4907/9/4/192 ; see also Halofsky et al. (2017). https://doi.org/10.1007/s10584-017-1925-0 and Stoddard et al. (2015) https://doi.org/10.1007/s10584-017-1925-0

Recommendation 4: Congress should consider expanding the CFLRP funding mechanism to develop and sustain collaborative capacity

A programmatic evaluation of the 23 CFLRP projects found that in the majority of cases, the CFLRP's sustained funding and mandate to collaborate: 1) brought together diverse partners who leveraged resources for restoration; 2) helped to provide a forum where multiple perspectives and interests were heard; and 3) helped work towards agreement for forest restoration (Schultz and McIntyre 2019; McIntyre and Schultz 2020). Yet, the CFLRP limited funding to implementation and monitoring, and as a result many CFLRP projects struggled or stalled due to inadequate resources to carry out the time-consuming work associated with social learning, conflict management, relationship-building, and building agreement that provide the foundation for implementation (Cheng and Sturtevant 2012; Butler and Schultz 2019). Thus, there is a need for additional, sustained investment in collaboratives to support the multiple types and timing of collaborative engagement opportunities and planning for capacity building (Table 1). Financial support for community champions, facilitators, coordinators, and technical and scientific support staff is critical to sustain collaborative groups over the long-term. These organizations and individuals can help: develop and sustain attention to CFLRP projects; develop and maintain accountability to co-developed rules, procedures, and boundary objects in addition to other tasks required among the group; and bring the best available scientific information to the types of assessments recommended herein.

The CFLRP competitive grant process focused its investments on funding mature collaboratives in high-priority landscapes with a higher likelihood of achieving landscape restoration goals. Yet, there is also a need for funding mechanisms to support collaborative restoration in landscapes where collaborative capacity is still forming or does not currently exist (Schultz and Moseley 2019). Otherwise, high-capacity organizations will continue to increase their capacity through competitive awards over time at the expense of lower-capacity organizations with fewer resources to engage in forest restoration activities (Cheng and Dale 2020). These issues of scale and "institutional fit" between top-down funding and capacity of collaborative groups to absorb the funding feature predominantly in the resilience and environmental management literature (Cash et al. 2006; Wyborn and Bixler 2013; Schoon and Cox 2018). Furthermore, funding that only supports restoration projects on federal forest lands can create a mismatch in social and ecological scales, wherein the scale of the collaborative institution does not fit the scale of the ecological problem (Crowder et al. 2006). Funding models that support cross-boundary forest management as envisioned in Shared Stewardship, and exhibited by the Joint Chiefs Partnership, would certainly bring other, diverse partners and resources to bear to solve complex and large-scale forest management problems (Table 1).

Conclusion

The Collaborative Forest Landscape Restoration Program is a national-scale policy experiment that provided an unprecedented opportunity to learn and infuse learning across federal land management. Collaboration has emerged as a favored policy tool, accompanied by rhetoric regarding its promise and benefits. While collaboration has produced observable and enduring benefits and outcomes, it is not without challenges. This synthesis of CFLRP projects finds that change is a fundamental aspect of collaboration. Collaborative groups are exposed to, and must navigate, internal organizational changes and external social, institutional, and ecological changes. Climate change will amplify the impacts of these changing conditions and may exacerbate vulnerabilities. Given the continued emphasis on utilizing collaboration to realize national-level policy goals regarding forest restoration and wildfire risk management across landownerships and jurisdictions as envisioned by the Forest Service Shared Stewardship Strategy, it is necessary to understand the ways in which collaboration can be sustained over many years and be adaptable and resilient to stressors. Here, the report outlined a number of practical solutions to adapt to internal and external changes, as well as a number of frameworks and approaches for collaboratively assessing social vulnerability and adaptive capacity to current and future change.

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Appendix 1: Roles of boundary spanning activities in supporting collaborative efforts

The following summarizes a number of examples of boundary spanning activities, how they support collaboration, and case examples for each activity. Note that the majority of these are from CFLRP projects– Non-CFLRP collaborative project examples were retrieved from the CFLRP Resource Library and represent boundary spanning activities in collaborative groups more broadly.

Joint fact-finding missions

Role - Intended to bring together diverse perspectives and research for knowledge exchange

Examples:

- Deschutes Collaborative Forest Project: Questions of interest to the collaborative group were not addressed in the scientific literature, and/or were not applicable to local ecological conditions. The group co-developed a research protocol that documented ecological and restoration needs, which was used to inform the collaborative group and the agency (Christenson and Butler 2019).

- Dinkey Landscape Restoration Project: Prior to being selected for CFLRP funding, stakeholders often cited conflicting scientific results to justify recommendations, which hindered the ability of Forest Service managers to make decisions. A conflict mediation group recommended that parties involved in federal collaborative forest restoration in the area conduct a joint fact-finding mission. The Forest Service and researchers subsequently compiled relevant science and synthesized the state of the science in a General Technical Report (North 2009)[31] on topics related to forest and fire ecology, ecosystem restoration and wildlife species, including the Pacific fisher (Bartlett 2012). This document provided the cornerstone for the Dinkey CFLRP project members and Forest Service to build scientific consensus, which subsequently led to them to co-develop guidelines to better consider Pacific Fisher and California Spotted Owl habitat in ladder fuels management (Moote 2013; Christenson and Butler 2019). These guidelines were adopted and integrated into the 2012 Soaproot Restoration Project Environmental Assessment (https://www.fs.usda.gov/nfs/11558/www/nepa/74251_FSPLT2_286575.pdf). The CFLRP project also developed a field guide to train field crews to identify Pacific Fisher habitat (Christenson and Butler 2019).

