

Young adult conservation jobs and worker health

Kathleen L. Wolf^{a*} and Elizabeth Housley^b

^a*College of the Environment, University of Washington, Seattle, WA, USA;*

^b*Our Future Environment Consulting, Seattle, WA, USA*

(Received 6 November 2015; final version received 15 November 2016)

Decades of research studies demonstrate links between healthy environment, healthy lifestyles, and healthy people. This study evaluated the correlations between young adult conservation workers' perceived stress, personal effectiveness, and nature experience using quantitative and qualitative social science methods. The study cohort numbered nearly 300 individuals serving on small crews for an entire year, and were dispersed across Washington State (USA) to participate in conservation projects in rural to urban landscapes. Pre- and post-test surveys, using validated measures of perceived stress, health dimensions, and personal resiliency, were further informed by mid-year, field-based interviews. Overall, the young adults expressed fatigue with the physical work but were quite healthy when compared to national benchmarks. They indicated a reduction in perceived stress, and indicated social function influences based on the conservation work. Conclusions address the importance and implications of expanding this work opportunity to a more diverse cohort and future research needs.

Keywords: human health; restoration; social science; stress reduction; urban forestry

1. Introduction

The health and environmental conservation domains are facing similar challenges, each in their own way. Historically, each has focused on acute, visible problems that can be diagnosed and treated with the best available science and technology. People are living longer and rivers are not catching fire, but communities still face significant challenges in reaching a healthy state for landscapes and human populations. A focus on health promotion, and not simply healthcare, is broadening a search beyond the clinic to the social determinants of public health. For conservation, the challenges of urban growth, climate change, and land use are driving the search for community-based solutions.

There is growing interest in the links between healthy environment, healthy lifestyles, and healthy people. Research done in multiple cities and nations shows that getting people into the outdoors and bringing the outdoors closer to people increases physical activity, reduces stress, builds social connections, and improves air quality (Westphal 2003; Hartig *et al.* 2014). In addition, conservation jobs and service programs help young people learn basic employment skills, improve community and ecosystem services, and help restore key outdoor environments (Schusler and Krasny 2010; Falxa-Raymond, Svendsen, and Campbell 2013).

What might be the effects of being engaged in the active work of landscape care and conservation? Some employment programs of state and local environmental organizations engage early career adults, including veterans, in socio-ecological

*Corresponding author. Email: kwolf@uw.edu

situations; such nature experiences may promote professional mastery, recovery from stress and anxiety, and other positive markers of personal resiliency.

Using quantitative survey and qualitative interview methods, this research explored how an outdoor work environment (spanning the urban to wildland landscape gradient) may serve as a path to personal effectiveness (through job opportunities, peer engagement, and skill building) and provide healing opportunities. These research questions guided the selection of quantitative and qualitative measures:

- (1) How does conservation work affect personal effectiveness and stress recovery?
- (2) How do social interactions contribute to stress recovery and personal effectiveness?
- (3) What individual traits and characteristics are related to stress recovery and enhanced personal effectiveness?

2. Literature review/background

2.1. Ecological restoration and conservation jobs

Conservation jobs, sometimes called ‘green jobs’, include a diverse set of programs at a federal, state or local level and typically combine community service and workforce development. Work activity, once focused in more rural landscapes, now includes urban settings. The goal of many ecological restoration projects is to assist the recovery of a degraded ecosystem so that its structure and function resembles a known, historic ecosystem (Standish, Hobbs, and Miller 2013). Projects in urban areas are typically balanced with the reality of ongoing human influence and need for access to nearby nature, i.e., parks and public green spaces (Andersson *et al.* 2014).

Although a variety of professional and highly skilled careers can be called ‘green jobs’, outdoor jobs in the conservation sector are typically labor intensive, and require a commitment to understanding ecological systems and willingness to learn new skills. The unique situation for outdoor workers perhaps lies in the lived experience and perception of being outside, breathing the air, feeling heat and cold and interacting with organic material, compared to a controlled, indoor work environment (Herzog, Colleen, and Nebel 2003). Directly interacting with vegetation and the landscape perhaps makes it even more apparent that humans are actively crafting and controlling local ecology (Standish, Hobbs, and Miller 2013).

2.2. Nature experience benefits

The aesthetic value of parks, trees, and open space has been widely praised for centuries. Human beings’ innate appreciation for ‘nature’, the biophilic response, has aligned with the growing body of scientific evidence concerning nearby nature experiences and human health and well-being (Beatley 2010). The nature response research now spans nearly 40 years and across many disciplines. Evidence suggests that nearby nature experiences can aid with attention restoration and stress reduction, contribute to positive emotions, encourage physical activity, and can promote social engagement and social support (Barton and Pretty 2010; Bratman, Hamilton, and Daily 2012; Kaplan 1973; Kuo *et al.* 1998; Matsuoka and Kaplan 2008; Thompson 2002). Benefit can come from all ‘forms’ of nature, whether rural or urban, designed or ‘wild’, and even virtual (Depledge, Stone, and Bird 2011). The salutary benefits of metro nature have economic consequences as

modern health care and therapy is a major expense for nations and communities (Wolf and Robbins 2015).

Much of the health and nature research literature investigates physiological and mental health outcomes derived from passive nature experiences, with differences of benefit related to duration or type of green space. In addition, participating in regular physical activity contributes to many physical and mental health benefits (Scully *et al.* 1998; Hartig *et al.* 2014). Distinguishing benefits due to either exercise or passive contact with nature has been noted in the research literature. Active movement within nearby nature, or 'green exercise', is the situation where the natural environment provides benefit above and beyond exercise itself. A study measured the effects of ten green exercise scenarios (e.g., walking, horse-riding and conservation activities) and found that they all led to improved mood and self-esteem post-activity, but no significant change related to physiological measures (Pretty *et al.* 2007). The benefits from green exercise during conservation activities were not significantly better or worse than other green exercise types (see also Barton and Pretty 2010). In a 2010 meta-analysis of 25 studies by Bowler and colleagues (2010), green exercise lasting an hour or less contributed to an increase in self-reported positive emotion compared to exercise in 'synthetic' environments.

