

Research Article - social sciences

Discrimination and Career Satisfaction: Perceptions from US Forest Service Scientists

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Abstract

Research, largely focused on academia, has shown demographic differences in perceptions and experiences of workplace culture in science fields, including natural resources. Less is known about experiences of those working for government institutions. This study examined relationships between demographic characteristics (gender, scientific discipline, years as a scientist), experiences of discrimination or harassment, and perceptions of career success and satisfaction as reported in a survey by 100 research scientists in the US Forest Service: a hierarchical federal agency with explicit goals for workforce diversification. Approximately half the survey respondents, and more women than men, indicated that they had experienced work-related discrimination or harassment. Survey respondents identified gender as the most common basis of discrimination. Although most felt successful and satisfied in their careers, this perception was lower among those who had experienced discrimination or harassment. These findings highlight challenges of workforce diversification, especially in hierarchical institutions where organizational structure favors conformity.

Keywords: Government researchers, harassment, workforce diversification, gender, diversity

Workforce diversity, workplace discrimination, and their effects on career satisfaction are complex, multi-dimensional issues. Within public agencies, workforce diversification is thought to facilitate working with heterogeneous stakeholders, improve decisionmaking, and foster innovation (Uriarte et al. 2007, Page 2008, Cheruvelil et al. 2014, Andrews and Ashworth 2015, Dockry 2015, Opstrup and Villadsen 2015, Riccucci and Van Ryzin 2017). In agencies with a science-related mission, barriers to a diverse workforce may diminish the potential of the scientific endeavor. These barriers are likely similar for government scientists and academic faculty; within higher education, barriers to

workforce diversification include discrimination, lack of mentors, and disciplinary preferences (Ecklund et al. 2012).

Multiple studies have shown that perceptions of the workplace environment vary by gender. A summary of 30 years of research indicated that women scientists often experience a “chilly climate” or work environment that ranges from overt sexual harassment to subtle exclusion from professional camaraderie (Blickenstaff 2005). In a study of medical school faculty, discrimination was experienced by women 2.5 times more than men (Carr et al. 2000). Furthermore, women who experienced discrimination were more likely to be from

Management and Policy Implications

Despite improvements in workforce gender balance, more women than men in a survey of US Forest Service scientists at one research station indicated they experienced work-related discrimination or harassment. Similar experiences have also been reported in other science-based institutions. The source of discrimination in our study was most often an employee of the same agency, suggesting the importance of work dedicated to solve these issues within the agency. In addition, women in our study were more likely than men to experience discrimination from employees of other organizations, highlighting the importance of also working with organizations external to the agency. Moreover, scientists in our study who experienced discrimination were less likely to feel successful and satisfied in their careers. The implication of this is that the workforce may not realize its full potential to meet agency mission and goals. Research has shown that hierarchical institutions, like the Forest Service, that emphasize demographic diversity targets and cultural conformity may perpetuate workplace norms and practices that negatively affect perceptions and experiences of women. Our research suggests that institutions that reduce workplace discrimination and harassment could improve employee perceptions of career success and satisfaction, which have implications for agency missions and goals.

senior rather than junior academic ranks; it is unclear whether this was because of changes in the work environment for junior academics or amount of time for senior academics to experience discrimination (Carr et al. 2000). Regardless, those who experienced discrimination had lower career satisfaction (Carr et al. 2000, Ecklund et al. 2012). These studies suggest, in general, career satisfaction of scientists may be lower for women than men, and that discrimination within science may be more prevalent for women and for women of high rank. Furthermore, experiences of discrimination differ among scientific disciplines. Women in science, technology, engineering, and mathematics (STEM) fields experience discrimination more than women in non-STEM fields (Blackwell et al. 2009). Within STEM fields, women in physics experience more discrimination than women in biology (Ecklund et al. 2012). Thus, experiencing discrimination may depend on the intersection of a scientist's area of scientific training and demographic characteristics.

Experiences of discrimination differ among organizations, because organizations are defined by unique culture, leadership, and policies (Gelfand et al. 2012). Within an organization, the basis for and duration of discrimination experiences vary by the source of discrimination. For instance, workers' well-being was more negatively affected when the source of discrimination was a supervisor rather than a peer coworker (Wood et al. 2013). In addition, discrimination by supervisors reduces an employee's level of organizational commitment and job satisfaction (Ensher et al. 2001), and the impacts from supervisory discrimination have been shown to permanently impact an employee's attainment of career goals (Schilpzand et al. 2016, McLaughlin et al. 2017). It is not known to what degree these findings apply to the scientific workforce.

Although there is a growing body of research on diversity and discrimination within academic institutions and science in general, there is relatively less research about government institutions. The US Forest Service has been attempting to diversify its workforce, particularly with regard to gender, since a 1980s civil rights lawsuit (Winokur 1986). As a hierarchical organization with a top-down structure, the Forest Service is well designed to implement centralized, institution-wide workforce diversification programs (Newman 1995, Kern et al. 2015). Yet, workforce diversification in the Forest Service has been described as a "discrimination and fairness" approach (Brown et al. 2010), focusing on organizational demographics rather than valuing diversity for improving organizational effectiveness and outputs. Moreover, the Forest Service has a history of favoring leaders who make decisions on recruitment and promotion that foster "acculturation" (Robinson 1975) and "willingness to conform" (Kaufman 1960, Carroll et al. 1996); voluntary compliance with these cultural norms continues today (Chojnacky 2012). For these reasons, organizational structure may favor conformity, making implementation of diversification programs difficult. Emphasis on demographic targets and cultural conformity may be associated with workplace norms and practices that negatively affect perceptions and experiences of employees.