- Colorado Front Range Landscape Restoration Initiative: Uncertainty and disagreement about historic forest structure led to a pooling of resources among the Landscape Restoration Team and various partners to develop a Front Range-wide assessment of fire history and historic forest structure patterns, ultimately to determine locally-relevant reference conditions to inform prescriptions (Addington et al. 2018; https://www.fs.fed.us/rm/pubs_series/rmrs/gtr/rmrs_gtr373.pdf). The GTR-373 document was developed with the intention that the Forest Service would use it to inform project planning.

- Southern Blues CFLRP: The Blue Mountains Forest Partners, part of the Southern Blues CFLRP project, convened and facilitated several meetings and field trips with scientists, Forest Service managers, community residents, representatives from the timber industry, and environmental conservation groups, and collaborated with and funded scientists to conduct a number of projects to characterize historic and current forest risks, structure and composition, and disturbance regimes in xeric ponderosa pine, dry ponderosa pine, dry mixed conifer, and wet mixed conifer forests. This resulted in the collaborative development of shared zones of agreement for each forest type that subsequently informed management decisions on the Malheur National Forest (http://www.bluemountainsforestpartners.org/work/zones-of-agreement/).

31 https://www.fs.fed.us/psw/publications/documents/psw_gtr220/

- Lower Dolores Working Group: Disagreement about the condition of native fisheries and minimum flow needs for whitewater boating led to a joint fact-finding mission called the Way Forward (http://ocs.fortlewis.edu/drd/way-forward.htm). Three fisheries experts were hired to summarize available data on native fish conditions independently. Subsequently, the experts came together to inform the collaborative of management options to sustain native fish populations. The collaborative group then assessed these management options in the context of social, economic, and legal feasibility to determine options that could be integrated in the near-term versus those that would be implemented in the long-term and would require additional funding or changes in policy (Moote 2013).

Peer-learning networks and activities

Role - To facilitate sharing of ideas, exchange of knowledge across cases and contexts. Each CFLRP project operated under a similar policy context, which supported this knowledge exchange.

Examples:

- Sustainable Northwest, Rural Voices for Conservation Coalition, and the National Forest Foundation, among others, hosted a number of regional- and national-level workshops and webinars, which allowed CFLRP project participants to share successes, barriers, and ways to overcome barriers to collaboration. Many peer learning workshops and webinars related to collaboration included: 1) dealing with transitions; 2) understanding and addressing critiques of collaboration; 3) measuring progress in collaboration; 4) elements of successful collaboration; 5) collaboration and the Federal Advisory Committee Act; and 6) NEPA and collaboration at the project-level. See the National Forest Foundation Toolbox of Resources for peer-learning sessions, workshops, and documents related to collaboration and other forest restoration topics (https://www.nationalforests.org/collaboration-resources/tools-search/results?q=&type=peer-learning-sessions&topic=). See the Sustainable Northwest Forest Program website for links to presentations from collaborative forest workshops and webinars (http://www.sustainablenorthwest.org/what-we-do/programs/forest). See the Rural Voices for Conservation Coalition for information and summaries from peer learning activities (https://www.ruralvoicescoalition.org/fostering-learning).

- National Forest Foundation hosts a practice of collaboration website where peer learning recordings are housed and where other tools and best management practices can be found (https://www.nationalforests.org/collaboration-resources/learning-topics/collaboration).

- From 2016-2018, forest staff from CFLRP projects participated in site visits to adjacent CFLRP projects to facilitate knowledge exchange and networking opportunities. These site visits consisted of multiple staff and divisions from the Washington Office (e.g., Forest management; Ecosystem Management Coordination; Fire and Aviation Management) as well as regional- and local-level leadership, community members, and collaboratives to support cross-scale networking and learning (https://www.fs.fed.us/restoration/documents/cflrp/SiteVisit/CFLRP-2016-2018-USFS-ProjectSiteVisits.pdf).

- The Allegheny Highlands Fire Learning Network (FLN), a non-CFLRP project, participated in regional- and national-level FLN meetings and field trips, which resulted in adjustment of prescribed fire treatments to better align with historical disturbances on mountain ridges based on what they learned from a group in Tennessee. They also adopted a monitoring protocol from a FLN group in Arkansas to enable comparison across cases (Moote, 2013).

Community field trips, pub crawls, pub talks, podcasts, interpretive trails, monitoring jam sessions, etc.

Role - To provide a forum for building trust and relationships in informal settings and for facilitating knowledge exchange among collaborative groups, Forest Service, and the broader community.