2.3. Conservation work benefits

As more cities adopt greening initiatives in response to economic and environmental challenges, access to a knowledgeable and skilled workforce benefits individuals and the larger community. In the US conservation job sector many organizations provide job skill development opportunities for new employees, and some are affiliated with federal or state corps programs (Price *et al.* 2011). Numerous organizations, such as Goodwill Industries and EarthCorps, partner with local city municipalities to provide conservation job training, leadership training, and employment for young adults who choose to work in urban green spaces (Falxa-Raymond, Svendsen, and Campbell 2013). Such programs often include civic engagement, leadership, and employment stability in their measured outcomes. These explicit program components for training and life skill development may contribute even more to the known increase in self-esteem and self-efficacy stemming from time outdoors (Svendsen *et al.* 2015).

3. Methods and approach

3.1. Study participants

Washington Conservation Corps (WCC) is an environmental service program supported by the US national AmeriCorps program. Corps members receive a living allowance, training, and an education award in exchange for their service. Corps members between 18 and 25 years of age engage in service work in small crews (of up to half a dozen people) to restore natural resource sites. A crew leader supervises each group and provides guidance on job skills, technical skills and knowledge, and arranges field logistics. The positions span a full year; some WCC members opt to continue the program for a second year. WCC engages approximately 300 people each year, a minority of whom are veterans.

Project work is highly variable, depending on local needs. Crews work on private and public lands across the entire urban to rural to wildland landscape gradient and within communities across all of Washington state (US). Work settings may be urban forests,

riparian corridors, wildlife habitat, or parks. Project goals may include park improvements, ecological restoration, and biological monitoring. Site-specific projects and tasks include planting, live staking, removing invasive vegetation, debris removal, trail building, and other work that requires skilled physical labor and hand tool use. Some crews (called Spike crews) provide short-term services to partnering agencies, particularly for emergency response such as fire or floods. All Corps members have an opportunity to spend a few days or weeks working in remote settings such as the Olympic National Forest or the Pacific coast.

3.2. Study administration

A set of pre-/post-quantitative measures was administered to all WCC members from autumn 2013 to autumn 2014 cohort who consented to participate (per University of Washington human subjects review). All study instruments are valid and reliable measures, as determined by development, evaluation, and prior review by social scientists. Pre-test surveys were administered at 2013 orientation sessions, following explanation of the study and consent process. All measures, though excluding some demographics (such as veteran status), were repeated in September 2014 as post-tests. The quantitative data were sorted and analyzed using SPSS. Measures of validity and reliability were addressed by adhering to coding and analysis recommendations from instruments' publishers.

During the pre-/post-measure interim, site visits in spring 2014 included qualitative, semi-structured "walking" field interviews and informal group discussion. Visits at four urban forest work sites provided additional data to better understand the beneficial outcomes of conservation employment and revealed the work context of employee experiences. The qualitative data analysis program TAMS Analyzer and Excel were used to store and conduct a preliminary interpretation of the data. Inter-rater reliability was limited for some of the data (McGoodwin 2001). A limited frequency and content analysis provided general supportive interpretations and themes.

3.3. Quantitative measures

Surveys, including all measures described below, were administered during the WCC orientation sessions in autumn 2013 to 289 participants (of the 290 person cohort) and then again to 243 participants at the autumn 2014 WCC debrief sessions (with reduced respondent count due to extended field assignments). New member orientations and end of session debriefs were each held at multiple regional Washington state locations. Debrief sessions were regional meetings where each crew had an opportunity to present and celebrate their accomplishments as their work year was coming to an end.

3.3.1. Demographics

Demographic data collection included: (1) background concerning education and employment, (2) income, (3) military service status, such as civilian vs. veteran and whether the person had served in a war zone or experienced combat, (4) how often the individual engaged in outdoor activities prior to employment, and (5) general attributes such as race, age, gender, relationship status, and nature condition around the individual's home.

3.3.2. *Perceived stress*

The Perceived Stress Scale (PSS) is a widely used psychological instrument for measuring the perception of stress (Cohen, Kamarck, and Mermelstein 1983). Using a Likert scale and recall of the prior month, ten items investigate how unpredictable and overwhelmed respondents find their lives, and current levels of experienced stress. The instrument assumes that self-appraised stress levels are influenced by the combination of daily hassles, major events, and changes in personal coping resources. It is considered valid, reliable and appropriate for our study population; PSS scores correlate with other scales of self-reported stress, health behaviors, drug use, and help-seeking behaviors (Cohen and Williamson 1988).

The PSS was used to investigate whether WCC participants report more or less stress during the last month of their service compared to their perceived stress prior to employment. Post-test analysis also included tests for difference in PSS means associated with gender and whether the individual responded to an emergency site during the term of WCC service. Prior research has reported higher perceived stress among self-identifying women (Cohen and Williamson 1988).

3.3.3. *Health overview*

The 36-Item Short Form Survey from the RAND Medical Outcomes Study includes widely used general health questions (Ware and Sherbourne 1992). It is designed for use with general populations and has strong validity and reliability. The measure consists of eight scales (each with multiple question items), conceptually representing distinct health outcomes. It captures symptoms common in extreme stress or anxiety diagnoses (such as post-traumatic stress) as well as general well-being, general mental and physical health (including anxiety, depression), social function, and physical abilities. A single question (Health Change) indicates perceived change in the individual's overall health (Ware, Kosinski, and Keller 1994). Scores are reported on a scale of 1 to 100, with higher scores indicating positive health and lack of adverse conditions.

3.3.4. *Personal effectiveness/resiliency*

Resiliency refers to personal qualities and skills that allow for an individual's healthy functioning or adaptation within the context of significant life adversity. Resilience measures examine the degree to which a person perceives being in control of his or her life, how well she manages stress, whether she has a social network of friends and family, and other general markers of well-being according to a specific research question or topic (Lee *et al.* 2013).

The Review of Personal Effectiveness with Locus of Control (ROPELOC) assessment was specifically designed to be sensitive to the effects of experience-based intervention programs (Richards, Ellis, and Neill 2002). It has been used in several outdoor programs and shows consistent reliability and validity. Participants indicate agreement (1–8 scale) for 45 statements comprising 14 internal scales. These include personal abilities and beliefs (Self-Confidence, Self-Efficacy, Stress Management, Open Thinking), social abilities (Social Effectiveness, Cooperative Teamwork, Leadership Ability), organizational skills (Time Management, Quality Seeking, Coping with Change), an energy scale called Active Involvement, Locus of Control, and a measure of overall effectiveness in all aspects of life. The scale also controls for whether changes are due to program effects or re-testing.

