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### Natural Resource Managers Adapt to Disturbance: Understanding and strengthening public land management and civic stewardship across both rural and urban forests during the COVID-19 pandemic

Lindsay K. Campbell<sup>1\*</sup>, Erika Svendsen<sup>1</sup>, Michelle Johnson<sup>1</sup>, Sophie Plitt<sup>2</sup>, Laura Landau<sup>3</sup>

<sup>1</sup>USDA Forest Service, Northern Research Station, [\\*Lindsay.campbell@usda.gov](mailto:Lindsay.campbell@usda.gov)

<sup>2</sup>Natural Areas Conservancy

<sup>3</sup>Rutgers University, Department of Geography

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#### Abstract

In addition to the devastating impacts on human health and the economy, COVID-19 is changing the way people interact with public lands such as forests, parks, and green spaces. Land managers have adapted practices in real-time to a changing reality. Establishing new field protocols, managing workforce capacity issues, responding to unprecedented demand, and reimagining the way the public is served through events and programs are some of the adaptations managers are making to ensure use and access to public lands. Many community-based partners have managed to adapt during this time of crisis to support public lands in cities, towns, and rural areas. These ‘green responders’ are known to be effective and adaptive across geographies and cultures; yet capacity to respond can be uneven and inequitable. To better understand what drives adaptation and ‘green response’ to disturbance, we pose the question: *How do public land managers, civic environmental groups, and governance networks adapt to the COVID-19 disturbance in their environmental stewardship?* Drawing upon semi-structured interviews (n=70) with USDA Forest Service managers in the northeastern United States, municipal park managers at the New York City Parks Department, and civic stewardship groups in New York City, we advance policy-relevant knowledge about networks and adaptation. We 1) identify the emergence of new groups, the transformation of partnerships, and the shifts in flows of information and resources across networks, and 2) share best practices and creative solutions during the pandemic. By documenting how natural resource managers responded to the first six months of the pandemic starting in March 2020, this study builds understanding of how adaptation can strengthen resilience to future disturbances. This work builds upon scholarship that has examined stewardship in the wake of acute and chronic disturbances including terrorism, hurricanes, wildfires, and pest invasions.

Keywords: COVID-19; land management; civic stewardship; adaptation; partnerships

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#### Introduction

In addition to the devastating impacts on human health and the economy, COVID-19 is changing the way humans interact with green space (Soga et al. 2021). In many instances, outdoor activities at safe distances are not only allowed, but encouraged by public health experts for sustaining physical, mental, and emotional health and well-being (Samuelsson et al. 2020; Slater et al. 2020). Yet, certain parks and forests have become overcrowded, and some are closed to public use (Grima et al. 2020; Venter et al. 2020; Plitt et al. in press). The crisis is revealing underlying inequities and vulnerabilities

across social groups and communities (Bassett et al. 2020; McPhearson et al. 2021). Natural resource managers—including public agencies and civic environmental groups—are determined to meet the needs of a changing landscape and context, but there are challenges that must be overcome. Establishing new field work protocols, adjusting to a limited workforce, rescheduling activities, adapting to on-line communications, and a dire need for resources are just a few of the emerging changes (Jacobs et al. 2020; McGinlay et al. 2020; Miller-Rushing et al. 2021; Sainz-Santamaria et al. 2021). As this crisis deepens and spreads, the impacts on how land managers steward natural resources in partnership with community stakeholders will continue to unfold.

Prior scholarship has examined stewardship of nature in the wake of both acute and chronic disturbances, including September 11th, hurricanes, floods, wildfires, and pest invasions--and has identified that stewards can serve as “green responders” to these events (Campbell et al. 2019; Chan et al. 2015; Svendsen and Campbell 2010; Tidball et al. 2010; Tidball and Krasny 2014). Stewardship groups can transform green infrastructures into social infrastructures that support well-being, diversity, and inclusion (Klinenberg 2018; Latham and Layton 2019; Campbell et al. 2021). Stewardship of the environment has been shown to strengthen place attachment, social cohesion, social networks, and knowledge exchange and diversification -- all indicators of social resilience at the community level (McMillen et al. 2016). Yet, in the current COVID-19 crisis, many stewards themselves are vulnerable -- including essential park or forest workers and civic volunteers. Critical work is carried out through community stewardship and it is becoming clear that groups have differing levels of capacity (Landau et al. 2019; Sampson 2012).