Nevertheless, representation of women in the Forest Service has increased from earlier decades. Research conducted shortly after the 1980s lawsuit, for example, found increases in both number of women and number of employees with scientific disciplines not traditional to the Forest Service (e.g., ecology) (Kennedy 1991). At the time, those from non-traditional disciplines perceived lower acceptance in the workplace than their forestry peers, but women were more satisfied

with their rank and promotion prospects than men (Kennedy 1991). More recent research has demonstrated that the representation of female scientists in the Forest Service is higher than the representation of female faculty in universities with comparable areas of study (Kern et al. 2015).

It is unclear whether scientists in the Forest Service have experiences of workplace discrimination similar to scientists in academia. Recent rates of reported discrimination among all Forest Service employees are low; for instance, a 2017 quarterly report of employee relations of the 25,000+ employees (62 percent men and 38 percent women) of the Forest Service showed 83 cases of unacceptable behavior (USDA Forest Service 2017b). Yet, recent reports in the media highlight a culture of sexual harassment and retaliation in some parts of the organization (Ebb 2018, Flock and Braja 2018) and internal assessments reveal employee mistrust of the complaint reporting process (USDA Office of Inspector General 2018a, b). As a consequence, experiences of discrimination and harassment may be under-reported.

The goal of the research reported here was to determine whether there are relations between Forest Service scientists' demographic characteristics (gender, length of service, and scientific discipline), experiences of discrimination (basis, source, duration, and impact), and perceptions of career success and satisfaction using already-available data generated from a survey in 2009–10. The study population was the Northern Research Station in the Research and Development branch of the Forest Service. In 2009, 471 people were employed as scientists in Forest Service Research and Development (Kern et al. 2015), and ~25 percent of this population worked for the Northern Research Station. Based on the literature, we developed three hypotheses: (1) experiences of discrimination would be more common among women, those with greater length of service, and those in scientific disciplines not traditional to the Forest Service (e.g., social science, biology/ecology, and quantitative/physical science) than among men, more recent hires, or those in traditional Forest Service disciplines (e.g., forestry and natural resources); (2) the source of discrimination would most often be from an internal rather than external coworker, and when the source was a supervisor, the duration of impacts would be perceived as permanent rather than temporary; and (3) scientists who experienced workplace discrimination would perceive lower career success and satisfaction than those who did not.

Methods

Survey Methodology

This study is based on data collected through a survey conducted in 2009–10. Literature review and peer reviews were the basis for survey development. The survey objective was to investigate the effects of demographic factors on the career pathways of the 134 Northern Research Station scientists: 95 men and 39 women. The Northern Research Station is one of five regional Forest Service research stations in the continental US, comprising 20 states in the Northeast and Midwest. An e-mail describing the project with a link to the survey instrument in SurveyMonkey® was sent to Northern Research Station scientists on December 9, 2009, with weekly e-mail reminders thereafter until the survey closed on January 15, 2010, allowing respondents 5 weeks to take the survey. The scientists were asked about various perceptions, values, and stages of their career. For the present study, the data were subset to responses to questions about demographic factors (i.e., gender, scientific discipline, rank, and length of service [years working as a Forest Service research scientist evaluated under the Research Grade Evaluation Guide (US Office of Personnel Management 2006)]) and perceived experiences of career success, satisfaction, and discrimination and harassment (hereafter “discrimination”) (Supplement 1). Demographic data about race, ethnicity, and LGBTQ identity were not collected because low representation precluded anonymity.

Demographic Characteristics

Demographic factors related to scientists' gender, scientific discipline, rank, and years as a scientist in the organization were anticipated to be associated with survey-reported experiences of discrimination and perceptions of career success and satisfaction. As a result, categorical responses to questions about respondent's gender (binary: female or male), scientific discipline (six categories: biology/ecology, forestry, other natural-resource management, physical science, quantitative science, or social science), rank (three categories from junior to senior: GS-11 or GS-12, GS-13, and GS-14+; US Office of Personnel Management 2006) and years as a Forest Service research scientist (5-year interval categories from 0 to 25 and a category of >25 years) were used as predictors. For all analyses, the six categories of scientific discipline were organized into four groups (biology/ecology, forestry/other natural-resource management, physical/quantitative science,

and social science). In addition, rank was dropped from analysis, because rank was correlated to years as a Forest Service scientist. Dummy coding was used for gender, scientific discipline, and discrimination; orthogonal polynomial coding was used for years as a scientist.

Experience of Discrimination

Scientists' experiences of discrimination as reported in the survey were one of two major responses of interest. Respondents provided a categorical response to the question "During your Forest Service career, have you ever personally experienced what you consider to be work-related discrimination or harassment?" Each respondent indicated experience of discrimination (yes/no) and, if yes, on what basis. Four close-ended bases for discrimination were listed: gender, age, race/ethnicity, and scientific discipline. One of the discrimination bases, "something else," was open-ended (narrative response) and generated heterogeneous responses that were not included in statistical analysis.

Definitions of discrimination and harassment were not provided to respondents. Instead, respondents were asked whether they had experienced what they "consider to be" discrimination or harassment. Determining whether perceived experiences of discrimination and harassment would meet objective definitions of these terms is difficult and outside the scope of the present study. However, one study of perceived and objective discrimination in an experimental setting indicated associations between the targets' perceptions and objective definitions of discrimination (Taylor et al. 1991). Regardless of definition, employees' perceptions of their work environment, and of discrimination and harassment specifically, were assumed to be related to their experience of workplace culture as positive or negative.

