Evaluating Diverse Trail Projects Using Standardized Assessment Tools: Conservation Corps Example

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Conservation corps trail assessment background

Service learning corps focused on youth and young adults make significant contributions to the maintenance and management of parks and public lands in the United States. These groups perform activities such as trail maintenance and building, habitat restoration, and other community activities such as disaster response. The effects of conservation corps programs on participants are well documented, with service-learning involvement leading to increased community engagement, positive attitudes toward public lands, and broad social, health, and economic benefits. A study commissioned by the Public Lands Service Coalition, for example, found that youth conservation corps participants experienced growth in areas such as community engagement, teamwork, and self-responsibility after completing the service learning programs. Participants were also more likely than a comparison group to pursue education and careers in natural resource management (Duerden, Edwards, and Lizzo, n.d.). Additionally, maintenance in national parks conducted by conservation corps resulted in significant savings to the agency, up to 87%, on project labor costs (NPS 2012).

Less is known about corps' impacts on environmental outcomes, however, due to the diversity of projects, habitats, and agency partners, and the challenge of measuring this effort. Evaluation of corps' activities contributes to national-level assessments of ecosystem health, increased accessi-

bility and public lands usage, enhanced visitor experiences, and promotion of human health outcomes. The result is the contribution of a standardized, national-level assessment of conservation corps work, focused on environmental outcomes.

As part of a collaboration with 14 conservation corps working across the USA, this project developed standard assessment protocols for trail maintenance and construction projects on public lands. As part of a three-year evaluation study, data collection focuses on trail activities during 2016 and 2017, and habitat activities during 2017 and 2018. This paper provides an overview of a multi-corps and research institution collaboration, a description of protocol development and associated training materials, and results, highlighting the environmental changes associated with corps work. Tangible outputs also include how these protocols could contribute to other programs or nature conservation goals.

Creation of parallel eco-logic model from best practices

Developing an effective measurement tool involved a review of the best practices using a three-part approach: literature review, surveys with corps partners, and interviews with public land managers. The result, a "parallel eco-logic model," mirrors a traditional logic model; it evaluates effectiveness by measuring environmental change. The eco-logic model addresses both short-term outcomes, such as reduced erosion on and alongside trails, as well as longer-term impacts, such as increased visitor safety. By establishing baseline measurements of environmental change, these short-term outcomes can be quantified in a meaningful way, while paving the way for longitudinal studies.

Development of standard assessment protocols

To standardize measures across a wide range of conservation corps, ecosystems, and project activities, a set of common, useful indicators were identified during the best practices review. Crews addressing these common problems contributed to overall environmental health, such as through the mitigation of forest fuels by removing natural debris. Nine indicators of trail condition and ecosystem health were identified as likely to occur across multiple environments:

- natural hazard or debris (e.g., NPS 2007)
- drainage feature damage (e.g., Ballantyne and Pickering 2015)
- structural damage (e.g., USFS 2011)
- erosional features (e.g., Cole 1983)
- increased tread width (e.g., Leung and Marion 1999a)
- root exposure or damage (e.g., Marion & Leung 2001)
- bedrock exposure
- muddiness or standing water (e.g., Applied Trails Research 2012)
- running water on tread (e.g., Leung & Marion 1999b)

An effort was made to ensure objectivity rather than subjectivity of measurements, considering that the crews were evaluating their own work. For example, rather than using a descriptive scale (i.e., good, fair, poor) of the severity of a trail maintenance concern, an alternative scoring system was adopted that used major, moderate, and minor to describe the extent of the issue. In addition, to accommodate the amount of time, equipment, and expertise available to crews in the field, while still capturing valid data, a rapid, visual assessment approach, based on percent cover, was used in the data collection protocols. Data were collected at the overall project level, as well as at the activity-specific, or plot, level. Plots were set based on the occurrence of a trail event, or feature

that triggered at least one hour of work on behalf of the crew (for example, repair of a damaged drainage feature). To capture the magnitude of environmental change, measurements were made pre-work and post-work at the same locations.

All of these considerations addressed the diversity of corps size, location, project type, and other variables, to ensure measurement applicability across different programs. Furthermore, to engage the corps with the research process, prepare them to collect data in the field, and integrate the evaluation into their operations, tools and training opportunities were provided in the form of an online and interactive training website, ongoing conference calls and communication with corps leaders, and in-person presentation of the trail assessment protocols at The Corps Network Conference, held annually in Washington, DC.

Trail study results

The first season of data collection was conducted from April through August, 2016. In that time, data for 163 trail work projects were submitted by ten participating corps, representing 118,119 crew hours, 773 trail miles, and 1,214 crew members (Figures 1 and 2).