3.3.5. *Environmental outlook*

The New Ecological Paradigm (NEP) scale is a survey-based tool devised to measure a person's endorsement of a "pro-ecological" worldview (Dunlap *et al.* 2000), including degree of environmental concern, and general environmental outlook. It is used in environmental education, outdoor recreation, and other realms where differences in behavior or attitudes are believed to be explained by underlying values, a worldview, or a paradigm.

3.4. *Qualitative measures*

Qualitative data potentially enable deeper understanding of the beneficial outcomes of conservation employment and reveal the situational context of employee experiences. On-site interviews were composed of semi-structured, open-ended questions divided into three general categories: how WCC service compared to previous jobs and how the nature-based work might influence their future; their greatest likes, dislikes and challenges on the job; and personal response to challenges in the context of the natural environment. The interview questions were constructed to align with the pre-/post-quantitative survey in terms of general health, resiliency, social function, personal effectiveness, and nature experience.

We visited four work sites in urban forest locations during spring 2014. Interviewers worked in situ with crew members for several hours per interview session. We talked to approximately 24 Corps members and 5 supervisors individually and in crew groups. All members and supervisors gave verbal consent prior to the site visits, and individual participation was voluntary. Responses were recorded using written notes. Limited frequency and content analysis of the qualitative data, and text analysis using TAMS Analyzer, provided general insights and themes.

4. Results

4.1. *Demographics*

WCC members ranged in age from 18 to 34, with the majority in the 22–24 age range; 58% were male. There was little variability in reported income, relationship status, number of children, race and veteran status. The majority (53.4%) were at or below \$20,000 in household income and 17% in the \$20,000–39,999 range. Reported income reflects employment status prior to WCC participation, with 38% working full time, 22% being unemployed, and 30% attending school. Most were of single marital status (87%), 98% did not have children, and 86% identified as White. Forty percent of the cohort had a bachelor's degree and, of the remaining, 29% had a high school diploma or GED. Twenty percent reported some college credit but no degree. More than a third of the participants were returning for their second year with WCC (37%), perhaps related to reported full time work status. Despite extensive efforts to recruit veterans, only 6% of WCC participants had served on active duty, a finding consistent with the general population; in 2012, 9% of the total US population aged 18–24 were veterans (Newport 2012). The post-test also asked about service at an emergency response site during the service year. Those who served (49.8% of the cohort) were either in designated Spike teams or were temporarily reassigned from their regular team to respond to an emergency situation.

WCC member participants are active individuals with access to nature around their home. In total, 63% reported engaging in outdoor physical activities more than once a week. Nearly 75% reported at least a moderate amount of, or more, vegetation gardens, yard landscape, trees, or small parks close to their home.

Table 1. Perceived Stress Scale; WCC pre-/post-scores and comparative scores for national age cohort for multiple years (Cohen and Janicki-Deverts 2012).

	Mean	Standard deviation	Paired <i>t</i> -test
WCC (pre-test over post-test)	12.74 (<i>n</i> = 218)	7.05	<i>t</i> (214) = 2.759, <i>p</i> < 0.006
	11.23 (<i>n</i> = 240)	4.76	
1983	14.54	5.95	
2006	18.64	7.24	
2009	16.78	6.86	

4.2. Quantitative results

4.2.1. Perceived stress

PSS instrument scores range from 0 to 56, with higher scores indicating higher stress levels. Table 1 displays the WCC pre- and post-test results, and norm comparative groups of Americans under 25 years of age in national surveys conducted by the PSS scale authors (Cohen and Janicki-Deverts 2012). WCC participants reported less perceived stress compared to others in their national age cohort both before and after their service year. Paired sample *t*-tests indicated a significant decline in perceived stress during the conservation work period. Multiple linear regression to examine whether perceived stress could be predicted by gender or working at an emergency site did not reveal significant results (Gender $\beta = -0.003$, n.s.; Spike $\beta = 0.005$, n.s.). The predictive validity of the PSS has been found to decline rapidly between four to eight weeks following the end of an intervention, but long-term effects are unknown in this study group as extended data collection was not feasible.

4.2.2. Health overview

RAND pre-test scores for WCC participants were higher than the comparative national sample in all categories except for Social Functioning (Stewart, Sherbourne, and Hays 1992) (Table 3). The standard deviation of the WCC scores is smaller than national response. WCC participants scored remarkably high on the Physical Functioning scale, indicating an already healthy and active group at the outset of the study. Post-test scores were slightly lower on six of the scales, although the participants' reported health generally remained higher than the national average. Scores increased at the end of the work year for General Health Perceptions, Social Functioning, and Health Change scales. The internal reliabilities (Cronbach alpha) for all RAND subscales, pre and post, were between 0.725 and 0.923; the average internal reliability for all subscales was 0.81.

Paired sample *t*-tests were conducted and significant outcomes are reported in Table 2. There was a significant difference in the scores for Social Functioning, Energy/Fatigue,

Table 2. Significant pre-/post-outcomes for RAND health measures (paired sample *t*-tests).

Scale	<i>t</i>	df	<i>p</i>	<i>d</i>	95% Confidence interval	
Social functioning	2.327	206	0.021	0.324	-7.67	-.635
Energy/fatigue	2.526	215	0.012	0.345	0.973	7.88
Bodily pain	4.930	215	0.000	0.672	4.41	11.59

Table 3. RAND 36-Item Medical Outcomes; WCC pre-/post- scores, with comparison to a national sample.