Examples:

- Field trips – almost all cases involved field trips in some capacity, which were perceived as effective ways to: 1) promote shared understanding and identify zones of agreement; 2) better document how broad restoration principles can translate to operations on the ground; 3) facilitate two-way knowledge exchange (i.e., collaborative group and stakeholders could learn about rules, regulations, and policies that constrain Forest Service management actions, and the agency staff become more knowledgeable about restoration priorities across the collaborative groups); 4) offer the chance for collaborative groups to review and provide feedback on restoration treatments; 5) learn from and about impacts of wildfire and insect disturbance; and 6) onboard new participants following turnover (Cheng et al. 2015; Antuma et al. 2014; Schultz et al. 2017; Mcyntyre 2019; DuPraw 2014; Christenson and Butler 2019; NFF 2016; Urgensson et al. 2017; Blue Mountain Forest Partners 2017; Monroe 2015; National Forest Foundation 2020). For example, a sub-committee for the Dinkey Landscapes conducted field visits with silviculturists to identify location-specific project objectives, and developed targets and marking guidelines linked to project objectives. Follow-up surveys with the collaborative led to a facilitated discussion of how marking guidelines were determined and for what purpose, which helped contextualize how decisions are made on the ground and link project objectives to operational constraints (Bartlett 2012).
- Monitoring jam sessions: The Uncompahgre Plateau and Colorado Front Range Landscape Restoration Initiative hosts annual monitoring jam sessions. These are hosted by the Colorado Forest Restoration Institute and provide a forum for community members to share and assess monitoring results and determine whether the monitoring results are consistent with desired conditions (USFS 2018; Cheng et al. 2017). A summary of a 2015 monitoring jam session in the Colorado Front Range CFLRP project can be found here: https://cfri.colostate.edu/wp-content/uploads/sites/22/2017/12/2015_FR-CFLRP-Monitoring-Jam-Session-2015-Summary-Final.pdf)
- Fire Learning Trail: The Grandfather Restoration Project CFLRP, in collaboration with the Southern Blue Ridge Fire Learning Network and Consortium of Appalachian Fire Managers and Scientists developed an interpretive fire learning trail that documents the value of fire on the landscape and the need for restoration. The Fire Learning Trail included interpretive signage along the way and had a podcast that was associated with the trail (McIntyre 2019; USFS 2018). More information about the Fire Learning Trail can be found here: http://www.appalachianfire.org/thefirelearningtrail

Technical and scientific expertise

Role - Provided support in monitoring and evaluation, adaptive management, forest and watershed science, law, etc.

Examples:

- The Landscape Restoration Team (part of the Colorado Front Range Forest Restoration Initiative) partnered with the Colorado Forest Restoration Institute to develop a monitoring protocol to determine forest structure change across scales and treatment types, using a combination of the Common Stand Exam method and spatially-explicit analyses (Cheng et al. 2015). The monitoring plan with information

on the monitoring protocol can be found here: https://cfri.colostate.edu/wp-content/uploads/sites/22/2018/10/2017_FR_CFLRP_Monitoring_Plan_Typeset_2018.pdf

- The Southwestern Crown of the Continent CFLRP hired a monitoring coordinator to develop a monitoring plan (https://www.sciencebase.gov/catalog/item/5b8f1bfce4b0702d0e7ec9d1) and support project implementation. A private firm, the Ecosystem Management Research Institute provided science and monitoring support (Butler and Esch 2019).
- On the Deschutes Collaborative Forest Project, The Nature Conservancy supported a monitoring and research program to identify knowledge gaps and communicate the research process and outcomes to partners (Butler and Esch, 2019).
- A field tour of the Missouri Pine-Oak Woodlands Restoration project, where representatives from state and federal agencies, NGOs, industry, and politicians voiced their reactions and concerns for current and future forest management led the collaborative to partner with other organizations to develop science-based assessments related to concerns and uncertainties heard that day. These included assessments of: 1) woodlands and wildlife; 2) the effects of fire and harvesting; 3) economic impacts; and 4) restoration during climate change (https://www.fs.fed.us/rm/pubs_journals/2018/rmrs_2018_thompson_f001.pdf).
- The Lemhi County Forest Restoration Group, a non-CFLRP project, partnered with the Rural Voices for Conservation Coalition for legal counsel to ensure that the Forest Service: 1) used the group's best practices criteria to evaluate contracting bids; 2) allowed a group member to sit on the bid review board; and 3) held a public meeting during NEPA planning to discuss alternatives development (Moote 2013).

Facilitators and Coordinators

Role - Facilitators helped: establish zones of agreement; recharge waning participation; re-align direction; conduct evaluations of collaborative progress and project implementation; and ensure tasks were completed on time. Facilitators were particularly important in areas of highly contested management issues (e.g., threatened and endangered species)

Coordinators had diverse responsibilities, including meeting planning, coordinating field trips, grant/report writing, monitoring and science delivery, designing outreach and communication strategies, work with Forest Service, developing rules, identifying issues for discussion, etc.

Examples:

- Four Forest Restoration Initiative: Facilitators evaluated collaborative progress, success, and trust-building through annual self-reported assessments among the collaborative members using a combination of notes from all-hands retreat and interviews (Esch and Vosick 2016).
- Facilitators in a Pacific Northwest site mediated conflict and built relationships through development of rules that mandated mutual respect and honesty, e.g., the group had to sign an oath that while they don't have to agree with each other, but will try to understand peoples' perspectives (Walpole et al. 2017).
- Colorado Front Range Landscape Restoration Initiative: Peak Facilitation helped to "re-energize" the group through (re)defining goals; revisiting missions and objectives; developing clear decision-making processes; and formalizing the process for determining membership (Bergmann, 2017).
- Coordinators and facilitators in the Uncompahgre, Colorado Front Range, and Four Forest Restoration Initiative helped convene meetings and field trips that brought together managers, collaborative stakeholders, and scientists to review results and recommend changes to management actions (Cheng et al. 2019).