A total of 2,586 trail indicator assessments across 803 plots were submitted over the data collection period. Plots were assigned categories of minimal, moderate, and major, depending on the severity of the problem. These categories correspond to ordinal values of 1, 2, and 3, respectively,

Figure 1. Location of corps that participated in trails data collection.

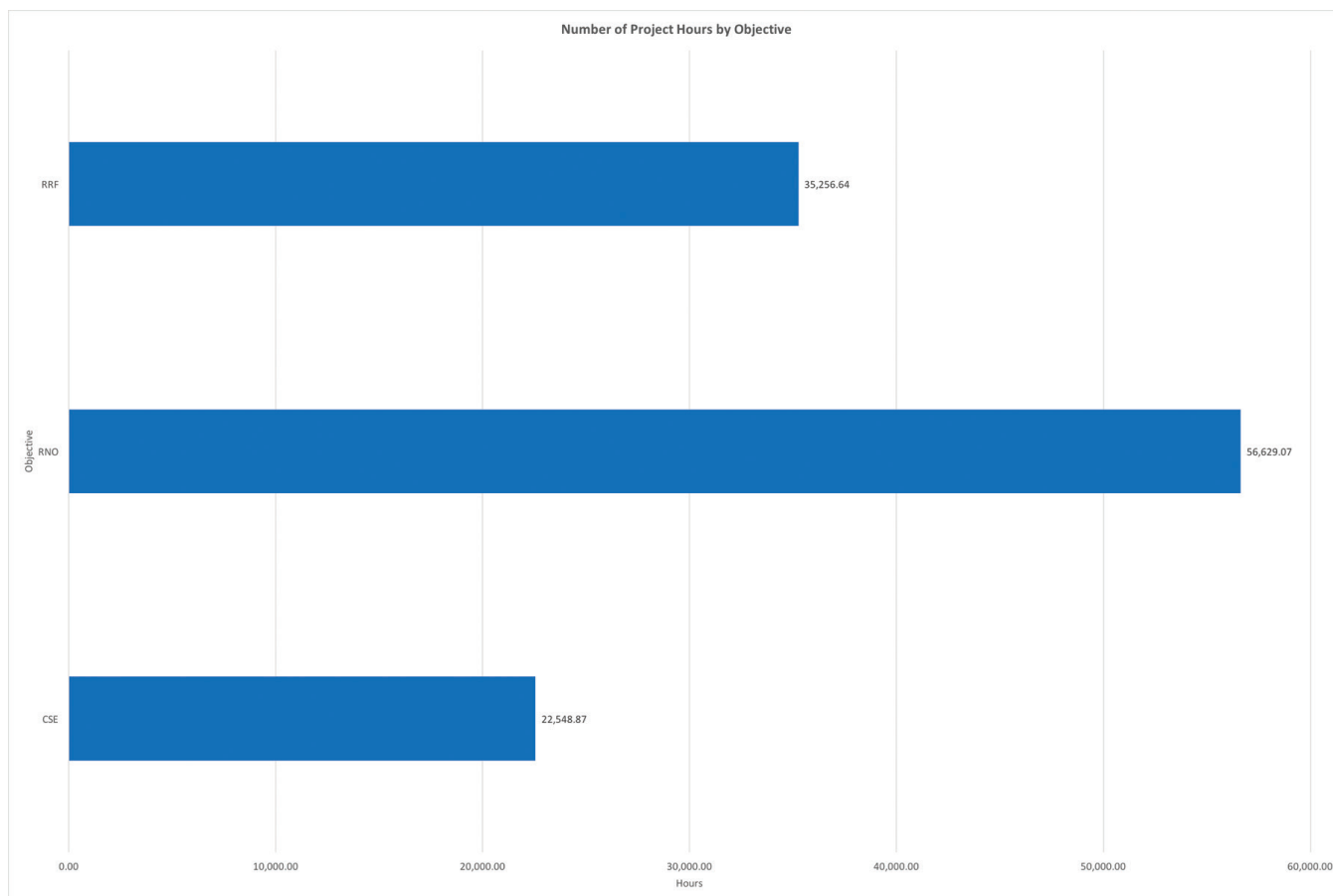## Conservation Corps Evaluation Project Partner Locations
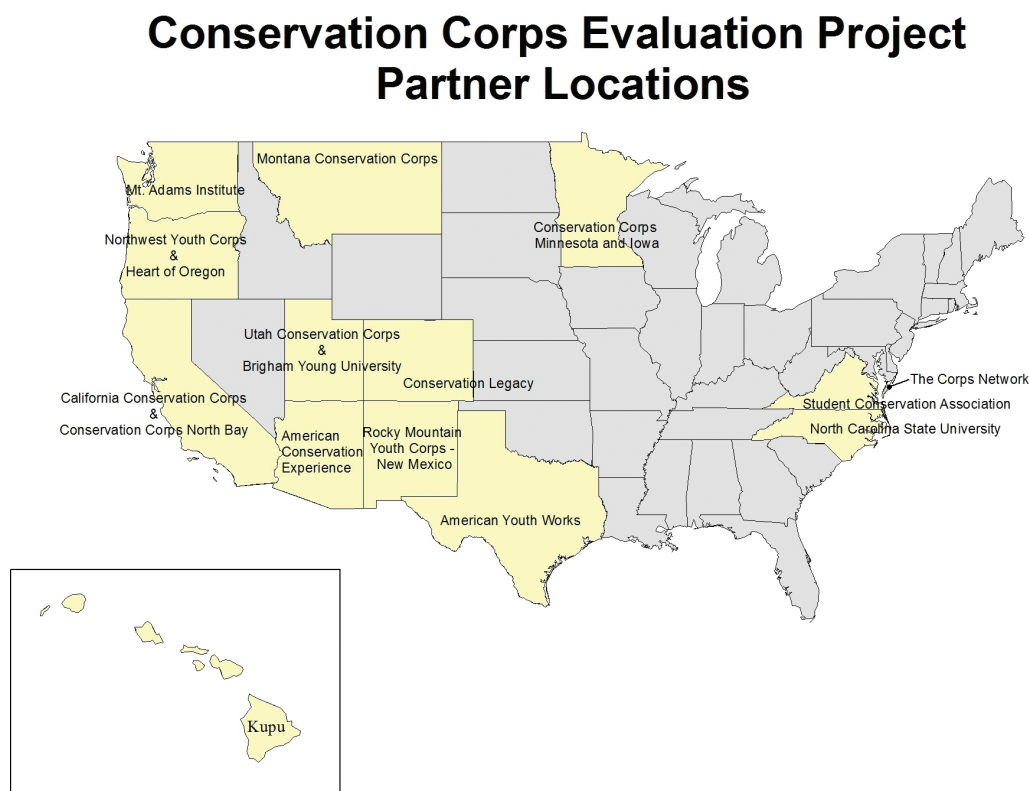
Figure 2. Trail project hours by objective (158 projects reported objective data). CSE = controlling soil erosion, RNO = reducing natural obstructions and hazards, RRF = restoring recreation function.