Scales	Meaning of scores		National Mean	WCC Mean*	National SD	WCC SD**
	Low	High				
<i>Physical Functioning</i>	Limited a lot in performing daily physical activities	Performs all types of daily activities, including the most vigorous, without limitations	84.2	95.67 94.43	23.3	10.0 14.44
<i>Role Limitations due to physical problems</i>	Problems with work or other tasks because of physical abilities	No problems with work or other tasks because of physical abilities	80.9	89.18 88.38	34.0	23.88 24.87
<i>Bodily Pain</i> ***	Very severe and limiting pain	No pain or limitations in the past month	75.2	85.65 77.65	23.7	18.74 18.70
<i>General Health perceptions</i>	Believes personal health is poor and getting worse	Believes personal health is excellent	71.9	75.16 75.85	20.3	16.33 16.62
<i>Energy/Fatigue</i> ***	Feels tired and worn out	Feels full of energy over the last month	60.9	64.48 60.05	20.9	18.51 19.70
<i>Social Functioning</i> ***	Frequent interference with normal social activities due to health	Social activities are not adversely affected by health	83.3	78.21 82.37	22.7	16.39 20.87
<i>Role Limitations due to emotional problems</i>	Problems with work or other daily life because of emotional problems	No problems over the past month with work or other daily life tasks because of emotional problems	81.3	84.29 83.71	33.0	28.03 29.84
<i>Emotional Well-being/Mental Health</i>	Feelings of nervousness and depression all of the time	Feels peaceful, happy and calm over the past month	74.7	75.04 75.00	18.1	18.68 17.51
<i>Health Change</i>	“Compared to one year ago, how would you rate your health in general now?”		59.14	67.20 69.83	23.12	20.84 23.00

Note: WCC Mean* is split, pre-test scores over post-test; WCC SD** is also a split display; Comparative National Means and Standard Deviation (SD) provided from a general 1992 U. S. population sample (n = 2,474) (Stewart, Sherbourne and Hays 1992); *** See Table 2.

and for experiencing Bodily Pain. The latter result implies that WCC participants were more likely to report feeling more tired, worn out, and with more aches and pains in the last month of their employment compared to service onset. Participants reported their physical ability more likely interfered with work or personal life at the end of the year, but this response was not statistically significant. Despite an increase in physical pain, participants rated their general health in a more positive direction across the year, though also not a significant result. Participants, despite feeling worn out, did not indicate that social activities were adversely affected by their health.

4.2.3. Resiliency

Table 4 reports means and standard deviations for ROPELOC scores. In pre-test, participants generally agreed with the positively worded statements about their abilities, beliefs and skills. Mean scores greater than 7.0 (on a 1 to 8 scale) were generated for subthemes of Open Thinking, Quality Seeking, and Internal Locus of Control, represented by statements such as “I am open to different thinking if there is a better idea”, and “I try to get the best possible results when I do things.” Within Locus of Control, participants tended to disagree with statements such as “My future is mostly in the hands of other people” ($M = 3.0$) but were more likely to agree with statements indicating that their own abilities outweigh constraints from outside forces ($M = 7.02$). Slightly lower scores were noted for the Time Management scale, including such statements as “I am efficient and do not waste time” ($M = 5.69$).

Post-test results revealed a slight decline or no change for most of the scores. Self-Confidence, Time Management, and Overall Effectiveness improved slightly. Paired sample t -test results indicated a significant difference for one subscale. The Cooperative Teamwork scale showed a decline in the score referencing ability to work as a team, although the RAND findings and qualitative data indicate improvement. The score

Table 4. ROPELOC scores on 14 scales; WCC pre/post-means and standard deviations (SD).

ROPELOC subscales	Mean (SD) pre-test	Mean (SD) post-test	p -value
Self-confidence	6.62 (1.1)	6.63 (1.03)	0.924
Self-efficacy	6.18 (1.25)	6.18 (1.18)	0.969
Stress management	6.09 (1.31)	5.87 (1.28)	0.076
Open thinking	7.07 (.94)	7.03 (.85)	0.645
Social effectiveness	6.15 (1.45)	5.9 (1.42)	0.100
Cooperative teamwork*	6.83 (.99)	6.63 (1.01)	0.030
Leadership ability	6.47 (1.25)	6.38 (1.29)	0.492
Time management	5.69 (1.36)	5.76 (1.27)	0.592
Quality seeking	7.03 (.93)	6.98 (.87)	0.482
Coping with change	6.30 (1.22)	6.11 (1.27)	0.101
Active involvement	6.70 (1.01)	6.66 (1.04)	0.620
Internal locus of control	7.02 (.97)	6.87 (1.13)	0.159
External locus of control	3.0 (1.42)	2.95 (1.47)	0.740
Overall effectiveness	6.15 (1.25)	6.29 (1.96)	0.380
ROPELOC control	4.24 (1.07)	4.12 (1.03)	0.229

Notes: score range is 1–8 for each scale; * $p < .05$.

declined from 6.83 to 6.63 [$t(216) = 2.179, p < 0.030$], with the 95% confidence interval at 0.019 and 0.377. Cohen's effect size value ($d = 0.297$) suggests this difference has small practical significance.

The internal reliabilities (Cronbach alpha) for all subscales, pre and post, were between 0.73 and 0.94 with one exception. The reliability alpha for the Overall Effectiveness in the post-test rises from 0.319 to 0.913 if this final question is removed: "Overall, in my life I am a very effective person." When the Overall Effectiveness subscale for the post-test is removed, the average internal reliability for both pre- and post-ROPELOC was 0.86. Reliability scores above 0.7 indicate that a scale measures its intended psychological or behavioral construct.

4.2.4. Environmental outlook

WCC participants were asked to indicate the strength of their agreement or disagreement with each of 15 statements in the NEP on a 5-point scale. Substantially meaningful dimensions did not emerge in the preliminary findings, and thus the NEP was treated as one single variable in further analysis (Olejnik and Algina 2000). Overall response changed little from the beginning of employment to the end ($M = 4.02, SD = 0.578; M = 4.02, SD = 0.61$). Participants tended to disagree with statements that suggest humans exist outside of nature and have rights over it, termed the Dominant Social Paradigm ($M = 2.47, SD = 0.60; M = 2.44, SD = 0.602$).

NEP responses are durable and not expected to change at the individual level in response to any short-term event or experience (Dunlap *et al.* 2000). However, WCC coordinators were interested in whether young, likely impressionable participants would shift their perceptions after a yearlong intensive conservation work experience. A study that administered NEP before and after a statewide drought concluded that "critical environmental experience can accelerate change in environmental worldview" (Arcury and Christianson 1990). Although nearly all responses shifted away from an unsure response, no statistically significant difference emerged across the employment timeframe (paired t -test, $t(198) = 0.169, p < 0.866$).