- Dinkey Landscape Restoration Project: With support from Sierra National Forest and the Wilderness Society, a half-time monitoring coordinator was hired to oversee the multiparty monitoring program. Responsibilities included maintaining communication between parties, maintain databases, and making sure tasks were completed and consistent with the expectations of the collaborative group (Moote 2013; Schultz et al. 2014). A similar role for coordinator was established in the Selway-Middle Fork project (Clearwater Basin Collaborative 2015).

- Dinkey Landsape Restoration Project: The facilitator built trust by providing confidential consultation for collaborative members to discuss interests and negotiation principles, and air grievances. This helped the mediator build rapport with the collaborative members and helped frame perceived conflicts among members as collective problems.

- Deschutes Collaborative Forest Project: Coordinator supported field trip planning and science engagement activities, and facilitated meetings with the Restoration Planning sub-committee to develop issue-based recommendations for restoration (Urgenson et al. 2017).

Appendix 2: Regional support and coordination for CFLRP work

In the 2020 NFF CFLRP Collaboration Indicator Survey, CFLRP project respondents were asked whether the Regional Office provided ample resources to support and coordinate CFLRP work using a rating scale (strongly agree; agree; don't know; disagree; strongly disagree). Of those who had involvement with the Regional Office, roughly 40% agreed or strongly agreed that the Regional office supported CFLRP work, while about 15% reported that the Regional Office inhibited CFLRP work. The table below summarizes the Regional Office-level factors that supported or inhibited collaborative function and performance as well as few exemplar(s) from survey respondents.

	Regional Office factors that support/inhibit collaborative function and performance	Exemplar(s)
Supporting	• RO prioritization of collaboration helped steer unit- and district-level commitment to collaboration • Regional personnel joined collaborative meetings, field trips, collaborative workshops • Provided resources for relationship- and trust-building activities (e.g., field trips, camping trips) • Provided timely response to needs • Provided skilled personnel, specialists • Provided flexible financing options • Aligned project resources • Provided feedback on CFLRP application • Provided assistance in reporting accomplishments	• *"The Regional office has attended collaborative field trips and statewide conferences in which collaboratives from across the state come together."* • *"[The] Regional Forester visited the CFLR area, met with the local coalition, and participated on a field trip."* • *"The RO has made it clear to the Forest Supervisors and the District Rangers what a priority they put on collaboration"* • *"When issues were raised regarding collaborative process, the RO stepped up and reaffirmed the agency's commitment to the process."* • *"RO support comes in the form of flexible financing, expert support, working for support from the WO."* • *"The Regional Office supported CFLRP function and performance through alignment of watershed restoration program resources and through relevant feedback on the second CFLRP application."* • *"Providing skilled personnel was very supporting."* • *"Supported function and performance by providing sufficient funding and manpower when needed."*
Inhibiting	• Lack of support, inconsistent, and/or conflicting guidance on navigating contracting issues, implementation • Uncertainty in support for CFLRP 2.0 • Mis-alignment with CFLRP project principles and design criteria caused friction • Mis-alignment between RO and Forest Units or districts • Limited involvement from regional specialists • Diminished engagement throughout life of CFLRP due to agency turnover • Elicited limited input from CFLRP project members on regional projects/initiatives • Limited funding, personnel to support and do the work	• *"The indecision of whether the region would support and submit new CFLRP proposals gave us a bit of whiplash."* • *"For first half of CFLRP, there was quite a bit of regional office engagement. During the second half, due to personnel turnover, the regional office has been totally invisible."* • *"The Regional office, in later years of the collaborative, cared little about input from the CFLRP and launched its own initiatives with little input."* • *"Regional office direction and guidance is sparse and often conflicting when it comes to proper implementation. [The] comfort and ability [at local scale] to expand policy interpretations to increase pace and scale objectives are inconsistent. Regional office goals for partnerships are not always implementable and the region often contributes to confusion when making agreements at the RO level without the proper consultation with implementation units like forest/districts."* • *"Lack of support or direction from regional office has been detrimental to implementation."*

Appendix 3: The multiple dimensions of trust and related activities to maintain or build trust

Stern introduced the concept of trust ecology and the multiple dimensions of trust (e.g., Stern and Coleman, 2014, 2019). In short, these concepts argue that there are many forms of trust, including dispositional, affinitive, rational, and procedural (or systems-based) trust. The actionable forms of trust (i.e., affinitive, rational, and procedural) are necessary to support collaborative function and performance. Building and maintaining diverse forms of trust can contribute to the resiliency of the collaborative. Below, we describe each different form of trust, and some practices and activities collaboratives have engaged in to build and maintain trust:

- **Dispositional trust** is the "general tendency or predisposition of an individual to trust or distrust another entity in a particular context" (Stern and Coleman, 2014: 122).
    - Dispositional trust, unlike the other forms of trust, is difficult to change as it develops over the course of a person's lifetime.