Source and Impact of Discrimination

Respondents who indicated that they had experienced discrimination were asked about the person who was the source of discrimination. The source was categorized as binary (yes/no) outcome variables by organization (Forest Service or non-Forest Service personnel) and occupation (supervisor [Forest Service only], scientist, or nonscientist relation to respondent). Additionally, respondents who responded that they had experienced discrimination rated whether it had an impact on each of five areas (Supplement 1): career advancement in the Forest Service, attitude toward work, attitude toward Forest Service as an agency, relationships with other

scientists, and relation with supervisor or other agency leaders. Ratings were one of the following: "No," "Yes, temporarily," or "Yes, permanently." Perceived impact of discrimination was analyzed for the subset of respondents who specified occupational and organizational sources of discrimination.

Perceptions of Personal Career Success and Satisfaction

The other major responses of interest were scientists' perceptions of personal career success and satisfaction. Using a 5-point Likert scale, subjective responses were used to indicate their degree of agreement with five statements about their career success/satisfaction: "I am professionally successful," "I made the right career choice," "I am satisfied with my current grade [rank]," "I am satisfied with the balance between my personal and professional life," and "Overall, I am satisfied with my career." For analysis, orthogonal coding was used.

Data Analysis

Data were analyzed in R version 3.3.1 (R Core Team 2016).

To assess nonresponse bias, we compared survey respondents to the population from which respondents were drawn on the one demographic variable (gender) that we had population data. We also compared early responders to late responders based on gender, years as a scientist, and frequency of reporting discrimination, following the idea articulated in Armstrong and Overton (1977) that a sample of late responders is likely to be less biased than a sample of early responders. To test early-to-late responder differences, binary variables (gender and discrimination) were tested with logistic regression, and ordinal variables (panels years) were tested with ordinal logistic regression. We also fit models that included interactions with a dummy variable coding early versus late responders.

For data analysis, predictors included respondents' gender, scientific discipline, and years as a scientist and were fixed main effects in the models and used as between-subject independent variables (listed in Table 1). Dependent variables included respondents' experience of discrimination and career satisfaction agreement for all respondents and the basis, source, impact, and duration of discrimination for those who indicated an experience of discrimination (listed in Tables 2–4). Source of discrimination and type of satisfaction were within-subject independent variables (listed in Tables 2 and 3).

For binary dependent measures, we analyzed the data with logistic regression. Because Likert dependent

Table 1. Number of responses (and median response, where applicable) for demographic variables by response from a survey of Forest Service scientists at one research station in 2009–10.

Demographic category	No. of responses	Median response
Gender		NA
Female	35	
Male	61	
No response	4	
Discipline		NA
Biology/Ecology	44	
Natural-Resource Management Group	31	
Forestry	29	
Natural-Resource Management	2	
Physical & Quantitative Science group	11	
Physical Science	7	
Quantitative Science	4	
Social Science	11	
No response	3	
Grade/rank		GS 14
GS 11/12	14	
GS 13	26	
GS 14+	55	
No response	5	
Years as scientist		11–15 years
0–5	14	
6–10	21	
11–15	15	
16–20	16	
21–25	15	
25+	14	
No response	5	

variables are on an ordinal scale, we analyzed those with ordinal logistic regression. The advantage of ordinal logistic regression over linear regression is that it does not treat a fundamentally discrete response variable as if it were continuous. Instead, it treats the response variable as having ordinal properties but not interval or ratio properties. Ordinal regression is the appropriate approach for analyzing Likert responses similar to the more familiar binary logistic regression, which is the appropriate approach for analyzing binary (yes/no) outcome variables. One way of interpreting coefficient tables in ordinal regression is that they represent effects on an underlying scale (a “logit scale,” which is the same underlying scale as in binary logistic regression), but the actual responses are quantified so that

Table 2. Number of respondents (out of 100) who experienced discrimination by specific source from a survey of Forest Service scientists at one research station in 2009–10.

Organizational and occupational source	Response	No. of responses
Overall discrimination (all sources combined)	No	47
	Yes	51
	No response	2
Forest Service supervisor	No	75
	Yes	23
	No response	2
Forest Service scientist	No	77
	Yes	21
	No response	2
Forest Service other personnel	No	80
	Yes	18
	No response	2
Non-Forest Service scientist	No	88
	Yes	10
	No response	2
Non-Forest Service other personnel	No	93
	Yes	5
	No response	2

responses on the underlying scale are not directly observed. We accomplished the ordinal regression via the ordinal package in R version 2015.6-28 ([Christensen 2015](#)). Models were fit with a random effect of respondent and tested fixed main effects. Predictors were coded with dummy contrasts, except that years as a scientist was coded with polynomial contrasts, which is the default coding in R for ordinal predictors. Specifically, to address hypotheses 1 and 2, a set of analyses tested the respondents’ responses to experiences, bases, sources, and impacts of discrimination with fixed effects that coded respondents’ characteristics (gender, years as a scientist, and scientific discipline). To address hypothesis 3, additional analyses tested the respondents’ responses to perceptions of career satisfaction, with each level indicating a different type of satisfaction with the fixed effects of respondents’ characteristics and experiences of discrimination. For analyses that included multiple responses per respondent, mixed effects analysis (random effect of respondent) was implemented (using the glmer function for binary dependent measures and the clmm function with 10 quadrature points for Likert measures); otherwise, the glm and clm functions were used. Statistical significance was assessed via likelihood-ratio chi-square

Table 3. Number of responses and median response for career success and satisfaction by type of satisfaction from a survey of Forest Service scientists at one research station in 2009–10.