Table 5 contains rating distributions on a subset of NEP variables, and includes comparisons from Washington residents in 1976 and 1990. WCC corps members were more in alignment with Washington state resident responses concerning human population capacity, but less so concerning human modification of the environment and the fragility of nature.

4.2.5. Comparing first- and second-year corps members

Of the entire WCC cohort 37% were returning for a second year, but were similar socio-demographically to the first-year group. Independent Sample t -tests (adjusted for the uneven number of groups) indicated that, with the exception of three variables, the first- and second-year WCC participants responded similarly. All ensuing comparison tests utilized combined data. The RAND measure of Health Change was the first inter-group difference with second-year members reporting higher scores: $M = 64.2, SD = 21.84; M = 71.94, SD = 17.91; t(213) = 2.85, p < 0.005, d = 0.391$. Differences were found for ROPELOC Leadership Ability [$M = 6.32, SD = 1.32; M = 6.79, SD = 0.915; t(213) = 3.129, p < 0.002, d = 0.429$], and the ROPELOC Internal Locus of Control [$M = 6.94, SD = 0.967; M = 7.22, SD = 0.89; t(201) = 2.201, p < 0.029, d = 0.310$]. Training and

Table 5. New Ecological Paradigm Scale; WCC pre-/post-scores, with comparison to Washington state residents.

Selected statements	WCC Responses % pre- & post-test					WA Resident responses, by year	
	SD	D	U	A	SA	1990	1976
Agree or Disagree that:							
We are approaching the limit of the number of people the Earth can support.	3.2 6.3	7.2 7.1	18.6 12.9	30.3 31.3	40.7 42.5	67% agree	73% agree
Humans have the right to modify the natural environment to suit their needs.	14.9 17.1	37.1 37.9	26.7 20.8	17.6 20.4	3.2 3.8	64% disagree	62% disagree
The balance of nature is very delicate and easily upset.	0.9 0.0	16.1 14.6	18.8 20.4	39.0 39.6	25.2 25.4	84% agree	80% agree

Notes: SD: Strongly Disagree, D: Disagree, U: Unsure, A: Agree, SA: Strongly Agree; pre-test response is posted over post-test; 1990 and 1976 results did not include Unsure (Dunlap *et al.* 2000).

skill building of the prior year's service may have contributed to more positive personal assessments.

4.3. Qualitative responses

Discussions during on-site walking interviews, responses to an open-ended survey question, and observations during the debrief sessions provided additional insights concerning outdoor conservation work, and supplement findings about the social and physical challenges expressed in the quantitative findings. The site visit data include individual and full-group crew responses to the interview questions. Six themes emerged from analysis and align with the constructs of the quantitative survey: professional interests and satisfaction, communication and teamwork, sensory experiences, overcoming challenges and learning new skills, ecosystems knowledge, and life transformations.

4.3.1. Professional interests and satisfaction

Most participants reported variations of generally positive experiences (81%). Many applied to WCC because they wanted on-the-ground experience in addition to their educational background and interests (29%). Compared to previous jobs, Corps members consistently said being outside was better for their health or happiness (57%): "I smile more"; "I don't feel constrained. Fluorescent lighting [in an office] is bad for me." Participants appreciated the immediate, observable environmental enhancements of their work, such as blackberry eradication or building a fence (29%). Reported downsides were the work stipend in relation to the labor required, and the lack of employment position permanence (19%). When asked what they wanted to do when the job ended, most said their experience with WCC influenced their thoughts about future plans (76%), but there was less agreement on the need to be outside regularly in any future job (33%).

4.3.2. *Communication and teamwork*

Crew members were particularly responsive to one particular question during the field interviews, “Imagine yourself in ten years, what will you remember about your time with WCC?” Nearly all participants anticipated ongoing social communications and work with their WCC colleagues. Many reported developing friendships with fellow members (67%), and valued situations and accomplishments where they had to “tackle” tasks cooperatively (62%). Of note was the mixed emotional experience learning how to work and communicate as a team (57%), expressed as overcoming negative experiences or challenges, with subsequent skill improvement or learning. Stories described learning how to communicate and accomplish tasks within challenging group dynamics, when under stress, or with people having differing communication and leadership styles.

4.3.3. *Sensory experiences*

Other responses to the 10-year retrospective question centered on sensory experiences (71%), and included noticing the change in seasons, unpredictable or uncontrollable weather, and “being in the dirt”. Participants often described remote and rural site locations, such as the Olympic Peninsula (of Washington state) or a farm with animals, as the most memorable or beautiful place they worked, and preferable over urban sites. Some (43%) observed that summer weather eased their negative memories of harsher winter weather, “most forget about the bad weather experiences by the time summer comes”. Some thought exposure to the weather made life more stressful or compounded stressful situations in their personal lives (33%). Others reported that their perception of being outside had changed because they developed a less “romantic” notion of weather and felt “more in tune” with changes in natural processes (33%).

4.3.4. *Overcoming challenges and learning new skills*

We asked crew members how they accomplished or approached challenging tasks. Sites described as the most memorable or rewarding were often also described as challenging and disliked (57%). They faced tasks such as hauling rock-infused mulch, working in snow, and carrying live stakes across a wetland. Physical or landscape challenges were translated to improved confidence or self-efficacy (33%), “I hesitate or doubt less. I overcome mental blocks and take on different physical tasks.” When asked about skills and tools gained during their time with WCC, nearly all members shared a positive memory of learning how to use a specific tool or attending training (71%). Elective and on-site training included herbicide application; wildfire response certification (a “Red Card”); plant identification; leadership, teamwork, and communication skills; chainsaw or other heavy tool use; wilderness first aid; and ethnobotany.

4.3.5. *Ecosystems knowledge*

We asked participants what they were learning about the natural world during their service year. Answers ranged from specific observations (19%) to larger views on ecology or cycles (14%). Most participants talked about plant identification. Nearly all described a positive memory or experience during classroom or fieldwork (90%). Some mentioned learning how to remove invasive vegetation or appreciating its tenacity (19%). A few members across different crews said they came into the job seeing all of the

outdoors as “just green” but then were “able to see differences in the environment.” Many crew members had recently completed an environment-focused undergraduate degree, but only a few discussed plants or processes they had learned in class (14%).