- **Procedural trust** is having trust in a set of procedures, rules, or binding documents to as a way to guide actions.
    - There are a number of ways to develop this form of trust, for example: 1) Develop clear, transparent collaborative structures that all participants are aware of; 2) co-develop a charter documenting rules for interaction; 3) establish criteria for decision-making and evaluation of decisions; and 4) establish a process whereby collaboratives can communicate about and negotiate dissenting opinions, and document the consequences for violating rules and procedures (Stern and Coleman 2019). Having a professionally-trained facilitator or coordinator can help establish and maintain these practices and procedures. Co-developing strong procedural trust is the basis for all other forms of trust, thus it may be pertinent to build this type of trust first and ensure that it is maintained. Procedures ad practices are particularly useful for navigating personnel turnover (Stern and Coleman 2019).

- **Rational trust** is developed over time as individuals demonstrate their expertise, performance, and follow-through on responsibilities.
    - Facilitators or coordinators can help build rational trust by managing timelines and deliverables so that products and feedback are delivered when they are expected. Also, some groups have developed sub-committees, which not only reduces responsibilities and accountabilities of the larger collaborative group, but also enables specialists to convene and develop recommendations on more technical issues to the larger collaborative group. Together, these factors enable individuals to demonstrate to others their professional/technical expertise, and as projects are completed on time members start to build trust that they can rely on others to get things done (Stern and Coleman 2019).

- **Affinitive trust** is where affinity for a collaborative member is developed based on positive experiences with the person, similar values or backgrounds, and/or perceived connectedness to one another.
    - Again, facilitators and facilitated discussions can help build affinitive trust by working together through contentious subjects. Additionally, field trips, pub talks, or other informal activities often lead to sharing information, shared learning, and relationship-building and help build affinitive trust (Stern and Coleman 2019).

Appendix 4: Positive and negative impacts of common stressors or changes experienced by collaboratives

The following lists both positive and negative impacts from common internal and external changes. Results are based on review of peer-review and gray literature, as well as results from the 2020 Collaboration Indicator Survey and worksheets completed at the SWERI Cross-boundary and Idaho Forest Restoration Partnership workshops in March and April 2020, respectively. These together indicated that turnover in participants, biophysical disturbance, and legal or policy changes were the most common stressors or changes collaboratives had experienced.

Changes	Positive Impacts	Negative Impacts
Turnover in participants	• Rejuvenate collaborative and provide excitement • Different viewpoints, consider new ways of doing things, and promote risk-taking • Turnover of disruptive or non-supportive members provides new opportunities to build relationships, identify common goals, and increase transparency and communication • Facilitate boundary spanning	• Backlogs, delays in progress, and uncertainty in implementation schedule • Collaborative member fatigue • Time lost to on-board, re-hash old arguments • Increased workload on remaining participants • Change in direction over long planning to implementation timeframes detrimental to progress • New and non-supportive participants can derail progress and erode trust • Loss of key voices diminishes balanced perspectives and equity in decision-making • Loss of understanding of social-ecological context • Loss of organizational vision, collaborative direction, and group norms • Conversations become unfocused, while messaging, agreements, guidance is inconsistent • Loss of understanding or commitment for collaborative engagement in different phases of work
Biophysical Disturbance	• Catalyst for establishing collaborative • Agreement that collaborative recommendations were effective, appropriate, and needed • Transitioned collaborative from recovery-oriented to resilience planning • Increased funding and support for landscape-scale projects, strategic planning, and NEPA • Wildfire helped meet ecological objectives	• Impacted planning units results in changes, delays, or uncertainty in implementation • Less involvement of collaborative in categorical exclusions to respond to disturbance • Loss of economic viability for timber sales and stewardship contracts • Increased cost to treat units impacted by insects • Diverted resources (personnel and funding) from projects or conflicting priorities regarding appropriate management actions • Lack of restoration after disturbance led to frustration and loss of membership • Poorly managed fire or escaped broadcast burn can erode social capital and trust • Shift in agency priorities to suppression, mitigation, and salvage • Increase in scope and magnitude of resource needs
Legal or policy change	• Increased number of opportunities for restoration activities across boundaries (e.g., GNA) • Increased funding for implementation and collaboration • Litigation refocused Forest Service resources and brought positive attention to collaborative	• Mexican spotted owl injunction stopped implementation on Forest Service land, almost forced mills to close • Litigation led to collaborator fatigue due to slow progress and division among groups • CFLRP/RMRI shifted focus away from existing collaboratives and created competition for resources (personnel and funding)

Appendix 5: Responses to internal and external changes and barriers to response

The following lists collaboratives' responses and barriers to response to common internal and external changes. Results are based on review of peer-review and gray literature, as well as results from the 2020 Collaboration Indicator Survey and worksheets completed at the SWERI Cross-boundary and Idaho Forest Restoration Partnership workshops in March and April 2020, respectively. These together indicated that turnover in participants, biophysical disturbance, and legal or policy changes were the most common stressors or changes collaboratives had experienced.