Type of satisfaction	No. of responses	Median response
Satisfied with career		Strongly agree
Strongly disagree	0	
Disagree	2	
Neutral	5	
Agree	40	
Strongly agree	51	
No response	2	
Professionally successful		Agree
Strongly disagree	0	
Disagree	1	
Neutral	6	
Agree	51	
Strongly agree	40	
No response	2	
Right career choice		Strongly agree
Strongly disagree	1	
Disagree	2	
Neutral	9	
Agree	34	
Strongly agree	52	
No response	2	
Satisfied with current grade/rank		Neutral
Strongly disagree	2	
Disagree	16	
Neutral	14	
Agree	30	
Strongly agree	36	
No response	2	
Satisfied with personal–professional balance		Agree
Strongly disagree	0	
Disagree	19	
Neutral	12	
Agree	44	
Strongly agree	23	
No response	2	

tests using $\alpha = 0.05$, except that Tukey pairwise post hoc comparisons were accomplished via the lsmeans package (Lenth 2016).

Results

Description of Sample

One hundred (75 percent) of 134 Northern Research Station scientists responded to the survey. Of the 96

Table 4. Number of responses for impact of discrimination by area of impact from a survey of Forest Service scientists at one research station in 2009–10.

Area of impact	Response	No. of responses
Career advancement	No	27
	Temporary	20
	Permanent	3
	NA	50
Attitude toward work	No	22
	Temporary	25
	Permanent	3
	NA	50
Attitude toward Forest Service as an agency	No	26
	Temporary	15
	Permanent	9
	NA	50
Relation with other scientists	No	25
	Temporary	2
	Permanent	4
	NA	49
Relation with supervisor/leaders	No	21
	Temporary	17
	Permanent	12
	NA	50

respondents who indicated their gender, 61 (64 percent) were male, and 35 (36 percent) were female. Scientific discipline was uneven among respondents (97 of whom reported their discipline): 45 percent were from ecology or biology, 32 percent forestry and natural resources, 11 percent social sciences, and 11 percent physical and quantitative sciences.

Years as a Forest Service scientist varied among respondents. Thirty-five respondents had 0–10 years, 31 had 11–20 years, and 29 had over 20 years of experience, representing 37 percent, 33 percent, and 31 percent of the 95 survey respondents reporting their years as a Forest Service scientist, respectively. Of the 96 respondents reporting their grade (rank), 14 (15 percent) were grade 11–12, 26 (27 percent) were grade 13, and 55 (57 percent) were grade 14+. Years as a scientist was positively correlated with rank (Spearman correlation 0.82). Descriptive statistics of the responses are in Tables 1–4.

Nonresponse Bias

Table 5 compares the sample (all responders) to the population and early responders to late responders. In

all three variables examined, early and late responders were similar and did not differ significantly. Women were very slightly overrepresented in the sample (36 percent female scientists in the sample versus 31 percent female scientists in the population, a difference that was not significant), but women were more prevalent (albeit not significantly) among late responders (40 percent) than early responders (33 percent). The small and nonsignificant differences between the population and the sample, and between early and late responders suggested that bias correction was not critical. In addition, bias correction methods outlined in [Armstrong and Overton \(1977\)](#) assume that nonresponders are more similar to late responders than early responders. However, percentage of female scientists was higher among late responders than early responders, but lower in the population than in the sample. We therefore did not apply bias correction for nonresponse. Finally, interactions with the dummy variable coding early versus late responders included in the models were not significant; the models reported below omit such effects.

Experience of Discrimination

Fifty-one respondents (52 percent of the 98 providing data on the item) indicated that they had experienced work-related discrimination or harassment (“discrimination” hereafter). Among all respondents providing data, 32 percent indicated that the basis of their discrimination experience was gender, 14 percent scientific discipline, 12 percent race/ethnicity, and 10 percent age. Discrimination on the basis of gender was more frequent than discrimination on other bases, an effect that was significant regardless of whether demographic characteristics (logistic regression followed by Tukey paired post-hoc, $P < .01$) were controlled.

The basis of discrimination interacted with respondent gender ($\chi^2 [3] = 9.20$, $P = .03$). Women responded that their discrimination was based on gender more frequently than men. Specifically, discrimination on the basis of gender was indicated by 49 percent (17/35) of women versus 22 percent (14/61) of men, an effect that was significant ($P = .02$) regardless

of whether other demographic characteristics were controlled.

Other demographic characteristics (years as a scientist and scientific discipline) were not significantly associated with probability of experiencing discrimination.

Perceived Effects of Discrimination

Roughly half of the respondents (51 percent) indicated that their discrimination experience had an impact (on career advancement in the Forest Service, attitude toward work, attitude toward Forest Service as an agency, relationships with other scientists, or relationship with supervisor or other agency leaders versus no impact; [Figure 1](#)). Duration of impact was indicated to be largely temporary. Demographics did not significantly predict impact area or duration.

Perceived presence of discrimination was significantly associated with organizational source but not occupational source. Specifically, respondents indicated that they experienced discrimination more frequently from Forest Service personnel than from non-Forest Service personnel ($\chi^2 [1] = 21.58$, $P < .001$); this difference persisted ($\chi^2 [1] = 15.95$, $P < .001$) when controlling for the nonsignificant effects of occupational source.