so that a reduction in value indicates a move toward desired conditions (Table 1). Analysis was based on the ordinal categories.

Implications and next steps

Following the initial season of trail data collection and analysis, findings were shared with participating conservation corps in the form of an overall report, as well as individual reports for each organization. Participant feedback was largely positive, with one site manager noting how they "really liked the content, in that they were able to record more and measure the impact on the trail."

In year two of the study, the focus will shift more toward measuring impacts on habitat restoration activities, primarily involving invasive species removal and forest fuels reduction. A similar approach will be used as for the trails data collection, which will continue in year two. Future research endeavors based on this data and findings may be used to determine larger-scale impacts on communities, economic implications, and ecosystem health. By adopting a standardized approach to measure conservation corps' work on public lands, the value and impact of these efforts can be better understood within a larger and more meaningful context.

Indicator	Number of plots	Average Pre-Score	Average Post-Score	p-value[1]	Effect size[2]
Natural Hazards/Debris	595	2.15	0.84	< 0.001	-0.78589
Erosional Features	469	1.95	0.90	< 0.001	-0.72911
Increased Tread Width	387	1.66	0.90	< 0.001	-0.61355
Drainage Feature Damage	306	2	0.91	< 0.001	-0.73344
Structural Damage	239	1.90	0.92	< 0.001	-0.65461
Root Exposure or Damage	236	1.53	0.89	< 0.001	-0.5826
Running Water on Tread	148	2.32	0.89	< 0.001	-0.77761
Muddiness	105	2	0.74	< 0.001	-0.73973
Bedrock Exposure	101	1.58	1.06	< 0.001	-0.54329

Table 1. Pre-work and post-work plot indicator measurements. Plot scores for each indicator were assigned categories of minimal, moderate, and major, which correspond to ordinal values of 1, 2, and 3, respectively.

Notes on statistical results in Table 1:

1. The p-values came from the Wilcoxon signed rank test for paired samples. This test was chosen as these data did not follow a normal distribution and included two paired dependent variables for which the means were examined. The p-value helps determine the statistical significance of the results. It is a measure of the likelihood of concluding that there is a statistically significant finding when one does not exist. A value of less than or equal to 0.05 is commonly used as a threshold for determining statistical significance.

2. Measures of effect size are standardized measures (between -1.0 and 1.0) that assess the magnitude of this difference. Effect size is often used to determine whether a statistically significant difference is meaningful in practice with effect sizes further from zero, either positive or negative, suggesting greater practical importance. For this statistical test, the criteria for interpreting the absolute value of the r value (or the effect size) are: small ≥ .10, medium ≥ .30, large ≥ .50.

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