4.3.6. *Life transformations*

During site visits, only a few indicated they were thinking through larger ideas about their own life or their work within environmental conservation. Some said their service with WCC taught them to be better adapted to life changes (24%) or to persevere through challenges “just like during a bad weather day” (24%). A few hoped to address bigger issues like climate change or wanted to give back to the community (24%). One member, after observing high school volunteers at one of their work sites dismissing the value of their work, realized “A labor job isn’t less than anything else. There is a lot of knowledge and skill in restoration work that people discount.” Tackling tasks cooperatively and learning how to communicate effectively was most often discussed (52%).

5. Discussion

This study began with several guiding questions, ultimately investigated using validated health and attitude measures, administered at the beginning and end of the WCC members’ year of service. Site visits and other qualitative data were collected to reveal additional insights about the study population, as there have been few prior studies that address the health and wellness of conservation workers.

The enrollment restrictions concerning age, experience, and compensation for Americorps generated a fairly homogenous study group. Most participants were in their early 20s, reported low income, and single marital status with no children. About 40% had a bachelor’s degree, higher than the general US population (28.8%, 2013 US Census) and Washington state (29.9%). Despite an early research design focused on veterans, only 6% of the cohort were veterans, despite extensive recruitment efforts. Of note for future conservation job programs, follow-up anecdotal reports indicated that veterans were not interested in the compensation level for the jobs, and wished to find jobs that better matched skills developed while in the armed services. A case-study evaluation of a veteran green jobs program found positive improvements despite similar low sample size and compensation ($n = 17$) (Bellottia *et al.* 2011).

5.1. *Findings and implications*

The early assessment of WCC participants found that most experienced low perceived stress and were physically very healthy. Prior literature suggests that women and those in challenging situations may be more likely to report perceived stress (Kuo 2003), yet we found no significant difference associated with gender or service during the year at an emergency site (about half the group went on special assignment). Across the group, mental and emotional health was at desirable levels at the outset of their service but not as positive as physical health. The most noteworthy result was the statistically significant reduction in perceived stress during the employment period. End of employment perceived stress levels fell even further below national averages (Table 2).

On measures of personal effectiveness (including personal and social abilities, and organizational dynamics) scores at the beginning of the study were lowest for time management and external locus of control. Responses for environmental attitudes

indicated that most do not have a hopeful outlook on the future of the environment, and are not sure where they stand on the ways to address environmental problems.

Returning second-year members reported better perceived health, higher perceived leadership ability, and stronger internal locus of control. This difference suggests the value of programs having multiple year employment opportunities, including longitudinal study, to explore how conservation employment might contribute to these differences, and the optimal length of employment to effect personal change.

Considering other pre- and post-test data, WCC members were positive overall about their physical and mental well-being but reported more physical bodily pain at the end of their tenure. The measures used in this study were probably not designed to capture the unique circumstances of having a physically demanding job. WCC members may have experienced overall improvement in physical strength and well-being, despite short-term fatigue due to strenuous field work. For example, despite reported sore muscles and joint pain, WCC members may have reduced physiological conditions associated with disease or reduced wellness (such as high blood pressure or stress) because of an increase in daily physical activity. A future study might use physiological health measures, such as resting heart rate and cortisol levels, to provide supplemental data about health.

At the end of the service year, participants did not indicate that social activities were adversely affected by their health. Yet before their employment began, members did indicate that their health interfered somewhat with their social activities. One possible interpretation is that feeling fatigued did not adversely affect the emergent social interactions of this very healthy group of young people. Another possible interpretation is a shift in choice of companions in the Corps members' social life during their year with WCC. In the survey open response section and during site visits, participants indicated they had to physically move away from friends and family to become immersed in the work position, and had developed "true friendship" with their peers. Relationships with fellow crew members and their supervisor was a reported positive in their experience.

Six themes frame the qualitative site visit data and reiterate the constructs of the quantitative survey: professional interests and satisfaction; communication and teamwork; sensory experiences; overcoming challenges and learning new skills; ecosystems knowledge; and life transformations. Many Corps members reported general improvements in physical and emotional well-being (81%), and that, compared to previous jobs, they found that being outside was better for their health or happiness (57%). Learning how to identify plants and use hand or power tools was a top reported benefit and source of confidence. The most common topic of discussion throughout the walking interviews was developing friendships and negotiating communication and teamwork (aligned with lower scores for quantitative measures of Cooperative Teamwork). When considering what they will remember in 10 years about their time with WCC, the participants' responses can be summarized as follows: gains in skills and self-efficacy; sensory experiences from 'nature'; communication challenges and accomplishments; learning how to work as a team and developing friendships.

5.2. Future opportunities

Overall, the WCC cohort was a group of mentally and physically healthy young adults, compared to national benchmarks. A significant reduction in reported stress suggested that conservation work may contribute to additional health benefits, although potential sources of perceived stress prior to employment were unknown. Findings suggest that conservation workers not only do good for the environment, but may gain or sustain

health benefits. The potential benefits to more diverse or even disabled populations were suggested by one response, “As a veteran with PTSD, WCC has improved my life vastly. I am more calm and less stressed. It is something that will continue to improve with more time in nature.”

Not all people (including young adults) may enter a program in as robust a health condition. The WCC cohort worked to the point of deep fatigue at times, but not all individuals with an interest in stewardship may have such physical capacity. How might conservation work be configured to attract people of diverse ages and physical abilities, and still provide situations to improve or sustain personal health and resilience? One opportunity is to introduce outdoor work as a therapeutic activity. Future studies could track individuals who begin a study with much lower initial health scores. Being able to compare those with low and high baselines, and investigate any statistically significant changes over time would aid future programming. Careful planning of work tasks to align with physical and emotional abilities would be important.

Social dynamics are also important, with young people developing relationships not only with co-workers, but with supervisors who may continue to serve as mentors. What is the role of in-team interactions in generating participant benefit, and how might positive interpersonal influences be encouraged? Finally, we found little change in environmental attitudes, a commonly stated outcome of conservation work programs. Yet anecdotes pointed to possible attitude change, such as “working with the WCC has convinced me to live as much of my life as possible outdoors and to work at things I care deeply about.” Future study, in collaboration with conservation work programs, should address these broader, socio-ecological questions.