The extent to which respondent demographics interacted with responses about occupational and organizational source of discrimination was examined. For these analyses, models that included the multiple-degree-of-freedom demographic factors (years as a research scientist and discipline, both of which had more than two levels and therefore would require more than one degree of freedom to fit) failed to converge. However, models converged that allowed for potential effects of gender and its interactions with organizational and occupational source. Organizational source and its interaction with gender were not significant, but the final model included the interaction of gender and occupational source along with the effects marginal to that interaction ([Table 6](#)). The key result is that gender interacted with organizational source ($\chi^2 [1] = 12.22$, $P < .01$). The nature of the interaction was that, whereas women reported almost the same rates of

Table 5. Comparisons of population to overall sample (“All responders”) and comparison of early responders to late responders for three important variables.

Variable	Population	All responders	Early responders	Late responders
Percentage female	31	36	33	40
Median panel years	NA	13	13	13
Percentage reporting discrimination	NA	52	49	55

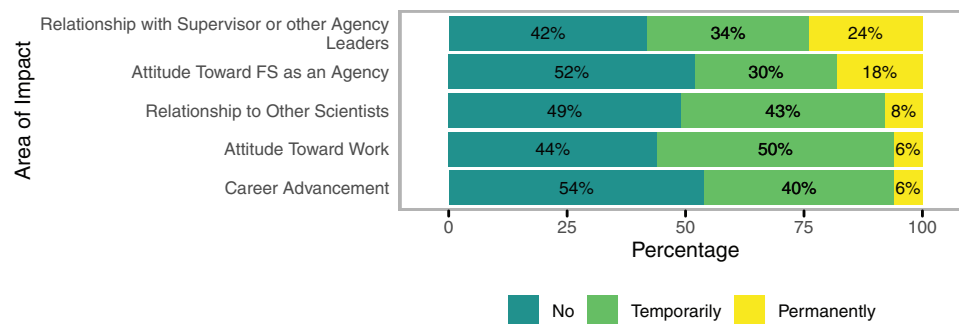


Figure 1. Duration of impact of discrimination (No, Temporarily, Permanently) for each of five areas of impact as perceived by respondents from a survey of Forest Service scientists at one research station in 2009–10 ($n = 51$ respondents for Relationship to Other Scientists; $n = 50$ respondents for the other four areas).

Table 6. Model coefficients from mixed-model logit regression of respondents' survey-reported experiences of discrimination as predicted by organizational source, occupational source, and respondent gender from a survey of Forest Service scientists in 2009–10 ($n = 96$).

Type	Effect	Description	χ^2/df	Coefficient estimate	Standard error	z	P	
Fixed	Intercept			-2.23	0.38	-5.93	<.001	***
	Organizational source	Non-Forest Service		-3.57	1.05	-3.39	.001	***
	Gender	Female		-0.79	0.49	1.63	.10	
	Organizational source \times gender	Non-Forest Service \times female	12.22/1	3.07	1.13	2.71	.007	**
	SD _{respondent}			1.48				
Random	SD _{respondent}			1.48				

Note: SD_{respondent}, respondent-to-respondent standard deviation (* $P < .05$, ** $P < .01$, *** $P < .001$).

discrimination from non-Forest Service organizations as from the Forest Service organization, men reported almost no discrimination from non-Forest Service organizations (Figure 2).

Perceptions of Personal Career Success and Satisfaction

Most respondents indicated that they were satisfied and felt successful in their careers. Agreement ranged from 67 percent to 93 percent with the greatest agreement with the statement "Overall, I am satisfied with my career." Disagreement was low, ranging from 1 percent to 19 percent, and the greatest disagreement was with the statement "I am satisfied with the balance between my personal and professional life."

Agreement among respondents was explained with the main effects of perception of satisfaction, years as a scientist, and experience of discrimination, with years as a scientist further simplified by including only the linear contrast as other contrasts were not significant (Table 7). Tukey pairwise post-hoc tests revealed that perceptions of satisfaction were similarly high for "Overall, I am satisfied with my career," "I

am professionally successful," and "I made the right career choice" but that perception of satisfaction was lower for "I am satisfied with my grade [rank]" and "I am satisfied with the balance between my personal and professional life." Relative to the respondent-to-respondent variability of 1.62 logit units, there was a large ($d = 0.94$) effect size for the difference between the two questions about grade/rank and personal/professional balance and the three other questions.

Lower satisfaction was somewhat more evident in respondents who indicated that they had experienced discrimination than those who did not ($\chi^2 [1] = 4.32$, $P = .04$) (Table 7, Figure 3). The coefficient for this lower satisfaction was -0.83 logit units, resulting in a medium effect size of $d = -0.83/1.62 = -0.51$.

Discussion

This study is one of the first to systematically explore research scientists' perceptions of discrimination, career success, and satisfaction in the Forest Service. We hypothesized that (1) discrimination would be more prevalent for women than men, for those with more years as a Forest Service scientist, and for those in

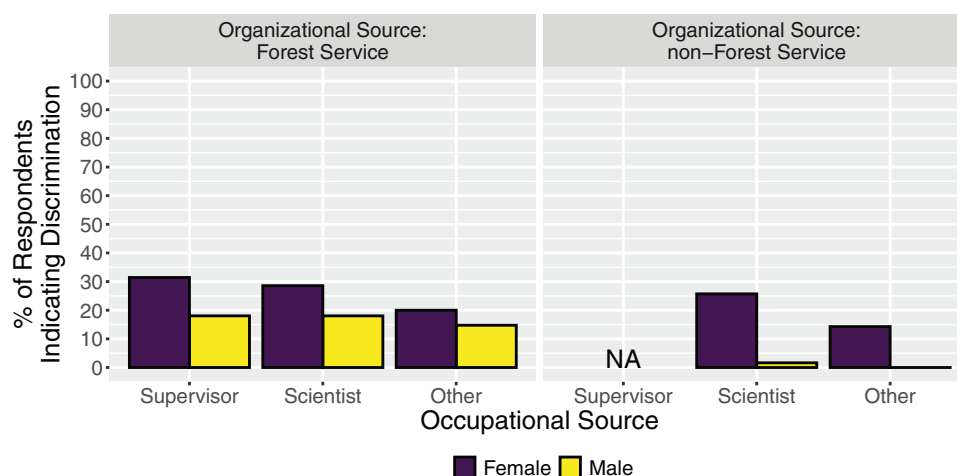


Figure 2. Percentage of respondents who indicated that they had experienced discrimination, by respondent gender, organizational (personnel) source, and occupational (relational) source from a survey of Forest Service scientists at one research station in 2009–10. Bars represent responses from 61 male and 35 female scientists ($n = 96$).