Changes	Responses to Turnover	Barriers to Responding to Turnover
Turnover in participants	• Develop strategic plan to minimize disruption from turnover • Develop and periodically review agreed-upon rules and procedures, MOUs with partners, etc. • Reinforce ground rules at meetings • Develop hand-over memos, onboarding workshops or meetings • Dedicate staff time to on-board new personnel, articulate responsibilities and accountabilities (e.g., buddy system, redundancy in positions or roles) • Leadership requirements to help them "learn the ropes" before leading • Hired a facilitator/coordinator to stay on topic, (re)define goals, vision, mission • Introduced more structure to the collaborative and sub-committees • Encouraged more time at meetings and more frequent work relationships • Pressure agency to remain accountable, fill vacancies/retain employees • Develop understanding/agreements with agency leadership to prioritize collaboration among field unit line officers • Collaborative engagement in FS hiring process • Increase partnerships and/or enhance partner coordination	• Agency culture - "move to promote" and detailing • Not enough "lead time" for departures • Lacking a "deep bench" of participants to recruit • Difficult to recruit/retain participants who have their own jobs, other commitments
Biophysical Disturbance	• Field trips to observe effects and discuss benefits of disturbance • Amended CFLRP project agreement: changed priority management areas and adjusted targets and implementation schedule • Identified alternative treatment areas or types (salvage, sanitation harvest) • Acquired additional funding from the state to support wildfire mitigation work • Articulated collaborative priorities and collaborative support for CEs and restoration • Re-established trust by providing a safe, open space for communication and negotiation • Joint fact-finding mission addressed impacts of salvage logging on environment/wildlife to inform future management decisions	• Scale mismatches – e.g., lost value of insect-killed trees before NEPA compliance completed • Not enough emphasis on socioeconomic impacts to the local communities • Much of resources diverted to removing dead trees and creating fire breaks. • Focus on administrative structure/procedures at expense of forest restoration and fuels reduction
Legal or policy change	• New Mexico State Forestry worked with industry to fund restoration work on private land • Field visits to fine tune silvicultural prescriptions in the face of litigation • Collaborative intervened in the lawsuit on behalf of the Forest Service • Submitted letters of support for the project and participated in the objection review process • Sought legal support from outside agency • Filed an amicus brief • Hired new staff to increase planning capacity and to solidify responsibilities for new collaborative restoration opportunities	• Mismatch in scales; project areas already specified and finding alternative treatments difficult • Lack of state, regional, federal direction or guidance • Difficult for collaborative to provide timely responses during litigation process • Lack of sufficient resources to keep other projects moving forward during litigation • Unsure of collaborative role in the litigation process • Uncertainty with application, funding, uncertain placement

Appendix 6: Example boundary objects from CFLRP projects

Boundary objects—"material objects and structures that occupy the space between a CGR [collaborative governance regime] and the bureaucracy and that provide mechanisms through which CGR learning and ideas can be absorbed and acted upon by the bureaucracy" (Cheng et al. 2015)—may provide a robust mechanism to mitigate the impacts that result from turnover.

Boundary objects can include:

1) agreements co-developed by the collaborative and Forest Service that set guidelines for restoration treatments and/or expectations and accountabilities (e.g., memoranda of understanding);
2) monitoring and adaptive management protocols; and/or
3) models, databases, or maps (Antuma et al. 2014; Cheng et al. 2015; Urgenson et al. 2017).

Below are a few examples of boundary objects found in the review of CFLRP projects that are currently being used or could be used as boundary objects:

- The Northeast Washington Forestry Coalition developed sideboards which provided recommendations for thinning, tree removal, and density thresholds in different areas (Antuma et al. 2014). It can be found here: https://www.nationalforests.org/assets/pdfs/Best-Practice-NEWFC-Forest-Management-Guidelines.pdf
- The Southern Blues Restoration Coalition is developing decision trees, which define zones of agreement among the collaborative from past projects so that future restoration treatments carried out by FS staff can be expedited so long as they are within shared goals of the collaborative. The decision trees also provide information regarding who to contact when questions or issues arise (Antuma et al. 2014).
- The Amador-Calaveras Consensus Group created a scorecard, which helped the collaborative group and Forest Service determine if a project fits within established recommendations (Antuma et al. 2014).
- The Colorado Front Range Forest Landscape Restoration Initiative and related partnerships have developed a number of documents that serve as boundary objects:
    - The Front Range Fuels Treatment Partnership Roundtable co-developed their Living with Fire document that the Forest Service uses as a guide for implementation (https://mountainscholar.org/bitstream/handle/10217/80354/Living_With_Fire_May2006.pdf?sequence=1&isAllowed=y). This was also a foundational document for the Colorado Front Range Forest Restoration Initiative CFLRP project proposal.
    - As part of the Upper Monument Creek Environmental Impact Statement, stakeholders associated with the Colorado Front Range Forest Restoration Initiative CFLRP and the Upper Monument Creek Collaborative developed treatment design criteria for operations staff, specifically to help translate broad ecological restoration goals into prescriptions on the ground. The treatment design criteria can be found here: https://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/Colorado/Documents/Appendix%20D_Final%20Design%20Criteria%20Report_12-11-13.pdf.
    - A summary report and collaborative recommendations from the Upper Monument Creek Collaborative to the Forest Service Pike National Forest that articulated the collaborative's desired conditions and management actions can be found here: https://www.

conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/Colorado/Documents/UpperMonumentCreek_Web.pdf.