5.3. *Linking the past with the future*

The “top-down” organization of WCC and similar US programs are rooted in President Roosevelt’s Civilian Conservation Corps (CCC) initiative to create jobs during the Great Depression and often conducted in more wildland settings. Today, in the United States, green infrastructure initiatives are emerging in urban renewal projects across cities and communities, and have broader social, economic, and environmental purposes (e.g., City of Seattle 2012; Philadelphia Water Department 2012). The 2009 Serve America Act called for a Clean Energy Corps that includes “conservation or youth service corps programs [that provide] work experience, life skills, education, career guidance and counseling, employment training, and the opportunity to develop citizenship values and skills through service to their communities and the United States” (Price *et al.* 2011, 9). Globally, ‘Green jobs’ serve “as a collective symbol and iconographic metaphor for the links between economy and the environment” (Kouri and Clarke 2014, 223).

The findings suggest a need to compare the goals, administrative structure, and worker outcomes of more diverse conservation work programs. In the US, career pathway programs similar to WCC are organized “top-down” and many programs benefit from local, state or federal support. Globally, some analogous programs are organized “bottom-up”, with an emphasis on direct local needs, such as food production or water conservation, rather than more general conservation. For example, green job programs in several African cities, western India, and British Columbia were developed as creative responses to political, social or infrastructure disenfranchisement (Shont’e Acey and Culhane 2013; Sahoo 2012; Vanwynsberghe 2016). Such grassroots programs focus on serving low-income or disadvantaged populations.

Recognizing the growing scientific evidence of nature experiences and health benefits, US organizations such as the Centers for Disease Control and Prevention and American Public Health Association are increasingly interested in the role of community and place for better human health (Wolf and Robbins 2015). Programs sponsored by US agencies and the United Nations, from local to global in scale, are engaging communities in outdoor programs to improve health and nurture a commitment to environmental interests and careers. Following the early precedents of CCC, and taking cues from global programs, new outdoor conservation jobs could be tailored to provide jobs to those most in need across fitness, interest, and sociodemographic diversities.

6. Conclusion

Tragic or traumatic situations and events may disrupt people's lives, but are not the most troubling sources of stress. Everyday life now presents chronic stressors such as financial strain, complex household interactions, extended commutes, and other persistent, challenging situations. Conservation jobs and service programs serve many worthwhile purposes. They help young people learn basic employment skills, provide community service, and help restore key outdoor environments. In this study we explored potential benefits to corps members in greater depth. Findings from this study suggest outdoor jobs promote personal health and effectiveness, adding to the green exercise and worker health literature. Outdoor work, in addition to more passive nature experiences, may be a remedy for chronic stress. Findings and conclusions point to a rich set of opportunities to expand the worker base for conservation jobs and learn more about the benefits of service to self and community.

Acknowledgments

We extend thanks to staff of Washington Conservation Corps, Washington State Department of Ecology, and Washington State Department of Veterans Affairs for project assistance. Americorps is a US national service program that provided worker support. All data procedures were approved by the University of Washington Human Subjects Division (Case #45777).

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by the USDA Forest Service, Cooperative Forestry, and administered by the Washington State Department of Natural Resources, Urban and Community Forestry Program [grant number IAA 13-2005/K244-11-DG-015].

References

- Andersson, E., S. Barthel, S. Borgström, J. Colding, T. Elmqvist, C. Folke, and Å. Gren. 2014. "Reconnecting Cities to the Biosphere: Stewardship of Green Infrastructure and Urban Ecosystem Services." *Ambio* 43 (4): 445–453.
- Arcury, T.A., and E.H. Christianson. 1990. "Environmental Worldview in Response to Environmental Problems: Kentucky 1984 and 1988 Compared." *Environment and Behavior* 22 (3): 387–407.

- Barton, J., and J. Pretty. 2010. "What is the Best Dose of Nature and Green Exercise for Improving Mental Health? A Multi-Study Analysis." *Environmental Science and Technology* 44 (10): 3947–3955.
- Beatley, T. 2010. *Biophilic Cities: Integrating Nature Into Urban Design and Planning*. Washington, DC: Island Press.
- Bellottia, C., C. Laffaye, K.R. Weingardt, M. Fischer and T. Schumacher. 2011. "Re-Visioning Veteran Readjustment: Evaluating Outcomes of a Green-Jobs Training Program." *Journal of Vocational Rehabilitation* 35: 51–57.
- Bowler, D.E., L.M. Buyung-Ali, T.M. Knight, and A.S. Pullin. 2010. "A Systematic Review of Evidence for the Added Benefits to Health of Exposure to Natural Environments." *BMC Public Health* 10: 456. doi: 10.1186/1471-2458-10-456
- Bratman, G.N., J.P. Hamilton, and G.C. Daily. 2012. "The Impacts of Nature Experience on Human Cognitive Function and Mental Health." *Annals of the New York Academy of Science* 1249: 118–136.
- City of Seattle. 2012. *City of Seattle Comprehensive Plan*. <http://www.seattle.gov/dpd/Planning/SeattlesComprehensivePlan/ComprehensivePlan/>
- Cohen, S., and D. Janicki-Deverts. 2012. "Who's Stressed? Distributions of Psychological Stress in the United States in Probability Samples from 1983, 2006, and 2009." *Journal of Applied Social Psychology* 42 (6): 1320–1334.
- Cohen, S., T. Kamarck, and R. Mermelstein. 1983. "A Global Measure of Perceived Stress." *Journal of Health and Social Behavior* 24 (4): 385–396.
- Cohen, S., and G. Williamson. 1988. "Perceived Stress in a Probability Sample of the United States." In *The Social Psychology of Health*, edited by S. Spacapan and S. Oscamp, 31–67. Newbury Park, CA: Sage.
- Depledge, M.H., R.J. Stone, and W.J. Bird. 2011. "Can Natural and Virtual Environments be Used to Promote Improved Human Health and Wellbeing?" *Environmental Science and Technology* 45 (11): 4660–4665.
- Dunlap, R.E., K. Van Liere, A. Mertig, and R. Jones. 2000. "New Trends in Measuring Environmental Attitudes: Measuring Endorsement of the New Ecological Paradigm: A Revised NEP Scale." *Journal of Social Issues* 56 (3): 425–442.
- Falxa-Raymond, N., E. Svendsen, and L.K. Campbell. 2013. "From Job Training to Green Jobs: A Case Study of a Young Adult Employment Program Centered on Environmental Restoration in New York City, USA." *Urban Forestry and Urban Greening* 12 (3): 287–295.
- Hartig, T., R. Mitchell, S. de Vries, and H. Frumkin. 2014. "Nature and Health." *Annual Review of Public Health* 35 (1): 207–228.
- Herzog, T.R., P.M. Colleen, and M.B. Nebel. 2003. "Assessing the Restorative Components of Environments." *Journal of Environmental Psychology* 23 (2): 159–170.
- Kaplan, R. 1973. "Some Psychological Benefits of Gardening." *Environment and Behavior* 5 (2): 145–162.
- Kouri, R., and A. Clarke. 2014. "Framing Green Jobs Discourse: Analysis of Popular Usage." *Sustainable Development* 22 (4): 217–230.
- Kuo, F.E. 2003. "The Role of Arboriculture in a Healthy Social Ecology." *Journal of Arboriculture* 29 (3): 148–155.
- Kuo, F.E., W.C. Sullivan, R.L. Coley, and L. Brunson. 1998. "Fertile Ground for Community: Inner-City Neighborhood Common Spaces." *American Journal of Community Psychology* 26 (6): 823–851.
- Lee, J.H., S.K. Nam, A. Kim, B. Kim, M.Y. Lee, and S.M. Lee. 2013. "Resilience: A Meta-Analytic Approach." *Journal of Counseling and Development* 91 (3): 269–279.
- Matsuoka, R.H., and R. Kaplan. 2008. "People Needs in the Urban Landscape: Analysis of Landscape and Urban Planning Contributions." *Landscape and Urban Planning* 84 (1): 7–19.
- McGoodwin, J.R. 2001. In *Understanding the Cultures of Fishing Communities: A Key to Fisheries Management and Food Security*. Technical Paper 401. Rome: Food and Agriculture Organization of the United Nations. https://arizona.openrepository.com/arizona/bitstream/10150/292622/1/azu_stoffle_buen_hombre_fao_report_w.pdf
- Newport, F. 2012. In *U.S., 24% of Men, 2% of Women are Veterans*. Gallup, November 12. <http://www.gallup.com/poll/158729/men-women-veterans.aspx>
- Olejnik, S., and J. Algina. 2000. "Measures of Effect Size for Comparative Studies: Applications, Interpretations and Limitations." *Contemporary Educational Psychology* 25 (3): 241–286.