Table 7. Model coefficients from mixed-model ordinal logit regression of respondents' perceptions of satisfaction as predicted by respondents' characteristics from a survey of Forest Service scientists in 2009–10 ($n = 96$).

Type	Effect	Description	χ^2/df	Coef- ficient esti- mate	Standard error	z	P	
Fixed	Perception of satisfaction		59.17/4				<.001	***
		I am professionally successful.		−0.43	0.31	−1.36	.17	
		I made the right career choice.		−0.11	0.32	−0.33	.74	
		I am satisfied with my current grade.		−1.45	0.33	−4.43	.00	***
		I am satisfied with the balance between my personal and professional life.		−1.97	0.33	−6.01	.00	***
	Experience of discrimination		4.32/1	−0.83	0.40	−2.08	.04	*
	Years as scientist	linear	11.72/1	1.74	0.50	3.45	.00	*
Thresholds	Strongly disagree			−7.93	0.76	−10.45		
	Disagree							
	Neutral			−4.77	0.45	−10.66		
	Agree			−3.70	0.42	−8.91		
	Strongly agree			−0.83	0.36	−2.30		
Random	SD _{respondent}				1.62			

Note: SD_{respondent}, respondent-to-respondent standard deviation (* $P < .05$, ** $P < .01$, *** $P < .001$).

scientific disciplines traditionally under-represented in the Forest Service (i.e., social and physical/quantitative sciences); (2) the source and impact of discrimination would be most likely from within the Forest Service and, when from a supervisor, have a permanent impact; and (3) scientists who experienced discrimination would express lower career success and satisfaction

than those who did not. The hypotheses were supported in part. For hypothesis 1, women in the study population were more likely to indicate that they experienced discrimination than men, with gender as the most common basis of discrimination. For hypothesis 2, experiences of discrimination were more likely from Forest Service employees and had a largely temporary

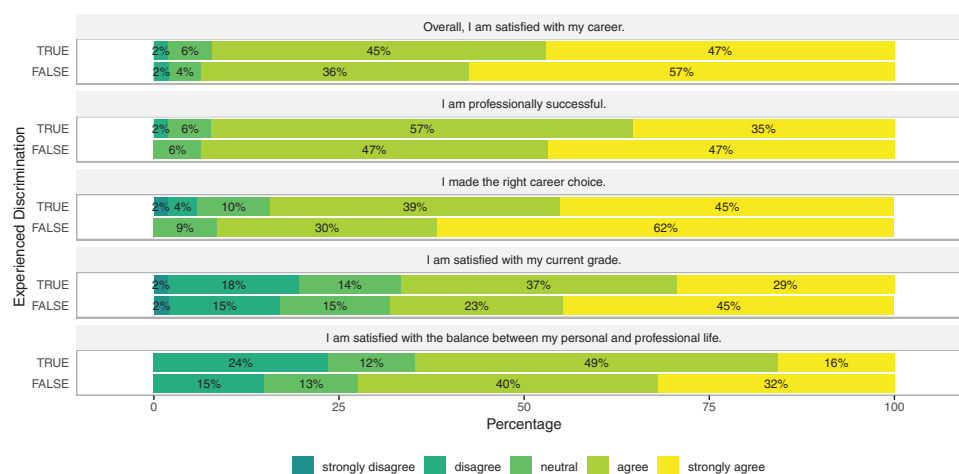


Figure 3. Level of agreement of respondents' perception of satisfaction by statement and experience of discrimination from a survey of Forest Service scientists at one research station in 2009–10 ($n = 96$). For each statement, responses were provided by 47 respondents who indicated that they had experienced discrimination ("True") and 51 respondents who did not ("False").

impact on respondents' workplace relationships and attitudes. And, for hypothesis 3, respondents indicated overall career satisfaction, especially as years as a scientist increased, but those who experienced of discrimination expressed lower satisfaction.

Prevalence of Perceived Discrimination

One of the most striking results was that over half the respondents in the study population indicated they experienced work-related discrimination, even though formally reported discrimination is low overall within the Forest Service. This result may be explained by a culture of conformity in which employees have been implicitly or explicitly discouraged from reporting discrimination. Retaliation and fear of reprisals for reporting have been described in the media (Flock and Braja 2018), and a report from the USDA Office of Inspector General (2018a) indicated employees may not trust Forest Service supervisors and managers to report sexual harassment and sexual misconduct. These reasons could explain the low number of reported cases of discrimination in the Forest Service, although the present study did not examine that issue directly. Whistle-blowing, in general, has been considered a rare event in the federal government (Lavena 2016). Yet, a study of a wide range of companies, industries, and occupations found that discrimination was under-reported and that the number of officially reported grievances did not predict perceptions of workplace discrimination (Ensher et al. 2001). Effects of perceived discrimination, which may or may not be influenced by external definitions, are argued to

be as important as those of objective discrimination (Hopkins 1980).