Therefore, it is important to understand how environmental networks comprised of many different community and government groups work together in adapting to the pandemic. Environmental governance networks at multiple scales can be effective in helping to provide greenspace and associated activities that are important to communities (Bulkeley 2005; Connolly et al. 2014; Buijs et al. 2019). In addition to the central role of public agencies, civic brokers (e.g. nonprofit conservancies, ‘friends of’ groups, watershed associations) share information and resources and mediate between government agencies and local communities (Connolly et al. 2013). As the system encounters the cascading stressors of the COVID-19 health crisis itself, compounded by shelter-in-place orders, economic impacts of the shutdown, and the lasting scarcity of resources - there are examples of emergence, learning, and brokering across the network.

Given this context, we posed the research question: *How do public land managers, civic environmental groups, and governance networks adapt to the COVID-19 disturbance in their environmental stewardship?* We conducted semi-structured interviews (n=70) with public land managers at National Forests within the Eastern Region - Region 9 (R9) of the USDA Forest Service (Forest Service) and urban parks in New York City (NYC), as well as civic stewardship groups in NYC. These interviews advance understanding about the roles of stewardship, partnerships, and natural resources in strengthening social-ecological resilience to disturbance. Our findings build new knowledge about a global pandemic, a distinct disturbance that occurs at the broadest spatial and temporal extents, involves cascading socio-economic stressors, and requires physical and social distancing measures to contain. Following a brief review of methods, we first summarize the disturbance impacts, capacity challenges, and programmatic adaptation, then we analyze changes in collaborative networks and partnerships, and finally we discuss the implications of these results in terms of adaptation to future disturbances.

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## Methodology

We conducted 70 semi-structured interviews with public land managers and civic stewards in the northeastern United States. Through our study design, we sought to understand patterns and processes associated with stewarding public lands across different sectors (public and civic), locations (urban and rural), and organizational levels (federal and municipal). Our selection criteria for *public land managers* were: for NYC, we included municipal land managers with New York City Parks Department (NYC Parks) working on parks with natural areas across the five boroughs (n=9); for R9, we reached out to all partnership and volunteer coordinators working on Forest Service R9 National Forests (n=16), as well an additional round of “spot check” interviews with key leaders at the regional and national levels (n=11). For *civic stewards in NYC*: we leveraged longitudinal data about civic organizations created through the Stewardship Mapping and Assessment Project, or STEW-MAP (Svendsen et al. 2016; Landau et al. 2019; [www.nrs.fs.fed.us/STEW-MAP/](http://www.nrs.fs.fed.us/STEW-MAP/)). A random sample of civic stewardship groups was selected, stratifying by network position (highly connected, moderately connected, less connected) and geographic territory (region-wide, neighborhood, block level) (Campbell et al. 2021). An additional snowball sample of civic groups engaged in COVID-19 response was identified through the first round of interviews, for a total of 34 civic interviews.

Interviews were voluntary and confidential (Rutgers University IRB Pro2020001281), lasted approximately 1 hour, and were conducted entirely via Zoom video conference. Following receipt of informed consent, interviews were audio recorded, auto-transcribed, and corrected for accuracy. Each interview was conducted by two researchers, and following each interview, debrief notes about core themes and findings were discussed. A total of 269 pages of debrief notes and 787 pages of transcripts were generated. The content was coded separately by two researchers via an open coding scheme that identified key phrases and concepts (Lofland et al. 2005). These initial codes were compared and discussed iteratively until consensus was reached among the coders, thereby enhancing reliability (Neuman 2003). These emerging themes were developed into preliminary findings presentations, which were shared as a “member check” with our community of practice as a way of validating and ground-truthing the results (Lincoln and Guba 1985).