- GTR-373: Principles and practices for the restoration of ponderosa pine and dry mixed-conifer forests of the Colorado Front Range. Although several studies addressed the management of dry mixed-conifer forests (e.g., GTR-PSW-237; RMRS-GTR-310), these were not specific to the unique characteristics of the Colorado Front Range and therefore lacked the specificity to plan, implement, and monitor forest restoration activities within the Colorado Front Range CFLRP footprint. To define a common vision for restoration, the Front Range CFLRP worked with a range of scientists and managers from federal agencies, academia, and environmental NGOs who helped produce and review GTR-373. First, a team of scientists reconstructed historical forest conditions along the Colorado Front Rang using best available science to identify desired conditions. The document was developed to help managers and the broader collaborative forest restoration community understand desired conditions, identify restoration recommendations and the principles behind those, and provide a set of steps for implementing these principles. One respondent from the NFF CFLRP collaboration indicator survey noted that document has been useful to deal with turnover in collaborative participants and maintain institutional memory, "we have numerous publications including GTR-373 that outline much of the vision for the collaborative."[32] The document can be found here: https://cfri.colostate.edu/wpcontent/uploads/sites/22/2019/03/RMRS_gtr373.pdf

- The Landscape Restoration Team also developed an adaptive management framework--which was approved by the Front Range Roundtable—that details the process of adaptive management (e.g., designing restoration goals, evaluating monitoring results, and changing actions): http://www.rmtrr.org/data/Aplet%20et%20al.%20FR-CFLRPAdaptiveManagement_CFRI-TB-1403.pdf

- The Colorado Forest Restoration Institute and Landscape Restoration Team also developed various monitoring protocols for ecological and socio-economic conditions (https://cfri.colostate.edu/wp-content/uploads/sites/22/2018/10/2017_FR_CFLRP_Monitoring_Plan_Typeset_2018.pdf); and understory plants (https://cfri.colostate.edu/wp-content/uploads/sites/22/2017/12/FR-CFLRP-Understory-Monitoring-Protocol-2015.pdf)

- The Deschutes Collaborative Forest Project developed issue-based recommendations for the management of ponderosa pine and dry mixed-conifer forests, and for management of ponderosa pine impacted by dwarf mistletoe (Urgenson et al. 2017). These recommendations were incorporated into the Deschutes National Forest Melvin Butte Vegetation Management Project (Deschutes Collaborative Forest Project Annual Report - https://www.fs.fed.us/restoration/documents/cflrp/2015AnnualReports/DeschutesFY2015AnnualReport.pdf).

- Four Forest Restoration Initiative developed the Large Tree Retention Strategy, which provides issue-based recommendations to resolve conflicts over cutting large diameter trees to meet ecological and biodiversity goals and objectives (Urgenson et al. 2017)(https://4fri.org/wp-content/uploads/2018/04/old_growth_protection-revised080812.pdf). Key components of this strategy were implemented in the Large Tree Implementation Plan in the Record of Decision for the Four Forest Restoration Initiative (https://www.fs.usda.gov/Internet/FSE_DOCUMENTS/stelprd3836454.pdf).

32 Participant 22, NFF Collaboration Indicator Survey

- The Dinkey Landscape Restoration Project used GTR 220, An Ecosystem Management Strategy for Sierran mixed-conifer forests (https://www.fs.fed.us/psw/publications/documents/psw_gtr220/), which summarized the state of the science on: 1) forest and fire ecology; 2) principles of ecological restoration and sivicultural practices; and 3) wildlife, particularly the Pacific fisher. It was used as a framework and baseline to develop shared visions or zones of agreement on restoration priorities and options within the CFLRP project footprint (Bartlett 2012).

- The Clearwater Basin Collaborative signed a memorandum of understanding with the Forest Service that defines expectations of the CBC and the Forests included in the Selway-Middle Fork Clearwater CFLRP project

Appendix 7: On the timing of involvement in the Environmental Analysis and Decision Making Phases

Cases pointed to the importance of interactions between stakeholders and the Forest Service early, often, and throughout the environmental analysis and decision-making (EADM) process pursuant to the National Environmental Policy Act (NEPA) and other requirements. We provide contrasting examples illustrating cases in which collaboratives were involved in the EADM process, as well as examples of how collaborative groups who were not included early and often in the EADM process subsequently mitigated this shortcoming.

- Uncompahgre Plateau Collaborative Restoration Project: Local participants were included early and often prior to and during the EADM phases. Involvement included collecting, analyzing, and interpreting information comparing historic vs. current forest conditions that, in turn, allowed participants to co-develop restoration principles to guide projects (Bergmann et al. 2019). When stakeholders participate in developing the evidence basis for why forest restoration is needed, it can often increase trust, potentially reduce conflict and litigation, and streamline the NEPA process.
- Alternatively, Cheng et al. (2015) and Butler and Esch (2019) noted that in the Colorado Front Range Landscape Restoration Initiative and the Amador Calaveras Cornerstone Project collaborative groups were not involved in the NEPA process. Instead, most of the acres treated were based on "shelf-stock" NEPA, which limited the flexibility of forest service managers to accommodate requested changes from the collaborative group.
- Compared to stakeholders involved in the Uncompahgre Plateau Collaborative Restoration project, stakeholders from the Colorado Front Range Landscape Restoration Initiative did not report an equal degree of trust in and satisfaction with the collaborative process (Bergmann, 2019).
- The Colorado Front Range Landscape Restoration Initiative and Amador Calaveras Cornerstone Project both developed approaches to mitigate this shortcoming in part by completing environmental impact studies in new project areas (e.g., Upper Monument Creek) with more direct participation of stakeholders, and also developing a review and approval processes for NEPA documents that were in progress or had been completed (Butler and Esch 2019).