The findings from microaggression research may explain, in part, results of this study and are supported by some of the voluntary write-in responses. Microaggressions are temporary and less obvious experiences of discrimination that can have cumulative and detrimental impacts on an individual (Solorzano et al. 2000, Sue et al. 2007, Sue 2010a, b). Voluntary write-in responses make it clear that some women believe that they need to work harder than men to prove they belong in the agency, and that this is something they perceive will always be a challenge in their career. One survey respondent wrote, "I wish the proverb of 'working two times as hard to be thought 1/2 as good' were only a deceptive self-perception. There is no doubt in my mind that the higher your grade, the more difficult it is for women scientists." Another survey respondent stated, "as a federal employee ... it's impossible not to get questions from others or question yourself [whether] you got your first job because [you] were a female with a degree in forestry. This can be both a positive and a negative influence. I think it made me work harder to 'prove' I deserved my job/next job. Although I experienced no obvious discrimination from fellow federal employees." Another woman wrote, "it became painfully clear that some of my colleagues and support staff think that I was hired because of my gender, and/or have problems with women in positions of authority. So, I have had to work extra hard to overcome that bias. Because of that, I feel a real sense of accomplishment about my career and my

success. Yet I also feel like it will always be hard for me.” Finally, one write-in response from a female scientist indicated that her ideas were often ignored, only to be taken up by male scientists. She states, “I have sat in more than one meeting where I made a point that was seemingly ignored. A few minutes later, the same point was made by an older male scientist, and was taken up for discussion.” These quotes are examples of microaggressions and show how some women can have positive perceptions of their career yet believe they will always have to work hard to prove they belong. Microaggressions can have negative impacts on people’s health, earnings, and work productivity, and affect employee recruitment, job satisfaction, retention, and promotion (Sue 2010a). In the present study, employees who stated that they had experienced discrimination were more likely to have lower job satisfaction than employees who did not, regardless of whether they perceived the effects to be permanent or temporary.

Another important and surprising finding from the survey was the large percentage of women who stated that they had experienced discrimination from non-Forest Service personnel; this percentage was significantly lower for men. Science is often conducted via collaboration, and organizationally diverse teams are not only encouraged by granting agencies (Cordova 2018) but often necessary because of the increasingly complex and interdisciplinary nature of research (Cheruvilil et al. 2014). Yet, findings of this study suggest that collaborative partners, i.e., employees of other institutions, are sources of discrimination for female scientists in the Forest Service. Although the Forest Service has articulated policies and processes for resolving workplace discrimination and harassment that comes from its own employees and those performing work on behalf of the Forest Service (USDA Forest Service 2017a), steps for addressing discriminatory behavior from external partners without formal agreements or contracts with the Forest Service are not as clear. If discrimination from research collaborators cannot be satisfactorily resolved, this group will continue to serve as a source of discrimination disproportionately affecting the experiences of female Forest Service scientists.

Lack of Conformity?

In this study population, women were the group of Forest Service scientists most likely to indicate that they had experienced work-related discrimination. Studies have shown women experience gender discrimination

throughout their professional careers more so than men (Shinew et al. 2000). Within the Forest Service, the intersection of shifting forest-management paradigms with efforts to increase gender diversity of the workforce likely makes this problem particularly acute (Kennedy and Mincolla 1986). Brown and Harris (2001) concluded that women in the Forest Service have been viewed as “scapegoats” for agency failures and challenges while also being seen as “saviors” for diversifying the agency and helping to adapt to new less commodity-focused management paradigms. These dual and conflicting roles may increase the potential for female employees’ perceptions of a chilly climate and experiences of discrimination.

Moreover, the agency’s organizational structure and workplace culture may also contribute to women having more negative experiences than men. Hierarchical organizations, such as the Forest Service, strive for assimilation among groups to meet organizational norms (Robinson 1975, Chojnacky 2012). Although contemporary leaders are more diverse in gender, ethnicity, and profession than the past, leaders are likely socialized to comply for promotion and selection for desirable positions (Gaffrey 2007), creating a homogenizing effect on employees (Brown et al. 2010). In other hierarchical organizations, gender diversity in top managerial positions alone did not appear to have organizational impacts (Opstrup and Villadsen 2015). As such, the strong culture of conformity may perpetuate historical views of forestry as a male field, resulting in a work environment that is unwelcoming to those in the minority, such as women.

Length of Service

Contrary to the hypothesis that experience of discrimination is positively correlated with length of service, this study did not find a significant relation between years as a Forest Service research scientist and respondents’ answers to questions about experiences of discrimination. This may mean that the probability that a Forest Service scientist will experience discrimination has remained constant over the decades of employment represented by the sample population, i.e., from the midtwentieth century to the present. As a hierarchical institution, workplace interactions may occur consistently over time within the context of chain of command of the Forest Service. Thus, research linking seniority (or time in tenured faculty positions) and experiences of discrimination among university faculty (Carr et al. 2000, Ecklund et al. 2012) may have limited application to the Forest Service because of

inherent differences in organizational structure (Kern et al. 2015). Alternatively, there may be differences in retention between those who experience discrimination and those who do not (Sonnert 1996). Whether this is a factor in the sample population is not clear, but if it was, increases in discrimination associated with length of service could be obscured in the data by a winnowing of the workforce over time to those with more positive work experiences.