- Philadelphia Water Department. 2012. *Green Stormwater Infrastructure*. Accessed April 23, 2015. <http://www.phillywatersheds.org/whatweredoing/green infrastructure2012>
- Pretty, J., J. Peacock, R. Hine, M. Sellens, N. South, and M. Griffin. 2007. "Green Exercise in the UK Countryside: Effects on Health and Psychological Well-Being, and Implications for Policy and Planning." *Journal of Environmental Planning and Management* 50 (2): 211–231.
- Price, C., J. Williams, L. Simpson, J. Jastrzab, and C. Markovitz. 2011. *National Evaluation of Youth Corps: Findings at Followup*. Washington, DC: Corporation for National and Community Service.
- Richards, G.E., L.A. Ellis, and J.T. Neill. 2002. "The ROPELOC: Review of Personal Effectiveness and Locus of Control: A Comprehensive Instrument for Reviewing Life Effectiveness." Paper presented at Self-Concept Research: Driving International Research Agendas, Sydney, August 6–8.
- Sahoo, S. 2012. "Chapter 10: Organizing Informal Women Workers for Green Livelihoods: The Self Employed Women's Association in Gujarat." In *Labor in the Global South. Challenges and Alternatives for Workers*, edited by S. Mosoetsa and M. Williams, 181–199. Geneva: International Labour Office.
- Schusler, T.M., and M.E. Krasny. 2010. "Environmental Action as Context for Youth Development." *The Journal of Environmental Education* 41 (4): 208–223.
- Scully, D., J. Kremer, M.M. Meade, R. Graham, and K. Dudgeon. 1998. "Physical Exercise and Psychological Well Being: A Critical Review." *British Journal of Sports Medicine* 32 (2): 111–120.
- Shont'e Acey, C. and T.H. Culhane. 2013. "Green Jobs, Livelihoods and the Post-Carbon Economy in African Cities." *Local Environment* 18 (9): 1046–1065.
- Standish, R.J., R.J. Hobbs, and J.R. Miller. 2013. "Improving City Life: Options for Ecological Restoration in Urban Landscapes and How These Might Influence Interactions Between People and Nature." *Landscape Ecology* 28 (6): 1213–1221.
- Stewart, A.L., C. Sherbourne, and R.D. Hays. 1992. "Summary and Discussion of MOS Measures." In *Measuring Functioning and Well-Being: The Medical Outcome Study Approach*, edited by A.L. Stewart and J.E. Ware, 345–371. Durham, NC: Duke University Press.
- Svendsen, E.S., L.K. Campbell, N.F. Sonti, and G. Baine. 2015. "Urban Stewardship as a Catalyst for Recovery and Change." In *Waterproofing New York*, edited by D.H. Brandt and C.S. Nordenson, 104–111. New York: Terreform.
- Thompson, C.W. 2002. "Urban Open Space in the 21st Century." *Landscape and Urban Planning* 60 (2): 59–72.
- Vanwynsberghe, R. 2016. "Green Jobs for the Disadvantaged in British Columbia: The Perspectives of Non-Governmental Organisations and Social Entrepreneurs." *Local Environment* 21 (4): 504–526.
- Ware, J., and C. Sherbourne. 1992. "The MOS 36-item Short-Form Health Survey (SF-36): Conceptual Framework and Item Selection." *Medical Care* 30 (6): 473–483.
- Ware, J., M. Kosinski, and S.K. Keller. 1994. *SF-36® Physical and Mental Health Summary Scales: A User's Manual*. Boston, MA: The Health Institute.
- Westphal, L.M. 2003. "Urban Greening and Social Benefits: A Study of Empowerment Outcomes." *Journal of Arboriculture* 29 (3): 137–147.
- Wolf, K.L., and A.S.T. Robbins. 2015. "Metro Nature, Environmental Health, and Economic Value." *Environmental Health Perspectives* 123 (5): 390–98.