Appendix 8: Ecological disturbance can redistribute priorities, erode trust, and undermine collaborative effectiveness

Ecological disturbance can constrain collaborative progress. Disturbance can shift priorities and, in some cases, take resources (e.g., personnel and funding) away from the collaborative group in order to address new problems on the landscape, which in turn can deter collaborative progress and create conflict among the group. A poorly managed fire can also quickly erode trust and social capital. For example:

- Uncompahgre Plateau Collaborative Restoration Project: The spruce beetle epidemic and subsequent development of the Spruce Beetle Epidemic and Aspen Decline Management Response (SBEADMR) led to reduced involvement among several key members of the Uncompahgre Plateau Collaborative Restoration Project, as their time and energy was shifted to SBEADMR (Bergmann, 2017).
- Colorado Front Range Landscape Restoration Initiative: High mortality from the mountain pine beetle epidemic in Colorado led to the development of a new collaborative group, the Colorado Bark Beetle Cooperative. According to Cheng et al. (2015), this new collaborative attracted significant attention and competed with the Front Range Roundtable for financial resources. It also led to conflict among the Front Range Roundtable members; some members wanted to shift some resources to treating higher elevation zones to take advantage of new funding sources to mitigate mountain pine beetle impacts, while others argued that there was no scientific need to treat that zone. The conflict reduced the group's focus on implementation and undermined collaborative effectiveness (Cheng et al. 2015).
- Burney Hat Creek Basins: Antuma et al. (2014) reported that the Forest Service was coordinating fuels treatments with the adjacent Lassen Volcanic National Park. In 2012, a fire broke out on NPS-managed lands. The fire eventually spread onto Forest Service-managed land and burned close to 20% of the planning unit. This effectively deterred cross-boundary collaboration in the short-term and led to discontent among the local community (Antuma et al. 2014).

Appendix 9: Collaborative Resilience Worksheet

Below, we have developed a structured assessment that collaboratives can use to assess their vulnerability and adaptive capacity. It helps identify current structures or practices in place to respond to change, which provide an understanding of the plausible and potentially desirable response options available to the group, and also identifies remaining needs, or barriers, that need to be overcome in order to build capacity to respond in the future. It is grounded in findings from this synthesis. It has been piloted at two collaborative workshops, including the 2020 SWERI Cross-boundary Landscape Restoration Workshop (https://sweri.eri.nau.edu/cross-boundary-landscape-restoration-workshop/) and the Idaho Forest Restoration Partnership (IFRP)'s 2020 workshop Evolving Forest Collaboration: Expanding Shared Stewardship. At both workshops, we encouraged individuals to fill out the worksheet. We also administered breakout groups where the worksheet components were collectively discussed and reported back to the larger group. At the SWERI cross-boundary workshop, a key takeaway from the collaborative resilience breakout group was that worksheets such as the one appended provide a structured process for collaboratives to self-assess their adaptive capacity. The worksheets can be used as a social learning exercise and reviewed annually or periodically. At the IFRP workshop, we conducted an exit poll – the majority of participants reported that this worksheet was a useful approach to documenting and understanding collaborative resilience to internal and external changes and about half indicated that they would take this worksheet back to their collaborative to collectively populate.

How resilient is your collaborative? Assessing the vulnerability and adaptive capacity of collaborative groups to internal and external change

In your breakout group, use this worksheet to:

- discuss and learn about the internal and external changes collaboratives have experienced;
- the associated impacts to collaborative function and performance;
- the ways in which collaboratives have dealt with these changes across cases and contexts;
- barriers that constrain response; and
- best practices that have facilitated response.

What internal or external change(s) has the collaborative group you are affiliated with experienced? *These could include: 1) turnover in participants; 2) the transition from direction-setting to implementation; 3) notable ecological disturbance; 4) sudden change in industry capacity; and/or 5) a legal or policy change, among others.*	**How have these changes impacted collaborative function or performance?** *These may include both positive changes or negative impacts. For example, participant turnover may have resulted in new opportunities for collaborative progress. Conversely, turnover may have caused set-backs in getting to agreement or delays in implementation.*	**In what ways have you prepared for, responded to, or mitigated impacts from these changes? Please provide examples.** *These could include: 1) developing a transition strategy (e.g., written agreements guiding restoration treatments, onboarding material, a buddy system, or redundancy in roles); 2) enabling collaborative involvement early and often throughout planning and implementation phases; 3) augmenting prescriptions, planning areas, or priorities in the event they are affected by wildfire, among others.*	**What barriers or constraints inhibited your ability prepare for or respond to these changes? Please provide examples.** *These could include: 1) lack of knowledge or experience about how to anticipate, plan for, or anticipate surprises; 2) lack of time – too many other issues to deal with; 3) lack of leadership within the collaborative; 4) lack of power, authority, or resources to affect change.*

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