Scientific Discipline

Significant relations between scientific discipline and respondents' experiences of discrimination were not found. This could also be explained by the hierarchical structure of the Forest Service and the integration of scientific disciplines that began with environmental regulations of the 1970s (Kennedy 1991). It has been several decades since multiple disciplines have been integrated into the Forest Service. For instance, a 1990 survey of Forest Service employees indicated that some beliefs transcend discipline but not gender; results of that survey indicated that women regardless of discipline had greater environmental concerns than men (Brown and Harris 1993). Thus, it is possible that perceptions of discrimination also transcend scientific discipline within this organization. The results of this research are supported by a study of physics and biology department faculty at elite universities; gender, not discipline, of faculty shaped the perceptions of gender disparities and discrimination (Ecklund et al. 2012).

Career Satisfaction

Results suggest that most Forest Service scientists in the study population were satisfied with their careers, believed they were professionally successful, satisfied with work/life balance, satisfied with their current grade, and believed that they made the right career choice (Figure 3). An employee with high job satisfaction will most likely have a high level of job engagement and therefore productivity (Hagedorn 2000). Overall, a satisfied workforce is important to organizational goals and mission.

However, those who indicated that they had experienced discrimination had lower satisfaction than those who had not. Given the relation between job satisfaction and productivity (Hagedorn 2000), experiences of discrimination might limit scientific discovery and therefore meeting agency goals. Research is most often carried out through collaborative teams of scientists from multiple disciplines and institutions (Cheruvilil

et al. 2014). High-performing teams are those which create, maintain, and foster diversity and effectively use interpersonal skills (Cheruvilil et al. 2014). Understanding discrimination as a barrier to job satisfaction will better enable the agency to create pathways to achieve its mission in science, management, and service.

Other Demographics

Experiences of discrimination and perceptions of career success and satisfaction from other under-represented groups (racial/ethnic minorities, LGBTQ people, etc.) were not analyzed in this study, because these groups represented <3 percent of the data, thus precluding anonymity. This prevented statistical analysis of experiences of discrimination and perceptions of career success and satisfaction in the Forest Service from those perspectives despite several survey write-in answers explicitly indicating discrimination based on "sexual orientation." Past research suggests that although there are some commonalities, experiences of women are not necessarily representative of those in other groups (Collins and Bilge 2016) and that intersectionality between demographic categories including gender can influence discrimination (e.g., Hollis 2017). For these reasons, additional research on the broader Forest Service population (i.e., all of Research and Development or the entire agency) is warranted in order to further explore experiences of those who are minorities in the organization.

Inference from the Literature

The study results support the deficits theory (Sonnert 1996) that formal and informal structural mechanisms such as discrimination in the scientific environment lead to lower success and satisfaction for affected groups (Settles et al. 2006). This suggests that there are still unresolved issues pertaining to gender discrimination in the Forest Service and the need for further research into employee perceptions of their career trajectories and relationships. Although there have been numerous studies of differences in perceptions of environmental and public participation values within the Forest Service (Kennedy 1991, Brown and Harris 1993, Mohai and Thomas 1995), relatively little has been done to explore perceptions of career satisfaction related to experiences of discrimination within the Forest Service.

Research also suggests attaining fully inclusive and diverse workplace culture is challenging for organizations, such as the Forest Service. For instance,

whereas demographic data indicate that Forest Service scientists are more gender-diverse than their academic counterparts at research universities in terms of proportional diversity (Kern et al. 2015), the Forest Service uses a passive approach to workforce diversification (Hopkins 1980). According to Brown et al. (2010), the Forest Service may not operate at full integration and inclusion using a “discrimination and fairness” approach. With more than half of Forest Service research scientists in this study population indicating that they had experienced discrimination, the findings support the idea that the agency has not attained full integration and inclusion.

Conclusion

Past research has shown that perceptions of the workplace environment vary by gender. Findings of this study suggest that gender bias remains a workplace issue for the Forest Service, even though this agency has focused on diversification of the workforce for decades. Although overt gender discrimination is less common than subtle gender discrimination for some scientists (McGuire et al. 2012), gender discrimination persists in less obvious ways (i.e., microaggressions or discrimination with mostly temporary effects) within the Forest Service scientific workforce.

There are few studies specifically about scientists within the Research and Development branch of the Forest Service, and another survey of this group will be necessary to assess change over time. In addition, the survey data represent 2009 conditions, and perceptions of work environments and career satisfaction may have shifted over the last decade. Contemporary data are needed to determine whether past perceptions represent current conditions. Moreover, because Research and Development scientists represent a small proportion of Forest Service employees overall (1.5 percent of 31,927 employees in 2009; US Office of Personnel Management 2009), new research should include the entire agency (e.g., the National Forest System, Business Operations, and State and Private Forestry), because intra-agency organizational learning environments and processes are different (Brown and Squirrell 2010). Consequently, the relation of findings from one branch of the Forest Service, such as those from the present study, to another branch is not clear without more complete agency-scale research. Moreover, future research could be strengthened by including other demographic groups and using established metrics for assessing discrimination like the Quick Discrimination Index as suggested by Burkard et al. (2002).

Today’s complex environmental issues require diverse scientific inquiry to generate a range of knowledge for science-based solutions and adaptive natural-resource management. Understanding how employees working for one of the largest land management agencies in the United States perceive discrimination and their careers is necessary for effective workforce management and scientific discovery. Although more research is needed, this study shows that gender, impacts from discrimination, and career satisfaction are related. Without attention to workplace culture, the Forest Service will be limited to realizing its mission related to scientific discovery and public land management.

Supplementary Materials

Supplementary data are available at *Journal of Forestry* online.

Supplement 1. Selected survey questions from US Forest Service, Northern Research Station Career Pathways Survey (2009–10).

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Conflicts of Interest

None declared.

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