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## Results

### Disturbance impacts, capacity challenges, and programmatic adaptation

Across public and civic sectors and federal and municipal lands, respondents reported an unprecedented level of green space use during the early months of the COVID-19 pandemic, from March-August 2020. In NYC, as nearly all indoor facilities closed, open space became one of the only areas where the public could recreate, exercise, or safely gather. Across the northeastern United States, interviewees observed examples of parks and forests being used as outdoor classrooms, remote offices, exercise studios, protest sites, and daycares. Between the sheer number of users and these newer uses, managers struggled to keep up with maintenance operations like trash removal and cleaning bathrooms. Alongside this surge in demand, the City of New York experienced severe budget cuts in 2020, which led to reductions in seasonal staff that provide crucial operations and maintenance support. Civic groups in NYC played a critical role in filling some of the gaps left behind by these municipal cuts, though the ability to respond was not even across the landscape. Forest Service respondents reflected on the challenges faced by already-lean budgets and staff.

Land management adaptations to COVID-19 evolved over time under shifting conditions of the pandemic and changing public health guidelines. The focus of the early adaptations was on keeping staff and visitors safe and involved closing facilities, distributing personal protective equipment (PPE), and moving a large proportion of staff to telework status. For example, NYC Parks initially closed all playgrounds and recreational courts where shared surfaces or close proximity meant that social distancing could not be easily practiced -- yet large “natural area” forests remained open throughout. As information about low surface transmission emerged, all sites remained open but with informational signage about masking, distancing, and handwashing. Eventually the focus evolved to include developing virtual content to engage the public--particularly students engaged in remote learning--to keep them connected to public lands. Volunteer programs began to resume by mid-summer, albeit in an altered way. Mass events such as tree planting days were avoided, individual and small group programs with social distancing were facilitated. This loss of large-scale volunteer events was also noted as a loss of capacity - as some of these events are used to get substantial work tasks completed. See Table 1.

**Table 1: Disturbance impacts, capacity challenges, and programmatic adaptation**

Theme	Examples
<b>Disturbance impacts</b>	<ul style="list-style-type: none"> <li>● Unprecedented number of visitors</li> <li>● Trash, dumping</li> <li>● Unauthorized events and novel uses</li> <li>● Municipal budget cuts</li> </ul>
<b>Capacity challenges</b>	<ul style="list-style-type: none"> <li>● Loss of seasonal hires, furloughs, and staffing cuts</li> <li>● Canceling or pausing of volunteer programs</li> <li>● Enforcement and maintenance challenges</li> <li>● Missed opportunities to engage the public when demand and interest in public lands is so high</li> </ul>
<b>Programmatic adaptations</b>	<ul style="list-style-type: none"> <li>● Closing facilities</li> <li>● Telework</li> <li>● PPE</li> <li>● Changes to fieldwork and office schedules</li> <li>● Creating virtual content</li> <li>● Public volunteer programs with safe social distancing</li> <li>● Creating new roles (e.g. social distancing ambassadors)</li> </ul>

### Collaborative Networks and Partnerships

Interviewees identified a range of ways that both specific organizational partnerships and whole networks shifted in response to COVID-19. More collaborative communications, knowledge, and resource-sharing networks were reported both among civic groups and between the civic and the public sector. Some civic groups reported new collaborations with emergent organizations such as mutual aid networks and informal clean-up efforts, as well as working with existing partners in new ways. Public land managers reported increased networking with other government agencies to standardize COVID-19 response. Overall, many groups expressed an increased need to share resources and tactics for operating in the pandemic, especially with regards to funding needs. We organized these partnership and network changes into a typology that ranges from scaling back and turning inward, to creating new partnerships and foci, to the emergence of wholly new groups, see Table 2.

**Table 2: Typology of changes in partnerships and networks**

Theme	Examples
Scaling back or turning inward	<ul style="list-style-type: none"> <li>• Canceled events and programs</li> <li>• Some small, all-volunteer groups had to entirely pause their content</li> <li>• Some public land managers relying on existing partners only</li> </ul>
Forming new partnerships and foci	<ul style="list-style-type: none"> <li>• Food security (civic)</li> <li>• Coordinating for COVID-19 safety and meeting recreational demand (public)</li> <li>• Virtual content allows to reach new, geographically dispersed partners</li> <li>• New coalitions to address need to share information and raise resources (e.g., Parks and Open Space Partners, Green Fund)</li> <li>• Existing coalitions take on new urgency (e.g., NYC Urban Forest Taskforce, Save our Compost, Great American Outdoors Act)</li> </ul>
Emergence of new civic groups	<ul style="list-style-type: none"> <li>• Mutual aid groups</li> <li>• New 'ad hoc' stewardship groups at neighborhood scale</li> </ul>

We also identified changes in flows of information and resources within these networks that occurred due to the pandemic. The changes in information flows were common across urban and rural contexts as well as public and civic sectors. The shift to virtual communications created both opportunities (i.e., the ability to reach more people at once, including geographically dispersed publics) and challenges (i.e., the loss of in-person socializing and trust building). All respondents worked to harness social media in new ways, including creating new virtual content, recruiting volunteers, and in some cases engaging “influencers” to reach new audiences. The resource constraints were mentioned more often in the NYC context of acute municipal budget cuts, whereas Forest Service land managers described operating under resource constraints even prior to COVID-19. These NYC municipal cuts also affected civic partners as well, with all reporting the need to “do more with less” and to find alternative sources of funding, including loans and philanthropic grants. The theme of 'doing more with less' is quite common in the field of natural resource management. However, in the case of COVID-19, parks and forests were essential to the well-being and stability of so many people. Public land managers and their partners were desperate to respond to demand despite fiscal and other challenges.

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## Discussion

What lessons learned can we distill for global partners searching for creative solutions during the pandemic? With this work, we do not aim to compare the civic and public sector responses as “better or worse” or “more or less” adapted - rather, we acknowledge that they play different roles in a networked system. In general, we found that the public sector displayed a greater reliance on internal staff or existing, trusted partners rather than forming new partnerships in the early months of the unfolding crisis. In the case of the Forest Service, this often involved landscape-level coordination with neighbors to ensure safe access to public lands. For NYC Parks, partnering involved relying upon well-known nonprofit park conservancies to support maintenance and programming when parks were in high demand. The NYC-based civic sphere displayed instances of nimble adaptation and change where existing capacities allowed for action - including the emergence of new groups (e.g. mutual aid, neighborhood stewardship) and the formation of new coalitions and funding streams (see e.g. Green Fund, <https://cityparksfoundation.org/nyc-green-fund/>). At the

same time, we note that many of these civic groups remain lightly resourced and scaling up adaptations can be a challenge. One limitation of this study is that we did not conduct interviews with civic partners of the Forest Service, therefore we can only rely on public managers' reflections on their roles. Differences in urban and rural settings also contribute to the density and intensity of these partnerships; there are quite simply more people, more staff, more volunteers, and more organizations to draw upon in NYC as a city of 8.8 million residents. Even when working in a less-populated setting, however, public managers can work to engage a wider circle of organizations "beyond the known knowns" to diversify and broaden their partners.

In the anticipated need to adapt to future crises, decision-makers could enable a "both/and" approach whereby they lean on trusted partners but remain open to new opportunities for collaboration. In this way, natural resource managers can fully invest in not only biophysical resources (forest, park, trees), but also in the social infrastructure (people, groups) that is needed to support those resources (see, e.g., Campbell et al. 2021). This includes both investing internally in leadership and staff training and development, and in building relationships and trust with current and potential community partners. Perhaps most critical is that it is helpful when this type of investment in staff capacity and partnership development occurs before the disturbance, to be able to draw upon these resources in moments of response. These partners bring multiple forms of knowledge and offer diverse perspectives that can be critical to consider in times of crisis. Finally, it is important to consider the ways in which disturbance and crises are compound, cascading, and intersect with pre-existing vulnerabilities. While not covered in this paper, we consider elsewhere the "twinning crises" of the COVID-19 pandemic and systemic racial injustice in the United States (see Svendsen et al. in press, Landau et al. 2021). Any adaptations to future crises must consider that not all members of the public experience risk or are impacted equally by disturbance.

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## Conclusions

This study contributes to our understanding of how groups in different environmental governance networks are adapting during this crisis. In both urban and rural settings, the findings from our interviews identify the capacities, gaps, and flows in the network--including the emergence of new groups, the formation of new partnerships and focal areas, and the need to pause, revisit or transform some existing programs due to resource constraints and new, urgent priorities in the COVID-19 context. This work demonstrates that relationships between groups and the early formation of social infrastructure is critical to adapting to disturbance in real time. By documenting how organizations across the northeastern United States respond to the first six months of the pandemic, this study builds understanding of how adaptation can strengthen resilience to future disturbances.

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